MAIL-BASED STOOL COLLECTION IN WOMEN WITH AND WITHOUT AGE-RELATED MACULAR DEGENERATION

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Purpose: To demonstrate the feasibility of collecting stool samples via the mail for subsequent sequencing of the gut microbial DNA in relation to age-related macular degeneration (AMD) status. We also explored response rates by AMD status. Methods: From June to August 2017, 200 participants of the Carotenoids in Age-Related Eye Disease Follow-up Study (CAREDS2), an ancillary study of the Women's Health Initiative (WHI), were mailed recruitment letters and consent/decline forms asking them to participate in a pilot study. Women who returned signed consent forms via the mail were sent stool collection kits. Completed kits were mailed back to study personnel. Ten percent of mailed kits invited women to complete two stool collections from the same bowel movement (duplicates). Results: Of the 200 women contacted, 152 (76%) consented via the mail. Kits were only sent to 150 women due to budget restrictions. There were 38 (19%) women who indicated they were not interested (n=22 mail; n=16 phone); 5 (3%) unable to be engaged or reached for participation; and 5 (3%) who indicated possible future interest. There were 142 (95%) women who returned kits; and 14 of these women sent duplicates (142 + 14=156 samples). Eleven (8%) of 142 women reported possible sample contamination (e.g., collection paper to catch stool ripped, stool was scrapped from toilet or collected with an un-provided device), and 7 (5%) of 156 samples leaked in transit. One leaked sample could be replaced by a duplicate that did not leak. This provided samples from 125 women for sequencing, of which 92 had gradable fundus photographs for assessment of AMD. Response rate did not differ by AMD status (Table 1). Conclusions: Collection of stool samples via the mail in postmenopausal women is feasible, both in women with and without AMD. Improvements in stool collection paper and reminders to tightly screw on the stool collection tube lid will likely improve usability of returned samples.

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<th>Table 1: Women (Number [%]) Participating by AMD Status</th>
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<td>Returned samples with good integrity</td>
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S/P indicates work done while a student/postdoc
EXPLORING POTENTIAL MEDIATORS BETWEEN FEAR OF FALLING (FOF) AND FALLS: A LONGITUDINAL MEDIATION ANALYSIS Afshin Vafaei* Afshin Vafaei, Tamer Salah, Fernando Gomez, Carmen Lucia Curcio, Mohammad Auais, (Lakehead University, Thunder Bay, Canada)

Background: Concurrent and longitudinal influences of FOF on the occurrence of falls is well established. Furthermore, evidence is accumulated on relationships between FOF and various mobility-related factors. However, mechanisms by which FOF results in fall events is not clear. Our aim was to explore mobility-related factors that mediate the longitudinal relationship between FOF and the incidence of falls. Methods: Longitudinal data (baseline, 2014, and 2016 follow-ups) were obtained from Canadian, Brazilian, Colombian, and Albanian community-dwelling older adults participating in the International Mobility in Aging Study. FOF was measured in 2012 using the Fall Efficacy Scale-International. The incidence of falls was measured in 2016 via self-reported questions. Examined mediators (in 2014) included balance and gait speed (part of the Short Physical Performance Battery), and frequency and limitations in levels of participation in social activities measured using the Late-Life Disability Instrument. Following the current theoretical models, we tested for separate, parallel, and serial mediations using the process analytical method. Results: After adjustment for socio-demographic factors, research site, depression, visual impairment, and number of chronic conditions, only balance remained a significant mediator for the positive relationship between FOF and falls by mediating about 25% of the total effects. The total longitudinal effect of FOF on the incidence of falls was slightly negated (6%) by better levels of social participation. Conclusions: A substantial proportion of the effect of FOF on the future occurrence of falls is mediated through poor balance and limitation in social participation. Potential clinical implications of these findings include guiding interventions in the management of FOF.

Tobacco smoking was examined as a risk for dementia and neuropathological burden in 531 initially cognitively normal older adults followed longitudinally at the University of Kentucky’s Alzheimer’s Disease Center. The cohort was followed for an average of 11.5 years; 111 (20.9%) participants were diagnosed with dementia, while 242 (45.6%) died without dementia. At baseline, 49 (9.2%) participants reported current smoking (median pack-years=47.3) and 231 (43.5%) former smoking (median pack-years=24.5). The hazard ratio (HR) for dementia for former smokers vs. never smokers based on the cause-specific Cox model was 1.64 (95% CI: 1.09, 2.46), while the HR for current smokers vs. never smokers was 1.20 (0.50, 2.87). However, the Fine-Gray model, which accounts for the competing risk of death without dementia, yielded a subdistribution hazard ratio (sHR)=1.21 (0.81, 1.80) for former and 0.70 (0.30, 1.64) for current smokers. In contrast, current smoking increased incidence of death without dementia (sHR=2.38; 1.52, 3.72). All analyses were adjusted for baseline age, education, sex, diabetes, head injury, hypertension, overweight, APOE-ε4, family history of dementia, and use of hormone replacement therapy. Once adjusted for the competing risk of death without dementia, smoking was not significantly associated with incident dementia. This finding was supported by an analysis of neuropathological outcomes on 302 of the participants, which showed a consistent pattern of reduced neuropathological burden among ever smokers relative to never smokers.
PREDICTION OF 10-YEAR MORTALITY IN A COHORT OF COMMUNITY-DWELLING OLDER ADULTS IN HONG KONG Io-leong Chan* Io-leong Chan, June Y.Y. Leung, C. Mary Schooling, (School of Public Health, The University of Hong Kong, Hong Kong, China)

Background: Mortality prediction in older adults may motivate healthy changes and facilitate patient management. The Suemoto Index based on five Western cohorts predicts 10-year risk of mortality in older adults. However, its validity in long-lived non-Western populations is unknown. Methods: We validated the Suemoto Index in Hong Kong, given Hong Kong has the longest life expectancy globally, using the Hong Kong Department of Health Elderly Health Service Cohort (n = 136,309, 47,801 men, 87,431 women) of ethnic Chinese adults aged 65+ years. We assessed model calibration (Hosmer-Lemeshow \( \chi^2 \)) and discrimination (Harrell’s C Statistic). Where appropriate, we recalibrated the Suemoto Index using Hong Kong survival rates and Hong Kong estimates for the 12 predictors (age, diabetes, heart disease, lung disease, cancer, smoking, alcohol use, body mass index, physical activity, difficulties with daily living, cognitive impairment and self-reported health). Results: After an average of 8.6 years of follow up, 9,240 men and 9,896 women had died, representing a lower mortality rate than in Western cohorts of the same age. The Suemoto Index was miscalibrated (\( \chi^2 = 2065 \) for men and 3842 for women) but adequately discriminated (Harrell’s C Statistic 0.696 ± 0.004 for men and 0.707 ± 0.004 for women) in the Chinese population. Using Hong Kong survival rates improved calibration (\( \chi^2 = 49.1 \) for men and 79.2 for women) but over-estimation was still significant, which was improved by re-estimating predictors from individual-level Hong Kong data, particularly body mass index and self-rated health. Conclusion: The Suemoto Index based on Western cohorts overestimated 10-year risk of mortality in the Hong Kong Chinese population. The Suemoto-HK Index based on Hong Kong survival and Hong Kong estimates for the predictors had good calibration and discrimination. The Suemoto model is applicable to the Chinese populations after refitting using population-relevant individual-level data.
REPEAT FALL INJURY AND SUBSEQUENT DEATH AMONG OLDER ADULT FALLERS: A STATEWIDE LONGITUDINAL STUDY  Kevin Kwan* Kevin Kwan, (University of California Merced)

Background- Falls are a leading cause of injury among older adults. In the USA, approximately one-third of all elderly adults experience falls annually. Previous studies have examined rates of falls, cost, and risk factors related to falls. Few studies, however, have utilized data from a population-representative sample of older adults, which is necessary to inform public health intervention and prevention efforts. Objectives- To estimate two-year risk of subsequent fall injury and death among older adults who had an index fall injury requiring emergency medical attention. Methods- Statewide, longitudinal, individually linked data from California was used to follow nearly 1.2 million older adults (aged ≥65 years) who reported to an emergency department (ED) for any fall injury in 2010, with follow-up through December 31st 2012. Older adult patients who suffered fall injuries were compared to other older ED patients who presented for other reasons. Incidence rate ratios were calculated to examine risk factors for repeat fall injury and all-cause mortality following the index visit. Results- A total of 1,196,010 older adults utilized ED services in 2010, 201,889 reported fall related injuries. Among older adult fallers, 37.4% had another fall injury, and 37.3% died, during the follow up period. Elderly fallers were 2.99 times more likely to have a subsequent fall-related injury ED visit after their index visit [95% CI=2.96, 3.02] and 1.21 times more likely to die [95% CI=1.20, 1.22] when compared to non-fallers. Conclusion- Older adults utilizing ED services for fall-related injuries are at high risk of future fall injury and death. Subgroups at elevated risk should be prioritized for secondary prevention efforts that research suggests are effective at reducing injury morbidity and mortality in this vulnerable age group.

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SEX DISPARITIES IN THE ASSOCIATION BETWEEN SUBJECTIVE COGNITIVE DECLINE AND LIFE SATISFACTION: RESULTS FROM A POPULATION-BASED SAMPLE Monique J. Brown*
Monique J. Brown, , (University of South Carolina)

Background: Subjective cognitive decline (SCD) is defined as an individual’s perception of worsening cognitive functions over time. SCD has been shown to influence life satisfaction among older adults. However, epidemiologic studies examining the sex disparities in this association are lacking. Therefore, the aim of this study was to determine the sex differences in the association between SCD and life satisfaction using a population-based sample. Methods: Data were obtained from 3,795 respondents (≥45 years) in the 2016 Behavioral Risk Factor Surveillance System Survey. Simple and multiple linear regression models were used to determine the association between SCD in the past 12 months and general life satisfaction (continuous variable). Models adjusted for age, race/ethnicity, education, income and employment; and were stratified by sex. Results: Approximately 14% of the population reported SCD, 14% of women and 13% of men. After adjusting for age, race/ethnicity, education, income and employment, respondents who reported SCD over the past year reported lower life satisfaction (β=-0.55; 95% CI: -0.66, -0.43). The association between SCD and lifetime satisfaction was also statistically significant for women and men (β=-0.47; 95% CI: -0.58, -0.35 and β=-0.65; 95% CI: -0.85, -0.44, respectively). Discussion: The association between SCD and life satisfaction was stronger among men than women. Nevertheless, intervention programs aimed at improving life satisfaction among aging adults with SCD are warranted for both men and women. Qualitative research may help to determine specific focal points for these interventions, which may vary based on differences by sex. Future studies should also use a longitudinal approach to examine the association between SCD and life satisfaction to determine the temporal sequence and potential mediators.
IMPACT OF DISEASE SCREENING ON AWARENESS AND MANAGEMENT OF HYPERTENSION AND DIABETES AMONG MIDDLE-AGED AND OLDER CHINESE: A FOUR-YEAR PROSPECTIVE STUDY L.H. Lumey* L.H. Lumey, Chihua Li, (Columbia University)

Background Awareness and management of hypertension and diabetes has been low in China, and it is not clear if the screening program implemented by a national health survey improved its participants’ disease awareness and management. Methods The China Health and Retirement Longitudinal Study (CHARLS) is an ongoing longitudinal health survey conducted among Chinese people aged 45 years and older since 2011. It was designed to be a nationally representative sample of this population. It followed participants every two years. In 2011, over 11,000 participants completed interviews and physical examinations and provided fasting glucose samples to screen for hypertension and diabetes. In 2013 and 2015, they were followed to track their awareness and management of each condition, and they were asked how they first became aware of their chronic condition. Results Over 80% of participants diagnosed with hypertension and/or diabetes in 2011 reported that they were unaware of their condition in 2015. Although some improvements in awareness and management of hypertension and diabetes were observed between 2011 and 2015, these improvements resulted mainly from physical examinations initiated by study participants (over 75%) or by their work unit or community (12-15%), and less so from CHARLS screening (3%). Participants with rural household registration status and lower BMI were most likely to be or to remain unaware of their condition. Conclusions Disease screening in CHARLS did not lead to significant improvements in reported awareness of hypertension and diabetes. Systematic feedback of screening results to survey participants and monitoring of disease awareness over time needs attention in CHARLS and other longitudinal health surveys to improve communication of screening results and disease management.
Background: Sepsis is a blood-borne disease with a very high mortality rate, so reducing the incidence and mortality of sepsis is a recognized health challenge. However, there is no effective treatment for sepsis. According to the statistics of drug use, Calcium channel blocker is the most used in the hypertensive drugs, among them, amlodipine is the top in the list for consecutive years. This present study is to assess the potential association between amlodipine and sepsis. Methods: This study investigated 54,996 cases with sepsis identified from 2000 to 2013 years in Taiwan’s National Health Insurance Research Database (NHIRD). For long term trends, we assessed the change in the incidence rates over 14 years by linear trend analysis. The Kaplan–Meier method was used for calculating the cumulative incidence of sepsis in each cohort. Cox proportional regression hazards models were used to estimate hazards ratios (HRs) and 95% confidence intervals (CIs). SAS version 9.4 for Windows was used to analyze all the data. All statistical significance was set as p<0.05. Results: Kaplan-Meier analysis showed that the cumulative risk of Sepsis in the amlodipine cohort was significant higher than that in the comparison cohort (log-rank test, p<0.001). In addition, Cox proportional regression showed that amlodipine users had higher risk of sepsis than non-users (adjusted HR [aHR] of 2.32, 95% CI=2.19-2.46). The aHRs at exposures of less than 28 defined daily doses (DDDs); 28-91 DDDs; 91-365 DDDs; and over 365 DDDs, were 2.22 (95% CI=2.01-2.44); 2.34 (95% CI=2.14-2.56); and 2.46 (95% CI=2.27-2.67) ; and 2.03 (95% CI=1.90-2.17), respectively, and the trend test, p<0.0001. Conclusion: The incidence of sepsis had a deep influence in the past 14 years. By means of the big data, our finding suggested the risk of sepsis with increasing amlodipine dose is steadily rising. Thus, the study to indicate a positive correlation between sepsis and amlodipine is imperative. Keywords: sepsis, National Health Insurance
ARE LOW INCOME CHILDREN MORE PHYSICALLY ACTIVE WHEN THEY LIVE IN HOMES WITH BIGGER YARDS? A LONGITUDINAL ANALYSIS OF THE NET-WORKS STUDY. Jonathan Miller* Jonathan Miller, Yingling Fan, Nancy E. Sherwood, Theresa Osypuk, Simone French, (University of Minnesota)

A small body of relatively weak literature has examined whether home yard size is associated with parent reported physical activity among young children. This study prospectively examined the relationship of the size of child's home yard to objectively measured physical activity over three years (2012-2017) among a cohort of 531 low-income children ages 2-4 at baseline who enrolled in NET-Works, a community-based pediatric obesity prevention trial (NCT01606891). The child's yard size was operationalized from publicly available GIS parcel boundary and building footprint data that were used to estimate the size of the outdoor yard around childrens’ homes. Moderate to Vigorous Physical Activity (MVPA) was measured using Actigraph GT3X accelerometers worn for at least 4 days by the child at baseline and 12, 24 and 36 month follow-ups. Using generalized estimating equations adjusted for, child age, household education, household income, adult MVPA, number of moves over follow-up and previous year’s MVPA, the association of each additional acre of yard size on MVPA one year later was not statistically significant (0.7 minutes per week; 95% CI: -1.2 to 2.6). However, a less conservative estimate, removing adjustment for previous year’s MVPA, found that each additional acre of yard size was associated with 5.7 (95% CI: 2.0 to 9.4) minutes per week higher MVPA for. This study provides evidence that the private space around a child’s house may impact their level of physical activity. Implications of these findings for improving physical activity among low income minority children may include incorporating home yard size considerations in affordable housing development projects, as well as housing voucher subsidy programs that address housing affordability. Urban planners and health practitioners may also consider land use control measures through zoning codes – particularly through defining setbacks and building envelopes – for securing minimum home yard spaces.

S/P indicates work done while a student/postdoc
CHILDHOOD CHEMICAL HAIR PRODUCT USAGE AND EARLY MENARCHE AMONG AFRICAN-AMERICAN WOMEN: FINDINGS FROM THE STUDY OF LIFESTYLE, ENVIRONMENT, AND FIBROIDS  Symielle A. Gaston* Symielle A. Gaston, Quaker Harmon, Donna Baird, Chandra L. Jackson, (National Institute of Environmental Health Sciences)

Introduction: Endocrine-disrupting chemicals in hair products may contribute to early menarche. Few studies have considered childhood hair product usage at multiple ages and early menarche. Methods: To investigate whether childhood hair product usage behaviors at ages 5 and 10 years were independently associated with early menarche, we used self-reported data from African-American women enrolled in the Study of Environment, Lifestyle, and Fibroids. Hair products included leave-in conditioners used ≥once/week or 1-3 times/month vs. rarely/never and chemical relaxers/straighteners used ≥twice/year or once/year vs. rarely/never. Log-binomial models were used to estimate the RRs and 95% CIs of early menarche (<11 years vs. ≥11 years) for usage of each hair product at ages 5 and 10, separately. Models were first adjusted for childhood socioeconomic characteristics. Models for age 10 were additionally adjusted for weight status relative to peers at age 10. Subsequently, all models were additionally adjusted for skincare product usage at each respective age. Results: Among 1,684 participants, mean age was 29±3.5 years and 18% reported early menarche. Although prevalence of leave-in conditioner usage at ages 5 and 10 were similar by categorical age of menarche, participants who reported early vs. later menarche had higher prevalence of ≥twice/year chemical relaxer usage at ages 5 (13% and 10%) and 10 (41% vs. 32%). Use of chemical relaxers ≥twice/year and once/year were positively associated with heavier weight which was positively associated with early menarche. After full adjustment, chemical relaxer use ≥twice/year at age 10 was positively associated with early menarche (RR=1.34 [95% CI: 1.09-1.66]). Conclusions: While chemical hair product use in early childhood was not associated with early menarche, frequent use during late childhood was associated with early menarche. Prospective studies are needed to determine the role of body weight and rule out reverse causation.
LONGITUDINAL SURVEY IN JAPAN TO ASSESS THE PATTERNS OF PRODUCT USE OVER TIME IN CIGARETTE SMOKERS AND IQOS USERS


Introduction: IQOS®, a novel heat-not-burn (HNB) tobacco product, has become popular in Japan in recent years. IQOS® has the potential to present less risk of harm to smokers who switch to those products versus continued smoking. Characterization of transitions between tobacco products is critical to understand the population impact of novel tobacco products. Methods: A longitudinal survey initiated in 2016 in Japan was used to examine transitions between tobacco products in two cohorts of participants selected according to their consumption when entering the study: combustible cigarettes (CC) or IQOS. Transitions between tobacco products were calculated at six, nine, 12, 15, and 18 months, counting from product initiation time (IQOS users) or study enrollment (CC smokers). Results: 599 IQOS consumers and 525 CC smokers were enrolled. Participants in both groups were predominantly males (>80%). Mean age was 42 years for IQOS users and 48 years for CC smokers. The majority of the participants who reported primarily smoking CC or using IQOS (≥70% of product use) did not change product use during follow-ups: the geometric mean percentage of sustained primarily use of IQOS and CC over three months was similar, with values of 86.7% [range 82%–93%] and 85.5% [range 72%–93%], respectively. Transitions mainly occurred among dual and poly-users of products. Conclusions: Our study provides results on longitudinal patterns of IQOS use in Japan. Results suggest that sustained primarily use of IQOS over time was comparable to CC use, indicating that IQOS is acceptable to consumers and offers an alternative to CC smoking. Longer observational studies on product use are needed to confirm whether the pattern of IQOS use observed in this study is sustained in the long term.
IDENTIFICATION OF SYSTEMIC LUPUS ERYTHEMATOSUS SUBGROUPS USING ELECTRONIC HEALTH RECORD AND GENETIC DATABASES
Milena Gianfrancesco* Milena Gianfrancesco, Benjamin Glicksberg, Andy Dahl, Cristina Lanata, Julia Kay, Joanne Nitiham, Kimberly Taylor, Ishan Paranjpe, Noah Zaitlen, Marina Sirota, Lindsey Criswell, Gabriela Schmajuk, Jinoos Yazdany, (University of California, San Francisco)

Systemic lupus erythematosus (SLE) is a multifactorial disease with genetic and environmental risk factors that encompass a wide range of disease severity and heterogeneous manifestations. Identifying nuanced patterns in clinical and molecular data of patients could reveal distinct clusters of disease which could in turn lead to more refined and personalized treatment regimens. We characterized subgroups of patients using genetic and EHR data for 416 individuals with SLE. Single nucleotide polymorphisms (SNPs) were genotyped on the ImmunoChip. We included 95 variants previously associated with SLE risk. EHR variables included age, sex, race, ethnicity, and disease-associated laboratory results. We first determined subtypes by clustering variables using multi-trait finite mixture of regressions (MFMR), a new clustering method designed for large, multi-trait genome-wide datasets that appropriately accounts for the complex structure of our multi-ethnic dataset. We then used regression analyses to examine whether demographic, genetic, and clinical variables had differential effects across clusters. Approximately 90% of patients were female; 52% were white, 13% African-American, 13% Asian, and 22% other/mixed race. Results demonstrated three distinct clusters (Figure). Cluster 1 (n=165) was characterized as predominately white, non-Hispanic/Latino patients with higher age of onset. Cluster 2 (n=121) had a higher percentage of other/mixed race individuals with mild disease. Cluster 3 (n=130) was categorized by more severe disease, including individuals with a higher percentage of abnormal laboratory values and lower age of onset. Eleven SNPs demonstrated significant genotype-cluster interaction with various phenotypes after correction for multiple testing. In conclusion, we identified three distinct subgroups of individuals with SLE via unsupervised clustering. Findings may assist in identifying disease treatments for SLE using a more personalized approach.

*Variable demonstrates evidence of significant genotype-cluster interaction.
COMPARING TRADITIONAL AND ALGORITHMIC-BASED APPROACHES TO CONFOUNDER IDENTIFICATION: A METHODOLOGICAL APPLICATION TO ESTIMATING THE EFFECT OF AUTOIMMUNE DISEASES ON 30-DAY MORTALITY AMONG ICU PATIENTS WITH SEPSIS
Corey M. Benedum*, Corey M. Benedum, Helen E. Jenkins, Louis Kim, Natasha Markuzon, Kimberly M. Shea, (Boston University School of Public Health and Draper)

Background: Deciding which variables to adjust for in epidemiologic analyses is based on several factors such as the underlying relationship between exposure, outcome, and covariates, data availability, and what has been done previously. Expert Opinion (EO) and literature review are typically used to identify which variables to adjust for. However, EO is imperfect and may lead to improper risk set adjustment. In this analysis, we compared EO with algorithm-based approaches to identify variables that should be adjusted for when estimating the association between autoimmune disease (AD) and 30-day mortality. Methods: The study population included 6200 sepsis patients identified from the MIMIC-3 ICU database between 2001 and 2012. We used EO and two machine learning algorithms - Hill Climbing (HC) and Incremental Association Markov Blanket (IAMB) – to select variables that should be adjusted for when estimating the association between AD and 30-day mortality from among 109 patient and clinical factors available for analysis. HC and IAMB algorithms identify variables to include in a risk set by statistically inferring underlying relationships (via a greedy search of potential DAGs [HC] or statistical testing [IAMB]) between exposures, outcomes, and covariates. Logistic regression was used to estimate the association between AD and 30-day mortality. Results: EO identified 9 variables for adjustment; HC identified 55 variables (7 of 9 which were selected by EO), and IAMB identified 20 variables (5 of 9 which were selected by EO). The same variable (SOFA score) was identified as having the greatest impact on the observed association in all three approaches (Fig1A). Adjusting for EO-selected variables yielded an OR=0.73 (95%CI:0.6-0.9); adjusting for HC and IAMB-identified covariates produced similar associations (Fig1B).
Conclusions: Algorithmic approaches may be useful for identifying confounders when EO is limited and the appropriate covariate risk set is unknown.

Figure 1: Comparison of EO, HC, and IAMB approaches for identification of an appropriate risk set for adjustment in the association between autoimmune disease and 30-day mortality. (1A) shows the magnitude of confounding for each covariate identified in any of the three approaches according to confounder identification approach. (1B) compares the EO-adjusted odds ratio of the association between autoimmune disease and 30-day mortality with the HC- and IAMB- adjusted odds ratios; algorithm-adjusted odds ratios were varied in sensitivity analyses where algorithm specific parameters were varied. For HC, manipulated parameters included, “Bins” (the number of bins used to discretize continuous covariates; [3, 5, 10, 15]) and “Restarts” (the number of initial search states used to identify the optimal DAG structure; [0, 5, 10, 15]). For IAMB, we varied “Bins” and “Type 1 error rate” (alpha = 0.1, 0.05, 0.01).
MECHANISM OF DETECTION OF THYROID CANCER AMONG WORLD TRADE CENTER-EXPOSED RESCUE AND RECOVERY WORKERS Rachel Zeig-Owens* Hilary Colbeth, Nadia Jaber, Charles Hall, Molly Skerker, Natalia Genere, Juan Brito, David Prezant, Rachel Zeig-Owens, (Fire Department of the City of New York (FDNY); Montefiore Medical Center)

Background: Positive associations of World trade Center (WTC)-exposure with thyroid cancer (TC) have been documented; but to date, none of the compounds found at the WTC disaster site have proven to be associated with TC. Although exposure to radiation may cause TC; only baseline levels were reported at the WTC site after the disaster. Instead, the elevated risk might be attributed to incidental detection as a result of increased medical surveillance. Aims/objectives: To classify the detection method (i.e., incidental vs. symptomatic) of TC cases via chart review, and to describe how incidental and symptomatic cases compare in terms of demographic make up and medical history. Methods/Approach: The study population consisted of 77 FDNY firefighters and Emergency Medical Service (EMS) workers diagnosed with TC post- September 11, 2001 (9/11) and arrived at the disaster site anytime between 9/11 and July 25, 2002. The detection method for TC was defined as symptomatic or incidental based on criteria used by Brito et al. Results: Of the total population, the mean age at diagnosis was 50.2 (±10) years and mean time to diagnosis after 9/11 was 10.2 (±4.7) years. Information relating to detection method was not found for 43 cases; however, they were demographically similar to the remaining 34 including in age at diagnosis, time to diagnosis, and WTC arrival time. Among the 34 cases for which a detection method was identified, 26 (76%) were incidentally detected and 8 (24%) were symptomatic. Lower respiratory conditions were verified among 69% of incidental cases and 38% of symptomatic cases. Conclusions: The majority of TC cases in which mechanism of detection could be determined were incidentally identified; however, continued exploration of the remaining 43 is warranted and ongoing. Most incidental cases had a WTC-related lower respiratory condition, indicating a history of frequent and detailed surveillance of their disease whereby an asymptomatic TC could be unveiled.

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THE ASSOCIATION BETWEEN WAIST CIRCUMFERENCE AND GASTRIC CANCER DEVELOPMENT: A TWO SAMPLE MENDELIAN RANDOMIZATION ANALYSIS

SangJun Lee*
SangJun Lee, Jieun Jang, Choonghyun Ahn, Sue K. Park, (Department of Preventive Medicine, Seoul National University College of Medicine)

Background: To address the problems of confounding and reverse causation in conventional epidemiology, the concept of an instrumental variable was introduced. Two-sample mendelian randomization (MR) in which the associations between the genetic variants and exposure and between the variants and outcome are estimated from non-overlapping sets of individuals from large consortia. Methods: Process of two-sample MR analysis is below. First, define instruments (genetic variants) to obtain Single nucleotide polymorphisms (SNPs) that are Genome-wide association study (GWAS) significant for the exposure. Second, get effects on outcome to extract the instrument SNPs from the outcome GWAS. Third, harmonize effects which is the effect of the SNP on the exposure and the effect of the SNP on the outcome correspond to the same allele. Study populations came from public data. The incidence of Gastric cancer (GC) clumping with LD R2=.001. Finally, a total of 30 SNPs in this study. Results: The significant association between waist circumference (WC) and GC development was founded in the Inverse Variance Weighting (IVW) methods. Moreover, the MR-Egger and Weighted median methods which are sensitivity analysis indicated a consistent result. Since the intercept term in MR Egger was statistically significant, horizontal pleiotropy effect was not found in this study. Heterogeneity was not found based on Cochran Q test. The causal effect was shown as estimated using each of the SNPs on their own and comparing against the causal effect as estimated using the methods that use all the SNPs. Conclusion: The association between the increment of WC and GC development can be found. Acknowledgement: This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIP) (No. NRF-2016R1A2B4014552). Key words: Stomach neoplasms, Instrumental variables, Mendelian randomization, Single nucleotide polymorphisms, Genome-wide association study

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IMPACT OF CHANGES IN LUNG CANCER HISTOLOGIC CLASSIFICATION AND STAGING ON SURVIVAL TRENDS BY STAGE IN SEER

Rebecca Ehrenkranz* Rebecca Ehrenkranz, Alison Van Dyke, Serban Negoita, Clara Lam, Peggy Adamo, (National Institutes of Health/National Cancer Institute/Division of Cancer Control and Population Sciences)

Background: Because of marked variation in disease outcome among patients diagnosed with bronchioloalveolar carcinoma (BAC), histologic classifications of lung and bronchus cancer changed in 2011 per recommendations from the International Association for the Study of Lung Cancer (IASLC), including discontinuation of the diagnoses BAC. Pathologic T stage criteria were also modified in the AJCC 7th edition. Per the Will Rogers phenomenon, such changes in group classification potentially impact group-specific prognosis. We sought to determine whether these classification changes affected survival by histologic type [invasive adenocarcinoma (ADC) and non-small cell lung cancer (NSCLC)] and by stage on a population level.

Methods: We used Surveillance, Epidemiology, and End-Results (SEER) data to establish lung cancer survival per updated IASLC histologic type and Summary Stage 2000 (local, regional, and distant/LRD) between 1998 – 2015 and by AJCC 6th edition stage between 2004 – 2015 (the years for which AJCC 6th stage was available). Survival for 12, 24, and 36-month periods were compared for ADC and NSCLC by stage using Joinpoint Regression Program trend analysis.

Results: No major differences were seen in survival by either LRD or AJCC stage when comparing ADC and NSCLC over time, despite changes in histologic classification and AJCC staging. Survival improved across all LRD groups. One difference was present in the Joinpoint model for 24-month regional survival: NSCLC survival declined after 2011 [Annual Percent Change (APC)= -1.03], whereas adenocarcinoma survival had no change in APC. Conclusions: Improved survival for ADC and for NSCLC was likely due to better screening, earlier detection, and improved targeted therapies and was not differentially impacted by changes in histologic classification or staging.

Lung Cancer 24-month Survival by Stage & Histology

S/P indicates work done while a student/postdoc
ASSOCIATION OF ABSOLUTE LYMPHOCYTE COUNT AND CANCER INCIDENCE AND MORTALITY: THE ATHEROSCLEROSIS RISK IN COMMUNITIES (ARIC) STUDY

Guillaume Onyeaghala* Guillaume Onyeaghala, Anna E. Prizment, Sarah Davidovics, Corinne E. Joshu, Elizabeth A. Platz, Aaron Folsom, Kala Visvanathan, (University of Minnesota School of Public Health)

Background: Lymphocytes, a core component of the adaptive immune response, play a key role in the host response to carcinogenesis by identifying and clearing tumor cells. We examined the association of higher circulating levels of pre-diagnostic lymphocyte count with cancer incidence and mortality in the Atherosclerosis Risk in Communities (ARIC) study. Methods: The ARIC study followed 15,792 men and women, 45-64 years old at baseline (1987-1989). Total WBC counts and differentials were assessed at baseline, and cancer incidence and mortality through 2012. The normal range for lymphocyte counts was defined as the mean +/- 2 standard deviations, and race-specific lymphocyte counts were categorized as below the normal range, tertiles within the normal range, and a above the normal range. Cox proportional hazards regression was used to calculate HRs and 95% CIs for overall and site-specific cancer incidence and mortality adjusted for age, race, study center, sex, smoking history, alcohol intake, BMI, education level and physical activity. Results: In our analytic cohort, 2,914 incident primary cancers and 1164 cancer deaths occurred during follow up. Current smokers with lymphocyte counts below or above the normal range were at an increased risk of cancer (HR (95% CI) = 1.69 (1.01–2.83) and 1.38 (1.00–1.89), respectively). Lymphocyte counts above the normal range were also associated with increased cancer mortality overall (1.44 (1.05–1.97)), among women (1.64 (1.13–2.40)), and among current smokers (1.60 (1.06-2.42)) (Figure 1). In site-specific analyses, lymphocyte counts above the normal range were associated with higher lung cancer mortality (1.91 (1.14-3.19)), but not lung cancer incidence. Conclusion: Higher pre-diagnostic lymphocyte counts are associated with increased cancer mortality overall, and increased cancer incidence and mortality in current smokers. Funding: ARIC was supported NHLBI contracts, NCI, and NPCR.

Figure 1. Association of race specific lymphocyte count with overall cancer incidence and overall cancer mortality stratified by smoking status in the ARIC study (1987-2012).
FAMILIAL CLUSTERING IN BREAST CANCER AGE OF ONSET Ann Von Holle* Ann Von Holle, Katie O'Brien, Dale Sandler, Clarice Weinberg, (National Institute of Environmental Health Sciences)

Familial clustering of age at onset would have implications for both risk prediction and etiology but has not been well-studied for breast cancer. We used a large cohort of unaffected sisters of proband cases to prospectively study whether breast cancer risk is influenced by the age at diagnosis of a previously affected sister. More than 50,000 women were followed for an average of 8 years in the Sister Study. Participants had never had breast cancer when they enrolled but had at least one sister previously diagnosed with breast cancer. With age as the primary time scale, we used Cox models to estimate the relative hazard associated with being at an age close to the age at which the sister had been diagnosed. The covariate characterizing closeness was a Gaussian function of the difference between the participant's time-varying age at risk and her sister's age at diagnosis, allowing for a symmetric effect that peaks when the participant reaches the proband sister's age at diagnosis. Other covariates in the model included: age at first live birth, age at menarche, an indicator variable for proband age at onset less than 50 years, BMI, menopause status and the product of BMI and menopause status. Another model permitted the age-closeness effect to depend on the time-varying age of the sister at risk. The estimated peak adjusted hazard ratio was 1.38 (95% CI: 1.17, 1.63). The adjusted model that included the age-closeness covariate had a better fit than the model excluding that covariate (Chi-square(1df) = 14.5, p<0.001). Evidence also supported age-time-dependence of the closeness association, with a larger magnitude of association at ages greater than 60 years. In summary, in the largest study of its kind for breast cancer, the risk increased at ages near the age when a sister had been diagnosed. This association suggests that there are important shared genetic and environmental contributions to age at onset.
Background: Dicamba is an herbicide that has been commonly used both agriculturally and residentially. The recent approval of genetically engineered dicamba-resistant cotton and soybean crops is expected to lead to increased dicamba use, and there has been growing interest in the potential human health effects of this chemical. A prior analysis in the Agricultural Health Study (AHS) found associations between dicamba use and colon and lung cancers. We have updated that analysis with an additional 12 years of follow-up and 2,702 cancers among dicamba users. Methods: The AHS is a prospective cohort of pesticide applicators in Iowa (IA) and North Carolina (NC). At enrollment (1993-1997) and follow-up (1999-2005), pesticide applicators reported lifetime dicamba use and factors influencing exposure intensity. Exposure was characterized by cumulative intensity-weighted lifetime days. We estimated relative risks (RR) and 95% confidence intervals (CI) using multivariable Poisson regression for incident cancers from enrollment through 2014 (NC) or 2015 (IA). Results: Among 49,922 applicators, 26,412 (52.9%) used dicamba. Compared to applicators in the lowest quartile of dicamba use, those in the highest quartile of intensity-weighted exposure days had elevated risk of chronic lymphocytic leukemia (CLL; n=93, RRQ4=1.80, CI:1.41-2.20, ptrend<0.001) and liver and intrahepatic bile duct cancer (n=28, RRQ4=4.94, CI:2.70-9.04, ptrend<0.001), and decreased risk of myeloid leukemia (n=55, RRQ4=0.59, CI:0.42-0.82, ptrend<0.001). Conclusions: In contrast to a previous analysis in this cohort, we observed no significant association between dicamba use and lung or colon cancer. We observed positive associations with CLL, liver and intrahepatic bile duct cancer, and an inverse association with myeloid leukemia, cancer sites not previously evaluated in the AHS in relation to dicamba use. Additional work is needed to understand potential mechanisms underlying these associations.
IN UTERO AND NEONATAL EXPOSURES AND LATER RISK OF YOUNG-ONSET BREAST CANCER
Mary Diaz-Santana* Clarice Weinberg, Katie O'Brien, Aimee D'Aloisio, Gloria Regalado, Dale Sandler, (National Institute of Environmental Health Sciences)

In utero and neonatal factors have been demonstrated to be associated with certain adult health outcomes, but such influences have not been well studied for young-onset breast cancer. We used a sister-matched case-control study to address this. Cases were women in the Two Sister Study who had been diagnosed with invasive or ductal carcinoma in situ breast cancer before the age of 50, and who had a sister control who had not had breast cancer herself and had also been under age 50 at the time of the diagnosis. In utero and neonatal factors considered were self-reported, and included: mother's preeclampsia, gestational hypertension, diethylstilbestrol use, and gestational diabetes, as well as low birth weight (less than 5.5 pounds), high birthweight (greater than 8.8 pounds), and short gestational age (less than 38 completed weeks). Perinatal factors included being breast-fed or being fed soy formula. In conditional logistic regression analyses, only birthweight was strongly associated with risk. The odds ratio (OR) for low birth weight was 1.52 (95% confidence interval [CI]: 0.97, 2.4) and for high birth weight was 1.91 (95% CI: 1.15, 3.17). We also carried out case-only analyses to assess etiologic heterogeneity for ER-positive versus ER-negative cancer. With age adjustment, being breast fed was associated with reduced odds of ER-negative young-onset cancer, with an OR of 0.66 (95% CI: 0.47, 0.94). Women who had gestated in a preeclamptic pregnancy and later developed young-onset breast cancer were at increased odds for ER-negative cancer 2.17 (95% CI: 1.01, 4.66). The results from this study suggest that certain pre- and perinatal exposures may contribute to subsequent breast cancer risk and tumor type among young women. Word count: 272
Numerous studies have suggested an influence of sex hormones on cutaneous melanoma risk. However, premenopausal progestogens, which are largely prescribed in various gynecological indications, have never been investigated in relation to melanoma risk. Our aim was to study the associations between the use of progestogens during premenopause and cutaneous melanoma risk in women participating in E3N, a prospective cohort of 98,995 French women aged 40-65 years at inclusion in 1990. Exposure to progestogen use was assessed in 1992 and through biennial questionnaire updates. We used Cox models adjusted for age, pigmentary traits, residential UV exposure in county of birth and at inclusion, and family history of skin cancer. Over 1992-2008, 540 melanoma cases were ascertained among 79,558 women. In age-adjusted models, we found a modest association between premenopausal progestogen use and melanoma risk (HR=1.21; 95% CI=1.00-1.45), which was reduced after adjustment for known melanoma risk factors (HR=1.13; 95% CI=0.94-1.37). The relation seemed stronger for women who used multiple types of progestogens in their lifetime (HR=1.30; 95% CI=1.01-1.67), although there was no heterogeneity across types of progestogens used (P=0.32). Among premenopausal progestogen users, we found no relation with duration of use, age at start or last use, time since first or last use, or time between first use and menopause. There was no heterogeneity according to anatomic site (P=0.56) or histologic type of the tumor (P=0.50). Although our results do not show evidence for confounding by sun exposure, progestogen users reported lower residential sun exposure levels and were more likely to use sunscreen, which suggest particular sun exposure profiles in progestogen users. Our findings do not support a strong influence of premenopausal progestogens on cutaneous melanoma risk. However, further research is needed to confirm these findings and investigate a potential effect modification by sun exposure on these relations.
The cancer registry in the United States is an invaluable scientific resource that enables scientists to quantify the burden of cancer, investigate the origins of cancers, evaluate the effectiveness of interventions, and identify disparities and needs from a local to national level. A tremendous investment of resources is made at the regional-, state-, and federal- levels to ensure standardized, clinically meaningful data is reported in a timely matter with over a 95% population coverage. While linkage with state cancer registries is a scientific necessity to investigate potential causes of cancer, the administrative and procedural hurdles are resource intense and often cost prohibitive. It could be characterized that the process to access cancer registry data is inefficient and therefore not fully utilized. Thus, the “return” on the financial and scientific investment is not fully realized (a lack of return on investment). We propose a framework, informed by operations management, that captures multi-level stakeholder values. Using the RIC Study as a case study we will assess areas of unmet needs at the institutional-, state-, and cancer registry-levels as well address the potential role of the Virtual Pooled Registry Cancer Linkage System (VPR-CLS). In brief, the RIC Study is a cohort of 7.3 million geographically-diverse children and their mothers with the goal to determine the risk of pediatric cancers (<21 y) associated with in utero or fetal (prenatal) or pediatric exposure to medical imaging.
CHANGES IN USE OF OPIOID THERAPY AFTER COLON CANCER DIAGNOSIS Lu Chen* Lu Chen, Jessica Chubak, Onchee Yu, Gaia Pocobelli, Rebecca Ziebell, Erin J. Aiello Bowles, Monica M. Fujii, Andrew T. Sterrett, Jennifer M. Boggs, Andrea N. Burnett-hartman, Debra P. Ritzwoller, Rebecca A. Hubbard, Denise M. Boudreau, (Kaiser Permanente Washington Health Research Institute)

Purpose: Despite the opioid epidemic in the general U.S. population, little is known about patterns of opioid use in cancer survivors who may have chronic cancer pain. Patients and methods: We conducted a retrospective cohort study of colon cancer patients diagnosed during 1995-2014 and enrolled at two Kaiser Permanente regions. Using pharmacy data, we constructed quarterly measures of opioid use from one year before cancer diagnosis through 5 years after diagnosis to examine changes in use over time. We measured proportion of patients with any use, incident use, regular use (use ≥ 45 days in a 91-day quarter), and their average daily dose (converted to morphine milligram equivalent, MME). To assess temporal trends, we estimated means and associated 95% confidence intervals of these measures by year of diagnosis. Results: We identified 2,039 colon cancer patients, of whom 11-15% received opioids in the 4 quarters before cancer diagnosis, 68% in the first quarter after diagnosis, and 15-17% in each quarter thereafter. Regular use of opioids increased from 3-5% before diagnosis to 5-7% after diagnosis. Average dose was 15-17 MME/day before cancer, 6 MME/day in the first quarter following cancer diagnosis, and 14-22 MME/day during the remainder of follow-up. Of those who received opioids after diagnosis, 73-95% were on a low dose (< 20 MME/day) throughout follow-up. Any use and regular use of opioids before cancer diagnosis and during survivorship increased over the 20-year study period. Conclusion: Opioid use slightly increased following a colon cancer diagnosis, but high dose use was rare. Over the past two decades, increase in opioid use was seen before and after cancer diagnosis.

S/P indicates work done while a student/postdoc
EXAMINING THE RELATIONSHIP BETWEEN COMORBIDITY TREATMENT AND PATIENT-REPORTED HEALTH-RELATED QUALITY OF LIFE (HRQOL) AMONG CANCER PATIENTS: A SURVEILLANCE EPIDEMIOLOGY AND END RESULTS AND MEDICARE HEALTH OUTCOMES SURVEY (SEER-MHOS) ANALYSIS Melissa Bruno* Melissa Bruno, Dannielle Kelley, Catherine Wang, Erin Kent, Donna Rivera, (National Cancer Institute)

As healthcare innovates and the population of individuals surviving in advanced age increases, the percentage of Americans living over the age of 65 is expected to double. With advancing age, cancer incidence increases; therefore, a surge is expected of persons with cancer. In addition to cancer risk, this population of elderly persons is also at increased risk for comorbid conditions that often require management of multiple diseases and medications. The presence of comorbid conditions and their complex management has the potential to exacerbate the decline of quality of life in the 65+ age group. Research shows that a decline of health-related quality of life (HRQOL) occurs in a significant proportion of cancer patients, but the causes of such decline in the context of patient reported outcomes are multifactorial and require further investigation. Obesity is a comorbidity that plays a “paradoxical” role in elderly health, specifically that to an extent, it was previously shown that increasing BMI is correlated with increased survival. Limited research exists detailing the mechanisms leading to the decline in the HRQOL of elderly cancer patients. Better understanding of the mechanisms that lead to a decline of HRQOL can provide further insights into patient-reported experiences and improve guidelines to support cancer populations. This study aims to investigate the effect of medication management for comorbidities on the HRQOL among cancer patients enrolled in Medicare Advantage. This study also aims to specifically examine the role of obesity and its interaction with comorbid conditions and on HRQOL. Using the SEER and Medicare Health Outcomes Survey (SEER-MHOS) data linkage, descriptive statistics and regression models will be generated to better understand these potential underlying associations.
RISK FACTORS FOR DE NOVO AND THERAPY RELATED MDS  Rina Yarosh* Rina Yarosh, Michelle Roesler, Michaela Richardson, Jen Poynter, (Division of Epidemiology and Clinical Research, University of Minnesota, Minneapolis, MN)

Background: Myelodysplastic syndromes (MDS) are a group of blood disorders exhibiting ineffective and dysplastic hematopoiesis. MDS cases are classified as de novo and therapy related (tMDS). Objective diagnostic criteria are not available for tMDS, cases are attributed to prior exposure to chemotherapy or irradiation exposure based on pathologic and clinical characteristics. All other cases are considered de novo. We evaluated associations between previously established MDS risk factors separately for de novo and tMDS. Methods: The study population included 347 de novo MDS cases, 39 tMDS cases and 684 population controls frequency matched by age and sex. Polytomous logistic regression was performed to calculate the associations between risk factors and de novo and tMDS compared to controls. Analyses were adjusted for matching criteria. Results: In univariate analyses, smoking status (p = .0715) and exposure to benzene (p=.0704) were associated with de novo MDS while history of previous cancer (p <0.001), previous exposure to radiation (p <0.001), previous exposure to chemotherapy (p<0.001) were associated with tMDS when compared to controls. These predictors were subsequently analyzed using multivariable logistic regression which found previous exposure to chemotherapy (p<0.001) to be a significant overall predictor of MDS. Smoking status (OR=1.47, 95% CI 1.11-1.94 for former vs never smoking) and benzene exposure (OR=1.51, 95% CI 1.02-2.23) were associated with de novo MDS but not tMDS. In contrast, prior exposure to chemotherapy was the only significant predictor of tMDS (OR=67.2, 95% CI 10.4-434). Conclusions: The previously established MDS risk factors of smoking and benzene exposure were associated with de novo MDS in our study while tMDS was overwhelmingly driven by previous exposure to chemotherapy. Future analyses of tMDS in studies with larger sample sizes will be required to determine whether environmental factors influence risk.
THE ASSOCIATION BETWEEN COMPONENTS OF METABOLIC SYNDROME AND THE RISK OF COLORECTAL CANCER IN CHINESE MALES: A POPULATION-BASED PROSPECTIVE STUDY
Xin Li*, Xin Li, Ni Li (Corresponding author), Gang Wang, Xiaoshuang Feng, Zhangyan Lyu, Luopei Wei, Yan Wen, Yuheng Chen, Hongda Chen, Shuhua Chen, Shouling Wu, Min Dai (Corresponding author), Jie He, (National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College)

Background: To investigate the association of metabolic syndrome (MetS) components with the risk of colorectal cancer (CRC) in Chinese males, the study was performed in the Kailuan male cohort, a large prospective cohort study. Methods: A total of 104,333 eligible males enrolled in the every 2-year health checkup were involved in the Kailuan male cohort study (2006-2015). Cox proportional hazards regression models were used to estimate the association between MetS and the CRC risk. Results: During a median follow-up of 8.9 years, 394 CRC cases were verified over a total of 824,211.96 person-years. Compared with males without MetS components, the HRs (95% CI) of developing CRC for males with 1, 2 and ≥3 MetS components were 1.53 (1.01–2.32), 1.42 (0.94–2.14) and 1.70 (1.12–2.56), respectively. In addition, among the 5 single MetS components, only the waist circumference≥90cm showed significant risk for CRC (HR: 1.32, 95% CI: 1.07-1.64). Further combination of increased waist circumference and elevated fasting blood glucose(≥5.6 mmol/L or drug treatment of elevated glucose) with normal levels of the other three components showed increased risk for CRC by 126% (95% CI: 1.10-4.64), however, the other combinations showed non statistical significant associations. Conclusion: Our study suggests CRC risk is correlated with the number of abnormal MetS components in males. Among MetS components, waist circumference, particularly concurrent with fasting blood glucose may be more strongly related to CRC risk than other MetS components. Fund programs: National Key Projects of Research and Development of China (grant no: 2018YFC1315000, 2016YFC1302500 and 2016YFC0905300); CAMS Innovation Fund for Medical Sciences (grant no: 2017-I2M-1-006); Training Programme Foundation for the Talents in Beijing City (grant no: 2017000021223TD05); Beijing Municipal Science and Technology Project (D171100002617001); PUMC Youth Fund (3332016131)

S/P indicates work done while a student/postdoc
POPULATION-LEVEL REFERRAL PATTERNS FOR CATHETER ABLATION IN PATIENTS WITH ATRIAL FIBRILLATION AND COMORBID HEART FAILURE

Michelle Samuel, Michal Abrahamowicz, Jacqueline Joza, Vidal Essebag, Louise Pilote, (Research Institute of McGill University Health Centre)

BACKGROUND: Current guidelines are relatively non-specific about the clinical profile of patients with atrial fibrillation (AF) and comorbid heart failure (HF) that should be considered for catheter ablation (CA). An assessment of real-world referral patterns for CA in the AF-HF population is warranted. OBJECTIVE: To identify clinical predictors for referral to CA in AF patients with comorbid HF. METHODS: A population-based cohort of patients diagnosed with both AF and HF was created using administrative data for a subset of patients with government prescription coverage in Quebec, Canada (1999-2015). Patients were followed from the date of diagnosis of both diseases until date of CA, accounting for the competing risk of all-cause mortality. Predictors for referral to CA were assessed as time-varying covariates in a cause-specific multivariable Cox model. RESULTS: Of 87,676 AF-HF patients [median age 80.5 year (IQR 73.6-86.0), 51.6% female, and median CHA2DS2-Vasc 4 (IQR 3-4)]; 289 (0.3%) underwent CA a median of 218 days (IQR 13-295) from index date. Warfarin, amiodarone, sotalol, class I antiarrhythmics, and diuretic use were statistically significant predictors for referral to CA, as well as the presence of an implantable cardioverter defibrillator (ICD). Advanced age, female sex, hypertension, coronary artery disease, valve replacement, prior stroke, chronic renal failure, chronic obstructive pulmonary disease, major bleeding, and cardiac resynchronization therapy (CRT) were associated with a lower probability of referral to CA. CONCLUSION: AF in patients with comorbid HF selected to undergo CA have a limited number of additional comorbidities. Presence of an ICD and use of antiarrhythmics, anticoagulants and diuretics were predictive of referral for CA.

Figure 1. Potential predictors for referral to catheter ablation

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Effect (95% CI)</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>0.94 (0.93, 0.95)</td>
</tr>
<tr>
<td>Women</td>
<td>0.45 (0.34, 0.55)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.62 (0.47, 0.82)</td>
</tr>
<tr>
<td>Diabetes</td>
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<tr>
<td>Coronary artery disease</td>
<td>0.62 (0.44, 0.87)</td>
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<tr>
<td>Prior myocardial infarction</td>
<td>0.82 (0.56, 1.21)</td>
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<tr>
<td>Valve replacement</td>
<td>0.51 (0.29, 0.89)</td>
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<tr>
<td>Vascular disease</td>
<td>0.69 (0.48, 1.00)</td>
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<tr>
<td>Prior stroke / TIA</td>
<td>0.30 (0.11, 0.81)</td>
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<tr>
<td>Chronic renal failure</td>
<td>0.53 (0.36, 0.75)</td>
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<tr>
<td>Liver Disease</td>
<td>0.35 (0.19, 0.65)</td>
</tr>
<tr>
<td>Prior major bleed</td>
<td>0.50 (0.31, 0.82)</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>0.46 (0.33, 0.65)</td>
</tr>
<tr>
<td>Implantable cardioverter defibrillator (ICD)</td>
<td>7.20 (3.85, 13.46)</td>
</tr>
<tr>
<td>Cardiac resynchronization therapy (CRT)</td>
<td>0.38 (0.21, 0.72)</td>
</tr>
<tr>
<td>Warfarin</td>
<td>2.94 (2.27, 3.82)</td>
</tr>
<tr>
<td>DOAC</td>
<td>1.29 (0.99, 1.69)</td>
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<tr>
<td>Amiodarone</td>
<td>3.33 (2.50, 4.27)</td>
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<td>Class 1 antiarrhythmic medications</td>
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<tr>
<td>Sotalol</td>
<td>2.02 (1.40, 2.93)</td>
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<tr>
<td>Diuretics</td>
<td>3.42 (2.52, 4.85)</td>
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RANDOM SURVIVAL FOREST IDENTIFIES KEY FACTORS PREDICTING CHRONIC KIDNEY DISEASE PROGRESSION: THE CHRONIC RENAL INSUFFICIENCY COHORT (CRIC) STUDY


BACKGROUND Increasing number of clinically-available and novel factors bring opportunities to improve CKD risk prediction, as well as statistical challenges of multiple comparison, nonlinearity, variable interactions, and missing data. We applied the machine learning technique of random survival forest (RSF) to identify factors associated with CKD progression. METHODS We studied the 3,939 subjects in the Chronic Renal Insufficiency Cohort and followed them for the composite survival outcome of eGFR halving or incident ESRD for 12 years. We used 73 clinically-available and 25 novel baseline variables as exposures, which covered a broad spectrum of socio-demographics, comorbidities, physical and laboratory measurements and medications. We applied the RSF approach with 1000 bootstrap iterations and log-rank splitting rule. We calculated statistics of variable importance and minimal depth to rank predictors according to their impact on prediction accuracy. We also graphed the adjusted relationships of CKD progression and the top 10 predictors. RESULTS After setting the outliers to missing, we included 3,921 individuals in the analysis. Missing data were imputed and variable interactions were incorporated in the RSF algorithm. The 98-predictor RSF model yielded a low prediction error of 14.2%. The top 10 predictors with highest variable importance values and smallest minimal depths identified by RSF are urine protein/creatinine ratio, urine albumin/creatinine ratio, eGFR, serum urea nitrogen, parathyroid hormone, serum albumin, high sensitive troponin T, systolic blood pressure, NT-proBNP, and FGF-23. The relationships between the predicted survival at 1-, 2-, and 5-year and the 10 factors are presented in the partial dependence plots. CONCLUSION We identified and ranked variables that are most important to CKD progression from among 98 clinically-available and novel factors using the RSF method. Utilizing all available high-dimensional data enabled us to predict outcomes with a low error rate.

Background As people live longer after a cancer diagnosis, morbidity from cardiovascular disease (CVD) has emerged as a health concern. Previous studies have largely not included Hispanic/Latino individuals, whose risk profile for both CVD and cancer differs from other populations, leaving it unclear which CVD risk factors may be most relevant for Hispanic/Latinos living after a cancer diagnosis. Methods The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) is a multi-site study of Hispanic/Latino adults in four urban US cities (N=16,415). History of cancer diagnosis was assessed during the baseline interview, along with the primary site of any reported cancers. CVD risk factors were measured through clinical exam (cholesterol, blood pressure (BP), and fasting blood glucose), echocardiogram (ECG) (QT, PR, and QRS intervals; presence of abnormalities), and interview (diabetes status, smoking status, and family history of coronary heart disease (CHD)). These risk factors were compared between participants with and without a history of cancer using linear and logistic regressions. Secondary analyses tested for differences by gender and cancer site, as well as confounding by body mass index (BMI) and age. All analyses accounted for design effects and sample weights. Results 600 participants (3.7%) reported a history of cancer (excluding non-melanoma skin cancers). History of cancer was associated (p<0.05), but differed by cancer site (p<0.05). Results were attenuated after adjustment for BMI and age (likelihood ratio tests p<0.05). Conclusion Among Hispanic/Latino adults, a history of cancer was associated with adverse CVD risk factors.
THE ROLE OF ASPIRIN IN THE RELATIONSHIP BETWEEN HYPERTENSIVE DISORDERS OF PREGNANCY AND INCIDENT MATERNAL CARDIOVASCULAR DISEASE

Jennifer Stuart* Jennifer Stuart, Lauren Tanz, Janet Rich-Edwards, Eric Rimm, Kenneth Mukamal, Gary Curhan, Kathryn Rexrode, (Brigham and Women’s Hospital/Harvard Medical School)

Background: Hypertensive disorders of pregnancy (HDP; gestational hypertension and preeclampsia) are associated with an increased risk of maternal cardiovascular disease (CVD). We hypothesized that regular aspirin use after pregnancy would lower the magnitude of the HDP-CVD association among aspirin users relative to non-users. Methods: Nurses’ Health Study II participants who were parous and free of CVD (n=60,392) were followed for incident CVD (coronary heart disease [non-fatal or fatal MI, fatal CHD] or stroke [non-fatal or fatal]) from 1989-2013. We used Cox proportional hazards models to estimate hazard ratios (HR) and 95% confidence intervals (CI) for the relationship between HDP in first pregnancy (normotension [ref], gestational hypertension, preeclampsia) and CVD, adjusted for age, race/ethnicity, parental education, family history of CVD <60y, and pre-pregnancy risk factors (e.g., smoking, physical activity, BMI). Effect modification by time-varying aspirin use was tested through a likelihood ratio test. Results: Nine percent of women (n=5,629) had HDP in first pregnancy. CVD events occurred in 657 women with normotension, 30 with gestational hypertension, and 75 with preeclampsia. Compared to women with normotension, gestational hypertension was associated with stroke (HR=1.65; CI:1.01-2.71) but not CHD (HR=1.21; CI:0.70-2.12), while preeclampsia was associated with CHD (HR=2.27; CI:1.69-3.04) but not stroke (HR=1.03; CI:0.68-1.57). Current aspirin use was not a significant effect modifier of the HDP-CVD relationship (p=0.53). HRs for the relationship between gestational hypertension and CVD were 1.58 (CI:1.01-2.49) in aspirin non-users and 1.15 (CI:0.61-2.18) in aspirin users. HRs for the relationship between preeclampsia and CVD were 1.52 (CI:1.10-2.10) in aspirin non-users and 1.67 (CI:1.16-2.40) in aspirin users. Conclusion: Aspirin use after pregnancy does not appear to modify the increased risk of CVD observed among women with a history of HDP.

S/P indicates work done while a student/postdoc
PHYSICAL ACTIVITY, CARDIOVASCULAR DISEASES AND MORTALITY MEDIATED BY DIABETES IN ELDERLY MEXICAN AMERICANS Kosuke Inoue* Kosuke Inoue, Elizabeth R. Mayeda, Kimberly C. Paul, Yu Yu, Mary Haan, Beate R. Ritz, (Department of Epidemiology, UCLA Fielding School of Public Health)

Background: Low physical activity (PA) is widely recognized as an important public health problem that increases the risk of cardiovascular disease (CVD) and mortality through metabolic disorders such as type 2 diabetes. We aim to elucidate the extent to which type 2 diabetes mediates the association between leisure-time PA levels and long-term adverse outcomes in an aging Mexican American cohort. Methods: The Sacramento Area Latino Study on Aging (SALSA) is a cohort of 1,789 adults ≥ 60 years at enrollment in 1998-99. We employed Cox proportional hazards regression models to investigate associations of PA levels (low, <25th; medium, 25th-75th; and high, ≥75th MET-hours/week) with all-cause mortality, fatal and non-fatal CVD events. Utilizing causal mediation analysis within the counterfactual framework, we decomposed the total effect of PA levels on outcomes into natural indirect effects (through diabetes) and natural direct effects (not through diabetes) and estimated mediation effects of diabetes according to sex. Results: Over a median follow-up of 8 years, we observed 579 deaths from all causes. Participants with low PA levels compared to those with high levels were at higher risk for all-cause mortality (HR, 1.44; 95% confidence interval [CI], 1.12–1.85), fatal CVD event (HR, 1.63; 95% CI, 1.15-2.30) and non-fatal CVD event (HR, 2.11; 95% CI, 1.46-3.07). Diabetes mediation explained 11.7%, 8.9%, and 10.9% of the total effect on all-cause mortality, fatal and non-fatal CVD events, respectively. The mediation effect of diabetes was most prominently observed in males compared to females. There was no indication for interactions between PA and diabetes. Conclusion: Diabetes mediated around 10% of the association between physical inactivity and all-cause mortality, fatal and non-fatal CVD events. Our findings suggest that there might be a worthwhile public health intervention combating low PA that contributes to diabetes to prevent long-term adverse outcomes in older Mexican Americans.
The prevalence of peripheral artery disease (PAD) has been assessed in various settings, though few large-scale studies have assessed the prevalence of asymptomatic PAD in the contemporary era of low smoking rates and effective medical therapy. Both non-modifiable and modifiable risk factors have been linked to PAD, but the precise magnitude of such associations has not been established. The objectives of the study were to estimate the prevalence of asymptomatic PAD in adult populations in UK and USA who voluntarily attended vascular screening and assess the relative importance of risk factors for PAD. This was a cross-sectional analysis of data collected between 2008-2013 by the commercial vascular screening company, Life Line Screening. The prevalence of asymptomatic PAD was estimated and associations with traditional risk factors were evaluated. This study included 2.2 million adults aged between 35-89 with no prior history of cardiovascular disease (CVD) or lung cancer. Asymptomatic PAD was defined as having an Ankle Brachial Index of <0.9. Multivariable logistic regression was used to estimate odds ratios for the association of risk factors and PAD, evaluating the relative importance of each after adjusting for confounders. Of 2.2 million attendees (mean age: 64 years, 35% male), 81,802 (3.7%) had asymptomatic PAD (3.7%). Most modifiable risk factors were associated with PAD. The largest increase in risk of PAD was observed among current-smokers compared to nonsmokers (OR 4.4 [95% CI 4.32-4.50]). Diabetes was also significantly associated with PAD (OR 1.83 [1.79-1.86]). However, LDL-C was not significantly associated with PAD. Furthermore, 28% of PAD burden was attributable to hypertension, 21% to smoking, and 9% to diabetes. These associations found in the present study confirm the importance of the established CVD risk factors for PAD and reinforce the existing literature targeted at preventative strategies for PAD.
INCIDENCE AND RELATIVE RISK FOR CARDIOVASCULAR DISEASE IN METABOLIC DISEASE COMORBIDITY Seokyung An* Seokyung An, Sue K. Park, (21993aaa@gmail.com)

There have been limited studies about the association between metabolic comorbidity and the risk of cardiovascular diseases such as myocardial infarction (MI) and stroke. Therefore, the aim of this study was to investigate the incidence and relative risk for MI and stroke in a combination of hypertension, diabetes, and dyslipidemia comorbidity. This study has comprised a total of 65,642 participants aged 40 to 79 years from health examinee (HEXA) cohort of Korean Genome and Epidemiology Study (KOGES). The age-standardized incidence, the relative risk for MI and stroke were estimated in a combination of metabolic comorbidity. Furthermore, we performed Cox proportional hazard model to calculate the hazard ratios (HRs) between a combination of metabolic disease comorbidity and MI and stroke, respectively. According to a mean follow-up of 5.9 years, age-standardized incidence of MI was 2.34% (95% CI: 2.20-2.47%) and stroke was 0.84% (95% CI: 0.77-0.92%). As the number of metabolic diseases increased, the risk for MI and stroke increased. Compared with participants without any of metabolic diseases, the HRs for MI and stroke were 1.53 (95% CI: 1.26-1.87) and 1.79 (95% CI: 1.30-2.46) in participants with one disease prevalence, 2.32 (95% CI: 1.91-2.83) and 2.75 (95% CI: 2.00-3.78) in those with two diseases and 3.05 (95% CI: 2.35-3.95) and 2.52 (95% CI: 1.63-3.90) in those with three of disease conditions at the baseline. In conclusion, any combination of hypertension, diabetes, and dyslipidemia was associated with myocardial infarction and stroke. This study was supported by the National Genome Research Institute, Korea Center for Disease Control and Prevention, and by a grant from Seoul National University Hospital. We would like to thank the participants and all members of the HEXA study group.

S/P indicates work done while a student/postdoc
Background: The National Health and Nutrition Examinations Survey (NHANES) is a major source for diabetes-related epidemiological studies; however, like many other health surveys, NHANES does not record the diabetes type: type 1 and type 2 diabetes mellitus (T1DM, T2DM). There is currently no standard method to distinguish between types of diabetes in health surveys, and diagnosis-age (with 30 years old as the threshold) is commonly used for this purpose. But recent studies have demonstrated that diagnosis-age is a poor differentiator for the two types of diabetes. The purpose of this study was to provide evidence that basing diabetes type classification on diagnosis-age alone lacks validity and to propose a reasonably precise method for classifying diabetes type for NHANES. Methods: First, to evaluate the diabetes-onset age criterion, we investigated NHANES 1999-2016 participants with diagnosed diabetes and valid medication information who were diagnosed before age 30. Next, we developed an algorithm, for the classification of the diabetes type that utilizes the differences between the T1DM and T2DM treatment strategies recommended by the American Diabetes Association. Using the algorithm, we classified all the diagnosed diabetes cases in the period of 1999-2016 and evaluated the classification results. Results: Among 646 participants in NHANES 1999-2016 with diagnosis-age younger than 30 years, 50% were not taking insulin, and 11% were on both insulin and oral anti-hyperglycemic medications, suggesting that at least 61% of them were T2DM cases, and only 39% were potentially T1DM cases. Therefore, using the diagnosis-age alone for identification of diabetes type result in low sensitivity for detecting T1DM cases and low specificity for identifying T2DM cases. Conclusions: This study suggests that diagnosis-age criterion for diabetes type identification could lead to critical misclassification and biases, and a treatment-based approach could be a more reliable method for the classification.

Table 2. Clinical Characteristics of Participants with Diagnosed Diabetes Therapeutically Classified as T1DM, T2DM and Unassigned.

|                                      | Type 1 diabetes (n=280, 1.11M, 6.1%)
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<tr>
<td></td>
<td>Mean (95% CI) or n (weighted-n, %)</td>
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<tr>
<td>Age at participation (years)</td>
<td>45 (43–67)</td>
</tr>
<tr>
<td>Age at diagnosis (years)</td>
<td>28 (26–30)</td>
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<tr>
<td>Diabetes duration (years)</td>
<td>17 (15–18)</td>
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<tr>
<td>Gender</td>
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</table>
| Female                              | 126 (47K, 42%)
| Male                                | 154 (65K, 58%)
| Race/Ethnicity                      |                                    |
| White                               | 135 (83K, 75%)
| Black                               | 93 (18K, 16%)
| Hispanic                            | 43 (8K, 7%)
| Others                              | 9 (2K, 2%)

|                                      | Type 2 diabetes (n=4732, 15.6M, 86.1%)
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<tr>
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<td>Mean (95% CI) or n (weighted-n, %)</td>
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<tr>
<td>Age at participation (years)</td>
<td>60 (59–60)</td>
</tr>
<tr>
<td>Age at diagnosis (years)</td>
<td>49 (49–50)</td>
</tr>
<tr>
<td>Diabetes duration (years)</td>
<td>10 (10–11)</td>
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|                                      | Unassigned (n=445,1.4M, 7.8%)
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<tr>
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<td>Mean (95% CI) or n (weighted-n, %)</td>
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<tr>
<td>Age at participation (years)</td>
<td>61 (60–62)</td>
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<tr>
<td>Age at diagnosis (years)</td>
<td>42 (40–43)</td>
</tr>
<tr>
<td>Diabetes duration (years)</td>
<td>19 (18–20)</td>
</tr>
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Means and proportions are weighted, using the calculated 18-year NHANES weight for 1999-2016.

1 (n=sample size, weighted-sample size, weighted percentage)
2 sample size (weighted-sample size, weighted percentage)
ASSOCIATIONS BETWEEN INDIVIDUAL AND COMMUNITY FACTORS AND TYPE 2 DIABETES ONSET IN PENNSYLVANIA

Annemarie G. Hirsch* Annemarie G. Hirsch, Jonathan Pollak, Joseph Dewalle, Melissa N. Poulsen, Brian S. Schwartz, (Department of Epidemiology and Health Services Research, Geisinger)

In Pennsylvania (PA), 12.8% of the adult population have diabetes and an additional 35.8% of the adult population have pre-diabetes. Every year, an estimated 71,000 people in PA are diagnosed with diabetes. We conducted a case-control study of type 2 diabetes (T2D) onset of primary care patients using electronic health record (EHR) data from 2001 to 2016 to evaluate associations between individual and community-level factors and T2D onset in 37 counties in PA. Cases were required to have at least two diagnosis codes for T2D; or at least one T2D medication order; or at least one T2D diagnosis code and an abnormal glycated hemoglobin or glucose value. To confirm new onset, cases had to have been observed for at least 2 years in the EHR prior to diagnosis. We selected 5 controls for each case, matched on sex age, and year of clinical encounter. We conducted logistic regression analysis of sex, age, race/ethnicity (non-Hispanic white, other), history of Medicaid (used for at least 1/2 of encounters, less than 1/2), body mass index (BMI, linear and quadratic), and rural/urban residential address (urban area, urban cluster, rural) on T2D onset. A total of 24,836 cases and 124,180 controls were identified. The following factors were associated with T2D onset (odds ratio: 95% confidence interval): non-white vs. white (1.72: 1.54, 1.93); Medicaid coverage for at least 1/2 of encounters vs. less than 1/2 (1.55 (1.42, 1.96); living in an urban area (1.20: 1.16, 1.25) or an urban cluster vs. rural (1.07: 1.03, 1.12); and BMI (1.39: 1.36, 1.39). Removing BMI from the model did not substantially change associations, providing some evidence that BMI is not a mediator of these associations. In a geographically diverse area of PA, individuals living in urban areas had higher odds of T2D onset than those in rural areas, adjusting for individual sociodemographic characteristics and BMI. This finding contrasts national studies that report higher T2D prevalence in rural areas.

S/P indicates work done while a student/postdoc
GENETIC RISK SCORE OF TYPE 2 DIABETES AND PROGRESSION RISK FROM GESTATIONAL DIABETES TO TYPE 2 DIABETES: RESULTS FROM TWO INDEPENDENT POPULATIONS


Background: Women with prior gestational diabetes (GDM) are at exceptionally high risk for type 2 diabetes (T2D). Yet, little is known about genetic determinants for the progression to T2D from GDM. Further, inference from existing data is hindered by small sample size. In a large study based on two independent populations, we examined a genetic risk score (GRS) for T2D in relation to the progression risk. Methods: This study included white women in the Diabetes & Women's Health Study, which followed women with GDM from the Nurses’ Health Study II (NHSII, N = 1998) and the Danish National Birth Cohort (DNBC, N = 550). A GRS of T2D was calculated using 59 T2D SNPs (GRS59) from genome-wide association studies in European populations. GRS scores for beta-cell function (GRSBC) and insulin resistance (GRSIR) were derived based on subsets of these SNPs. The relative risks (RRs) of progression to T2D were estimated using log-binomial regression. RRs from the two cohorts were meta-analyzed using fixed effects models. Results: During the study follow-ups of more than 10 years after the index pregnancy, 416 (20.8%) in NHSII and 155 (28.2%) women in DNBC developed T2D. GRS59 was positively related to the risk of progression to T2D. RRs (95% CI) for increasing quartiles of GRS59 were 1.00, 0.99 (0.79, 1.23), 1.26 (1.03, 1.55), and 1.25 (1.01, 1.53), respectively (p-trend = 0.008). The associations were significantly stronger among lean (pre-pregnant BMI < 25 kg/m2) than overweight or obese women (p-interaction < 0.001). Further, GRSIR, but not GRSBC, was related to the risk of T2D. RRs (95% CI) for increasing quartiles of GRSIR were 1.00, 1.25 (1.02, 1.55), 1.32 (1.07, 1.64), and 1.29 (1.05, 1.58), respectively (p-trend = 0.02). The results were generally consistent across the two cohorts. Conclusion: In this large prospective study of women with prior GDM, greater GRS of T2D, especially GRS of insulin resistance, was associated with a greater risk of progression to T2D.

S/P indicates work done while a student/postdoc
A SURVEY EXAMINING DIABETES RISK-BASED SCREENING BY HEALTH CARE PROVIDERS IN GUAM Victoria Flisco* Victoria Flisco, Yvette Paulino, (University of Guam)

Diabetes is a high priority non-communicable disease in Guam. The American Diabetes Association (ADA) released the updated Standards of Medical Care in Diabetes—2018 screening criteria to test for prediabetes and type 2 diabetes mellitus (T2DM) in asymptomatic children and adolescents who are overweight or obese and have one or more additional risk factors. The aim in this study was to examine the knowledge, attitudes, and practices (KAPs) of a non-randomized sample of 18 health care providers (HCPs) in Guam. A questionnaire was administered to collect data on demographics and KAPs related to the ADA standards. Of the 18 HCPs (12 pediatricians, 4 family physicians, and 2 nurse practitioners), the mean age was 47 ± 11 years. The majority of HCPs included females (67%) and Asians (65%) then Native Hawaiians/ Pacific Islanders (35%). The mean duration of healthcare practice was 14 ± 10 years. The majority (67%) of the HCPs reported they often use or refer to the ADA standards. Regarding practices, all the HCPs reported they use overweight or OW and family history or FHIS as screening criteria for T2DM. The majority (67%) reported they are likely to order a test for T2DM based on OW condition only. In addition to using OW as a criterion, the HCPs reported using other risk factors including Acanthosis nigricans or AN (94%), dyslipidemia (83%), maternal history or MH (72%), hypertension (72%), race/ethnicity (67%), polycystic ovary syndrome (56%), and small-for-gestational-age birth weight (6%). A few HCPs (39%) reported they are likely to order a test for T2DM based on AN condition only. Regarding knowledge and attitudes, 44% of the HCPs reported FHIS as the most important risk factor to use, 33% reported AN, and 6% reported MH. The majority (94%) agreed that AN is associated with insulin resistance. While many of the HCPs in this study use or refer to the ADA standards, opportunities remain for the improved uptake of these standards related to ordering a test for T2DM.
AIR POLLUTION AND PARTICULATE MATTER COMPOSITION IN RELATION TO EPIGENETIC AGE Alexandra J. White* Alexandra J. White, Jacob K. Kresovich, Joshua P. Keller, Zongli Xu, Joel D. Kaufman, Clarice R. Weinberg, Jack A. Taylor, Dale P. Sandler, (National Institute of Environmental Health Sciences)

Air pollution is associated with numerous adverse health outcomes. Advanced epigenetic age, estimated using DNA methylation, may be a marker of biological consequences of prolonged air pollution exposure. In a sample of non-Hispanic white women ages 35-74 living in the contiguous U.S. (n=2,764), we estimated annual average ambient residential levels of PM2.5, PM10 and NO2 using a land-use regression model fit to regulatory monitoring data. Predictive k-means was used to assign participants to one of 7 clusters that correspond to different relative combinations of PM2.5 components. We measured DNA methylation (DNAm) in blood samples using the Illumina's Infinium HumanMethylation450 BeadChip and calculated DNAm age using the Levine/PhenoAge clock. Age acceleration was derived by regressing DNAm age on chronological age and calculating the residuals. Using linear regression models accounting for blood cell composition, we estimated adjusted associations between an interquartile range (IQR) increase in pollutants and age acceleration. For PM2.5, we stratified by component cluster membership. Higher age acceleration was observed for PM10 (β=0.24, 95% CI: 0.03, 0.46) but not for NO2. For PM2.5, we observed heterogeneity by component cluster membership (p for interaction=0.001). PM2.5 was associated with higher age acceleration in a western US-based cluster, characterized by high proportions of crustal elements Si, Ca, K and Al (β=3.96, 95% CI: 0.72, 7.20), and in a Pacific Northwest-based cluster characterized by overall high proportions across pollutants (β=1.94, 95% CI: 0.41, 3.46). In contrast, PM2.5 was inversely associated with age acceleration in a Southeast-based cluster defined by relatively low pollutant proportions (β=-1.84, 95% CI: -3.19, -0.48). In conclusion, air pollution was associated with epigenetic age acceleration, with heterogeneity in the association between fine particulate matter and epigenetic age acceleration by particulate matter composition.
ASSOCIATIONS OF TOXIC METAL BIOMARKERS WITH CYTOMEGALOVIRUS IN THE US POPULATION Catherine Bulka* Catherine Bulka, Paige Bommarito, Rebecca Fry, (University of North Carolina)

Background: Toxic metals are pervasive environmental contaminants and suspected to be immunotoxicants, but little is known about their relation to cytomegalovirus (CMV). The virus can cause lifelong disabilities in congenitally infected infants. Although it is mostly asymptomatic in adults, emerging data suggest high CMV-specific antibody titers indicate impaired adaptive immunity. We, therefore, evaluated cross-sectional associations of arsenic, cadmium, lead, and mercury biomarkers with prevalent CMV and antibody levels among a representative sample of the US population. Methods: Interviews and clinical examinations were performed on 1,545 individuals (49% female, aged 6-49 years) as part of the National Health and Nutrition Examination Survey 2003-2004. Metal concentrations in urine and blood samples were measured by inductively coupled plasma mass spectrometry. We calibrated urinary arsenic concentrations using a validated residual-based method to remove the contribution of non-toxic arsenobetaine. CMV immunoglobulin G (IgG) antibodies were measured in serum using enzyme-linked immunosorbent and immunofluorescent assays. We fit survey-weighted Poisson and Tobit models to assess associations with CMV seroprevalence and antibody titers, adjusting for sociodemographics, lifestyle characteristics, viral risk factors, and urinary creatinine. Results: The weighted seroprevalence of CMV was 55%. In mutually adjusted models, a 1 μg/L increase in urinary cadmium was associated with 10% (95% CI: 4, 17%) higher prevalence of CMV and a 0.17 (95% CI: -0.01, 0.34) units higher antibody response. Point estimates for urinary arsenic were positive but imprecise, whereas estimates for blood lead and mercury concentrations were near null (Figure). Conclusion: For the general US population, exposures to cadmium and arsenic to a lesser extent might increase the risk of CMV infection or impair immune control of the virus.

*Adjusted for age, gender, race/ethnicity, nativity, family income, household crowding, serum cotinine, and urinary creatinine
ELEVATED BLOOD LEAD LEVELS AMONG RESETTLED REFUGEE CHILDREN IN OHIO, 2009 – 2016

Madhav P. Bhatta* Sunita Shakya, Sunita Shakya, Madhav P. Bhatta, (Kent State University College of Public Health)

Objective. Childhood exposure to lead in any amount is a serious health concern. Previous studies among resettled refugee children in the United States (U.S.) have reported high prevalence of blood lead level (BLL) ≥10 µg/dL. However, studies in the U.S. resettled refugee children using the 2012 Centers for Disease Control and Prevention definition of elevated blood lead level, defined as BLL ≥5 µg/dL, are limited. This study assessed the prevalence of EBLL (BLL ≥5 µg/dL) at resettlement among newly admitted refugee children in Ohio. Methods. This cross-sectional study used data from the post-resettlement refugee medical screening of 5,661 children resettled in Ohio from 2009 to 2016. Prevalence of EBLL and adjusted prevalence ratio (PR) were computed using modified Poisson regression modeling. Results. Of the overall sample (children aged <18 years), 49.3% (95% CI: 47.9–52.0) were female and 22.3% (95% CI: 21.2–23.3) had an EBLL. Children resettled from South Asia region including Afghanistan (EBLL=56.2%), Nepal (44.0%), Bhutan (32.8%) and Burma (31.8%) had the highest EBLLs. In addition, those aged <6 years (PR = 2.0; 95% CI: 1.6–2.6), male (PR = 1.3; 95% CI: 1.1–1.4), and those screened within 30 days of arrival (PR = 1.7; 95% CI: 1.1–2.5) had significantly higher EBLL than children ≥13 years, female and those screened after 90 days of arrival. Among children <6 years of age, the EBLL prevalence was 27.1% (95% CI: 25.2–28.8) and children aged 12-23 months had the highest EBLL prevalence at 32.4% (95% CI: 28.1–36.6). Afghani and Bhutanese children had the two highest EBLLs at 75.7% (95% CI: 65.7–85.8) and 39.9% (95% CI: 35.9–43.4), respectively. Conclusions. Overall high proportion of EBLL and variation in EBLL by country of origin among U.S. resettled refugee children warrant comprehensive, yet tailored, guidelines for health professionals and resettlement and government agencies for better prevention and awareness programs targeting these high-risk children.
INTERACTION OF ALLERGENS AND PLASMA FOLATE ON SEVERITY OF ALLERGIC AND AUTOIMMUNE DISEASES Yu-Cheng Kuo* Yu-Cheng Kuo, Min-De Cheng, Feng-Cheng Liu, Tsung-Yun Hou, Yu-Ching Chou, (School of Public Health, National Defense Medical Center, Taipei, Taiwan)

Background: Different allergens and deficiency of folate has been associated with allergic and autoimmune diseases; however, there are few reports that focus on the interaction between allergens and plasma folate on severity of allergic and autoimmune diseases. Objective: This study was to evaluate the interaction of allergens and plasma folate on severity of allergic and autoimmune diseases. Methods: This study was a cross-sectional research performed a systematic workup for Division of Rheumatology in patients admitted to Tri-Service General Hospital in Taiwan. We identified 219 patients with allergic and autoimmune diseases and test the blood biochemistry simultaneously. Furthermore, all patients were interviewed by trained interviewers using structured questionnaires. The categorical and continuous data were compared by using the chi-square test and Student’s t-test, separately. Logistic regression model was used to estimate OR and 95% confidence interval (CI). All statistical analyses were performed using SPSS 23.0 software. Results: Regression analysis showed that keeping pets and plasma folate >5.92ng/mL were more likely to have allergic and autoimmune diseases (OR=3.55, 95% CI=1.27-9.88). Also, there was joint effect interaction between keeping pets and plasma folate on severity of allergic and autoimmune diseases. However, there was antagonist joint effect interaction between mildewed house and plasma folate on severity of allergic and autoimmune diseases (adjusted OR=0.16, 95% CI=0.04-0.62). Also, there was joint effect interaction between mildewed house and plasma folate on severity of allergic and autoimmune diseases. However, there was antagonist joint effect interaction between mildewed house and plasma folate on severity of allergic and autoimmune diseases (adjusted OR=0.16, 95% CI=0.04-0.62). After stratifying plasma folate, the interaction was more pronounced. In plasma folate >5.92 ng/mL group, the OR of living in suburb and living in detached house were 3.08 (95% CI=1.19-7.95) and 2.92 (95% CI=1.13-7.52), respectively. Conclusion: The results suggest that there were joint effect interaction and stratified effect interaction between allergens and plasma folate on severity of allergic and autoimmune diseases. Keywords: Plasma Folate, Allergic and Autoimmune Diseases, Interaction
EXPOSURE TO METAL MIXTURES AND GROWTH-RELATED TRAITS IN BANGLADESHI CHILDREN AGED 5-7 YEARS Yu-Hsuan Shih* Yu-Hsuan Shih, Mohammad Hasan Shahriar, Tariqul Islam, Alauddin Ahmed, Golam Sarwar, Victoria Persky, Habibul Ahsan, Maria Argos, (University of Illinois at Chicago)

Background: Health effects of toxic and trace metal mixtures in children have not been well characterized. Previous studies suggest associations between exposure to certain metals and growth-related traits, however, most of the associations remain suggestive and have not been replicated. Furthermore, studies to date have focused primarily on single metal analyses without considering the potential for co-exposure and interdependence among metals. Objectives: We evaluated the cross-sectional association of exposure to metal mixtures and anthropometric measures in 491 children aged 5-7 years from the Bangladesh Environmental Research in Children’s Health cohort. Methods: For anthropometric measures, including height, weight, body mass index (BMI), and waist circumference, z-scores adjusted for child's age and gender were calculated and modeled as continuous variables. Weighted quantile sum (WQS) regression analysis was conducted using a panel of 17 metals measured in children's toenails to generate positive and negative metal mixture indices in a training dataset (n = 196, 40%), and the effects of the indices on anthropometric measures were tested in a validation dataset of 295 children (60%), adjusting for confounding variables. Results: An index predominated by uranium, cadmium, and lead, was inversely associated with z-score of height (β = -0.21, 95% confidence interval (CI) = -0.35, -0.07). We also identified an index, predominated by arsenic, cadmium, and uranium, inversely associated with z-score of weight (β = -0.14, 95% CI = -0.28, 0.00). Conclusions: Our results suggest associations between exposure to metal mixtures in early life and growth-related traits in children. Analyses using other statistical approaches to characterize metals mixtures will be conducted.
GENETIC CAUSAL ATTRIBUTION AND PSYCHOSOCIAL IMPACT OF EPILEPSY  Diana Garofalo*, Shawn Sorge, Ruth Ottman, (Mailman School of Public Health)

Background Studies have found that affected individuals who believe the cause of their disease is genetic may react in various ways, including optimism for improved treatments and pessimism due to perceived permanence of the condition. This study assessed the psychosocial impact of genetic attribution among people with epilepsy. Methods Study participants were 181 persons with epilepsy from multiplex epilepsy families. A self-administered survey was used to assess perceived psychosocial impact of epilepsy and genetic attribution of epilepsy. Psychosocial impact was assessed with the Impact of Epilepsy Scale, containing items about relationships, employment, overall health, self-esteem, and standard of living. Genetic attribution was assessed using a scale derived from three items asking about the role of genetics in causing epilepsy in the family, the chance of having an epilepsy-related mutation, and the influence of genetics in causing one’s epilepsy. We estimated prevalence ratios (PRs) for impact of epilepsy above the median using Poisson regression with robust standard errors, adjusting for seizure severity. Results Participants’ age averaged 51 years; 89% were white, 61% were women, 53% were college graduates. The genetic attribution scale was significantly associated with having a high impact of epilepsy (adjusted PR 1.4 (1.07, 1.91)). One of the three genetic attribution questions (belief that genetics had a big role in causing epilepsy in the family) was also associated with a high impact of epilepsy (adjusted PR 1.8 (1.07, 2.98)). Conclusions The relationship of the genetic attribution scale to impact of epilepsy reflected a 40% increase in the likelihood of high impact of epilepsy for each one-unit increase in genetic attribution score (p=0.015). This association could arise either because belief in a genetic cause leads to adverse psychosocial impacts, or a greater psychosocial impact of epilepsy leads some to believe their epilepsy is genetic.

S/P indicates work done while a student/postdoc
MATERNAL BLOOD PRESSURE AND DIFFERENTIAL PLACENTAL DNA METHYLATION
Tsegaselassie Workalemahu* Tsegaselassie Workalemahu, Xuehuo Zeng, Deepika Shrestha, Marion Ouidir, Katherine L. Grantz, Fasil Tekola-Ayele, (The National Institute of Child Health and Human Development (NICHD))

DNA methylation is a potential regulatory pathway through which maternal blood pressure (BP) may influence placental development. However, specific methylated sites in the placenta associated with BP have not been identified. We examined the associations of maternal systolic blood pressure (SBP) and diastolic blood pressure (DBP) with epigenome-wide placental DNA methylation. This study included 301 mothers that provided placenta at delivery as part of the NICHD Fetal Growth Studies. Genome-wide placental CpG methylation was measured using HumanMethylation450BeadChip. Trimester specific (TM1, TM2, TM3) SBP/DBP measurements were abstracted from medical records. Epigenome-wide analysis that adjusted for race/ethnicity and fetal sex was used to estimate percent methylation change per mmHg increase in DBP/SBP. The biological functions of the genes near the top epigenome-wide signals (p<1e-5) associated with SBP/DBP were evaluated using pathway analysis. Although none reached genome-wide significance, top CpGs associated with 1 mmHg increase in DBP and SBP during TM1 include, 1.1% (p=2.8e-6) and 0.8% (p=2.4e-6) higher methylation of cg11480264 near ANKRD31, respectively. In TM2, 1.6% (p=8.8e-7) higher methylation of cg02955114 near ERC2 and 0.5% (p=3.3e-6) lower methylation of cg05412396 near ISL2 were observed for 1 mmHg increase in DBP and SBP, respectively. In TM3, 1 mmHg increase in DBP and SBP were associated with 0.1% (p=2.3e-6) higher methylation of cg00563678 near RNF150 and 0.1% (p=1.1e-6) higher methylation of cg04237822 near PTPRN2, respectively. Notably, the genes near our top signals were significantly enriched in cardiac function/cardiovascular disease. Findings reported herein provide the first evidence that higher maternal BP may alter placental DNA methylation at genes implicated in cardiovascular diseases. Future studies with larger samples may facilitate identification of biomarkers and drug targets for BP regulation.
Estimates of substance use and related problems are usually based on studies that exclude high-risk population, such homeless. Cocaine paste use (i.e., coca paste, basuco, paco, crack) is one of the leading causes of treatment admission in Chile and other Latin-American countries; however, little is known about its epidemiology, and its association with the harm related to the use of other substances. We estimated the prevalence of substance use disorders (SUD) among current cocaine paste users of the Metropolitan Area of Santiago, Chile. We used the respondent-driven sampling methodology to enroll people of 18+ years of age with current heavy use of cocaine paste (i.e., 2-3 times per week during the past 3 months). From an initial number of 9 key informants in our study (know as “seeds”), participants contacted a maximum of 3 individuals in their social network, which could also contacted up to 3 individuals in their social networks, and so on, as in a snowball sampling. Substance use disorders were measured with the Mini-International Neuropsychiatric Interview conducted by trained psychologist. Population proportions and uncertainty for each parameter were obtained by accounting for individual network size and homophily. There were 398 valid interviews from 6 productive seeds. The average age in the sample was 37.5 years; 81.9% were males. The past month prevalence of alcohol, marijuana, and snorted cocaine use was 86%, 53%, and 38%, respectively. The population proportion of people who met criteria for substance use disorder was 98% for cocaine paste (% CI: 95, 99), 67% for alcohol (% CI: 59, 75), 60% for marihuana (% CI: 51, 69), and 41% for snorted cocaine (% CI: 33, 49). Polysubstance use and comorbid substance use disorders are frequent among people who use cocaine paste regularly in the Metropolitan area of Santiago. This coexists with multiple other social and health problems in this population.
EXAMINING THE DELIVERY AND DOSAGE OF CAREGIVING INTERVENTIONS AND CAREGIVING PRACTICES IN RURAL BANGLADESH


Background: Programs for caregivers of children in low- and middle-income countries have shown positive effects on child development, though few studies have directly compared interventions of different delivery strategies and dosages. We examined differences in caregiving outcomes across delivery strategy and intervention dosage for a caregiving support intervention that integrated information on child stimulation, water, sanitation, hygiene, and nutrition, in Kishorganj, Bangladesh. Methods: The study sample includes mothers of children aged 6-24 months who participated in a 9-month cluster-randomized trial of an integrated care-giving support intervention. The trial had two intervention arms and a comparison arm; the interventions included health promotion sessions with caregivers delivered every two weeks in either (1) group sessions (group arm) or (2) alternating group and individual sessions (mixed arm). Caregiver stimulation was assessed with six questions from the Early Child Development Index of UNICEF's Multiple Indicator Cluster Survey. Mean caregiver stimulation scores were compared at end line using linear regression models. Results: Preliminary results at end line show that caregiver stimulation scores were higher in the intervention arms than in the comparison arm (adjusted difference: 1.16, 95% CI: 0.90, 1.41). The mixed arm had higher scores than the group arm (adjusted difference: 0.39, 95% CI: 0.13, 0.66), and participants who attended over 75% of sessions had higher scores than those who attended less (adjusted difference: 0.35, 95% CI: -0.04, 0.74). Subgroup-specific mean number of sessions attended and stimulating caregiving scores are presented in table 1. Conclusion: Both intervention arms Delivery strategy and dosage may moderate the effects of integrated caregiving interventions on self-reported stimulating caregiving practices. A focus on improving attendance to group sessions may maximize behavior change from integrated caregiving interventions.

<table>
<thead>
<tr>
<th>Intensity</th>
<th>n</th>
<th>Mean number of sessions attended (SD)</th>
<th>Mean caregiver stimulation score (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>282</td>
<td>0 (0)</td>
<td>3.65 (1.50)</td>
</tr>
<tr>
<td>Group</td>
<td>144</td>
<td>13.82 (3.88)</td>
<td>4.57 (1.34)</td>
</tr>
<tr>
<td>Mixed</td>
<td>150</td>
<td>14.55 (3.69)</td>
<td>5.01 (1.17)</td>
</tr>
<tr>
<td>&lt;75% of sessions attended</td>
<td>105</td>
<td>10.39 (3.96)</td>
<td>4.57 (1.35)</td>
</tr>
<tr>
<td>&gt;75% of sessions attended</td>
<td>189</td>
<td>16.34 (0.94)</td>
<td>4.92 (1.21)</td>
</tr>
</tbody>
</table>

Table 1: Caregiver stimulation scores by delivery and dosage at intervention end line

S/P indicates work done while a student/postdoc
CHILDHOOD TRAUMA AND LATER-LIFE COGNITIVE FUNCTION IN “HEALTH AND AGEING IN AFRICA: LONGITUDINAL STUDY OF AN INDEPTH COMMUNITY IN SOUTH AFRICA” (HAALSI) Lindsay Kobayashi* Lindsay Kobayashi, Meagan Farrell, Collin F Payne, Livia Montana, Sumaya Mall, Ryan G Wagner, Kathleen Kahn, Stephen M Tollman, Lisa F Berkman, (Georgetown University)

Background: The effects of childhood trauma on cognitive function in later-life are understudied, especially in low- and middle-income countries (LMICs). Unbiased measurement of cognitive function can be difficult in LMICs, as poor cognitive test scores can be due to low education or literacy, rather than cognitive impairment.

Methods: We investigated associations between childhood trauma and cognitive function domains while accounting for cognitive test bias, using baseline data from the population-representative HAALSI study of 2038 rural Black South Africans aged 40-79 in 2015. The exposures were four traumatic experiences prior to age 16 (parent unemployed for >6 months, parents drank/used drugs, parents fought often, physical abuse by parents). The outcomes were latent cognitive domain z-scores (executive function, language, visuospatial ability, memory) in the Oxford Cognitive Screen, a novel tool designed for low-literacy settings. We specified a multiple-indicator, multiple-cause structural equation model to estimate direct effects of each childhood experience on latent cognitive domain z-scores, adjusting for confounding by age, sex, country of birth, and residual test bias according to education and literacy. Results: One-third of the sample was illiterate. The model was of good fit to the data (RMSEA=0.028; 95% CI: 0.025-0.031). We corrected for mild bias in visuospatial and memory tests by regressing test scores and latent cognitive domains on education and literacy. Traumatic experiences ranged from 15% (parental unemployment) to 35% (physical abuse by parents), and were not associated with cognitive domains, except having parents who drank or used drugs with -0.07 SD latent memory domain z-score (SE: 0.03; p=0.02). Conclusions: Measurement is a key issue for cognitive aging research in LMICs. As life course epidemiology in LMICs with aging populations grows, this study raises several methodological questions pertinent to the future of this subfield.

S/P indicates work done while a student/postdoc
APPLICATION OF A MULTIDIMENSIONAL RURAL INDEX TO DETERMINE THE EFFECT OF RURACITY ON COUNTY COLORECTAL CANCER MORTALITY  Blake Buchalter*  Blake Buchalter, ,  (Oregon State University)

Colorectal cancer (CRC) mortality is a major concern in rural areas of the United States due to low screening rates and other factors. However, few studies have attempted to directly assess rural CRC mortality disparities for the entire US. Further, the methods used to classify areas as rural or urban in CRC studies vary and are largely based on single rurality measures such as population size or density, leading to inconsistent results for rural-urban CRC disparities. Rural indexes have become more popular due to their increased geographic consistency and ability to capture the multidimensional nature of rurality. The Index of Relative Rurality (IRR) is one, and measures rurality in 4 dimensions: population size, population density, remoteness, and built-up area. IRR is a unitless index measured from 0 to 1, with 0 denoting the most urban areas and 1 denoting the most rural areas. The present research employs linear regression to compare the latest 5-year average age-adjusted county-level CRC mortality rates by IRR county values. 2011-2015 CRC mortality rates were obtained from the CDC’s National Center for Health Statistics National Vital Statistics System, while 2010 IRR values were accessed via public data published by Purdue University. Of 3,142 US counties, data for 2,174 were utilized for this study, as 3 were removed from the analysis to match county ID codes between datasets, and 965 were removed due to cancer data suppression for patient anonymity and rate estimate stability. Preliminary analysis showed that counties in the 75th percentile for CRC mortality rate were 7% more rural than counties in the 25th percentile. Linear regression results exhibited that for every 10% increase in IRR county rurality, there were 1.2 more CRC deaths per 100,000 population (p<0.0001). The positive linear relationship indicates that rural counties in the United States have significantly higher CRC mortality rates than urban counties based on a multidimensional rural index.
SOCIOECONOMIC STATUS AND ASTHMA PREVALENCE DISPARITIES AMONG NATIVE HAWAIIAN/OTHER PACIFIC ISLANDER, ASIAN, AND WHITE ADULTS IN THE UNITED STATES – FINDINGS FROM THE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2001–2010 Holly Jessop* Holly Jessop, , (University of Hawaii at Manoa)

Background: Despite higher asthma prevalence, little is known about the epidemiology of asthma among Native Hawaiian/Other Pacific Islanders (NHOPI), or about the roles of socioeconomic factors in such asthma disparities by race. Objectives: 1) Does the burden of asthma in the U.S. decline with gains in socioeconomic status (SES) regardless of race, or do socioeconomic gradients with asthma prevalence vary by race? 2) Is asthma prevalence elevated among NHOPI regardless of SES, or do racial disparities in asthma prevalence vary by SES?

Methods: Multivariable logistic regression using 2001-2010 BRFSS data was conducted to provide adjusted lifetime and current asthma prevalence ratios for several different indicators of SES, within groupings by sex and census race category. Adjusted asthma prevalence disparities by race were also investigated within groupings by sex and SES. Results: After controlling for geographic region, time period, age, body mass index, smoking status, healthcare coverage, and healthcare provider, asthma prevalence markedly differed between groupings by sex and race, with those identifying as NHOPI frequently having the highest point estimates of ever-diagnoses and current asthma. There were consistent dose-response declines in asthma prevalence with increasing SES, but only among Whites and women of race other than NHOPI, White, or Asian; associations between asthma and SES differed by sex and race. Similarly, asthma disparities by race were modified by sex and SES; stratification by SES attenuated associations between asthma and race, but asthma disparities by race persisted including for NHOPI. Conclusions: Investigations of racial asthma must account for interactions between sex, race, and SES. Determinants of health not sufficiently captured by categories of racial/ethnic identity and/or commonly used measures of SES play a complex role in the inequitable distribution of the U.S. asthma epidemic.

S/P indicates work done while a student/postdoc
Racial Disparities in the Control of Hypertension and the Mediating Role of Residential Segregation: The Brazilian Longitudinal Study of Adult Health (ELSA-Brasil) Joanna MN Guimaraes*, Joanna MN Guimaraes, Sharrele Barber, John Jackson, Leticia Cardoso, Rosane Griep, Maria de J Fonseca, Maria I Schmidt, Bruce B Duncan, Sandhi M Barreto, Lidyane Camelo, Alexandre Pereira, Dora Chor, (Oswaldo Cruz Foundation)

The potential mechanisms linking race/color to the control of hypertension have been scarcely studied, particularly outside the United States. We investigated racial disparities in the control of hypertension and the potential mediating role of residential segregation in a large urban setting in Brazil, the multicenter Longitudinal Study of Adult Health (ELSA-Brasil). All 3,023 medicated hypertensives from the baseline (2008-2010) assessment of the ELSA-Brasil were included. Uncontrolled hypertension was defined as SBP \( \geq \) 140mmHg or DBP \( \geq \) 90mmHg. Race/color was self-reported (White, Brown, Black). Brazilian indigenous and Asian descent were excluded. Socioeconomic residential segregation (low, middle, high) for study-defined neighborhoods was based on household income data from the 2010 Brazilian demographic census. We conducted an exploratory analysis based on interventional analogues for mediation analysis using standardization, which yields a disparity reduction (explained portion, analog of the indirect effect) and disparity residual (unexplained portion, analog of the direct effect) upon removing marginal disparities in socioeconomic segregation across race/color groups.

Age and sex adjusted prevalence of uncontrolled hypertension was 31.4% for Whites, 44.0% for Browns and 50.7% for Blacks. The observed age and sex standardized prevalence difference was 17.8% (95%CI 13.3 to 22.3) for blacks vs. whites and 11.2% (95%CI 7.1 to 15.4) for browns vs. whites. For blacks vs. whites, the explained portion was 0.0% (95%CI -0.1 to 0.1%) and the unexplained portion was 18.0% (95%CI 12.4 to 23.6%); for browns vs. whites, the explained portion was 0.0% (95%CI -0.1 to 0.1%) and the unexplained portion was 10.7% (95%CI 6.0 to 15.4), while accounting for age, sex, education and center. Racial disparities in hypertension control did not appear to be explained by racial differences in economic segregation in this Brazilian setting, neither for blacks nor for browns.
EFFECT OF REGIONAL CHARACTERISTICS IN SOCIOECONOMIC DISPARITIES FOR CANCER MORTALITY, CHILE, 2016 Maria José Monsalves* Maria José Monsalves, Doris Durán, Pablo Ruiz-Rudolph, (Universidad de Chile/Universidad San Sebastián)

Introduction: Cancer is among the leading causes of death worldwide, and is the second cause of mortality in Chile. It has been reported that the population of lower socioeconomic status (SES) has higher cancer mortality in Chile. However, the existence of inequalities according to the regional characteristics of the country have not been explored. Objective: To explore social inequalities in the distribution of cancer mortality according to rurality, local poverty and regional distance. Methodology: Analytical ecological study of the deceased population due to gallbladder, stomach, esophagus, lung, pancreas, breast, cervical and colorectal cancers. Mortality data was extracted from the Department of Health Statistics and Information. Direct standardization was carried out with the WHO standard population. For the disparity's analysis, rurality, regional poverty and distance from the regional capital to the Metropolitan Region were considered. Absolute and relative differences and, absolute and relative inequalities slope indexes were estimated (SII and RII respectively). Results: The greatest absolute and relative differences were observed in stomach cancer (AD = 4.4 x 100,000, RD = 1.71) and gallbladder cancer (AD = 2.3 x 100,000, RD = 1.88). The highest values of total disparity were for stomach cancer (SII = 5.72), followed by esophagus (SII = 2.88), gallbladder (SII = 2.08) and colorectal (SII = 1.07). Pancreatic cancer did not present disparities according to rurality and lung cancer showed an inverse relationship (SII = -4.58). Some differences were reduced by adjusting for regional poverty. Conclusions: It is possible to observe social inequalities according to rurality in some cancers, even when adjusted for poverty and regional distance to the metropolitan area. In addition, there are differences in mortality between regions, not associated with the variable rurality, poverty or regional distance that could be explored in future studies.

S/P indicates work done while a student/postdoc
GEOGRAPHICAL VARIATIONS AND FACTORS ASSOCIATED WITH CHILDHOOD MEASLES VACCINATION IN ETHIOPIA: A SPATIAL AND MULTILEVEL ANALYSIS

Tefahun Taddege*, Tefahun Taddege, Lemma Derseh, (Ethiopian Field Epidemiology and Laboratory Training Program, Institute of Public Health, University of Gondar, Ethiopia)

Background: Despite the considerable improvement of childhood measles vaccination, measles outbreaks have been occurring in most parts of Ethiopia. Understanding the neighborhood variation in measles vaccination is crucial for evidence-based decision-making. However, the spatial pattern of first dose of measles-containing vaccine (MCV1) and its predictors are poorly understood. Hence, this study aimed to explore the spatial pattern and associated factors of childhood MCV1 coverage.

Methods: A secondary data analysis was conducted using the 2016 Ethiopia demographic and health survey data. A total of 3,722 children nested in 611 enumeration areas were included in the analysis. Poisson-based purely spatial scan statistics and multilevel logistic regression models were employed.

Result: Seven statistically significant SaTScan clusters of areas with low MCV1 coverages were detected. The most likely primary SaTScan cluster was detected in the Afar region, secondary cluster in the Ethio-Somali region, and tertiary cluster in Gambella region. Individual and community level factors accounted for 82% of the variance in the odds of MCV1 vaccination.

Older child age (AOR=1.53; 95%CI: 1.25-1.88), pentavalent vaccination first dose (AOR=9.09; 95%CI: 6.86-12.03) and third dose (AOR=7.12; 95%CI: 5.51-9.18), secondary and above maternal education (AOR=1.62; 95%CI: 1.03–2.55) and media exposure were the factors that increased the odds of MCV1 vaccination at the individual level. Children with older maternal age had lower odds of receiving MCV1. Living in Tigray, Oromia, Ethio-Somali, Gambella, and Harari regions were factors associated with lower odds of MCV1 from the community-level factors.

Conclusion: A clustered pattern of areas with low childhood MCV1 coverage was observed and both individual and community level factors were significant predictors of childhood MCV1. Hence, it is good to give priority to the areas with low childhood MCV1 coverage and to consider the identified associated factors.
Background/Objectives: Body mass index (BMI) tracks from childhood to adulthood, but the extent to which this relationship varies across the distribution and according to socio-economic position (SEP) is unknown. The aims of this study were to quantify child-adult BMI tracking in three nationally representative cohorts and investigate whether BMI tracking is associated with SEP. Methods: We used serial BMI and socioeconomic data from 15095 participants from three British birth cohorts (National Survey of Health and Development (n=2,274); National Child Development Study (n=7,143); British Cohort Study (n=5,678)). BMI tracking between 11 and 42 years was estimated using quantile regression, with estimates reflecting correlation coefficients. SEP disparities in tracking were investigated using a derived SEP variable based upon social class in both childhood and adulthood. This SEP variable was entered into the quantile regression as an interaction term with the 11-year BMI z-score. Results: In each cohort, tracking was stronger at the upper end of the distribution of BMI at 42 years. For example, for males in the NSHD, tracking estimates at the 10th quantile were 0.30 (0.21, 0.38), increasing to 0.66 (0.50, 0.83) at the 90th quantile. Tracking estimates were generally higher in those from the low SEP group (relative to high SEP) and this pattern was observed in all three cohorts. For example, for males in the NSHD, tracking estimates at the 10th, 50th, and 90th BMI quantiles were 0.25 (0.06, 0.44), 0.17 (0.00, 0.33), and 0.17 (-0.06, 0.41) units higher for the low SEP group compared to the high SEP group. However, evidence from formal tests of effect modification was weak. Conclusions: We observed greater childhood-to-adulthood BMI tracking at higher quantiles and among lower SEP groups, thereby suggesting that obese children from disadvantaged backgrounds may be more likely to be obese adults than equally obese children from advantaged backgrounds.
GENDER DIFFERENCES IN GULF WAR ILLNESS: A RE-ANALYSIS OF DATA FROM THE CDC AIR FORCE STUDY USING CDC AND KANSAS CASE DEFINITIONS  

Vahe Heboyan*  Vahe Heboyan, Maxine H. Krengel, Kimberly Sullivan, Nancy Klimas, Candy Wilson, Steven S. Coughlin, (Augusta University)

Introduction. Nearly 1 in 3 U.S. veterans who served in the 1990-1991 Gulf War have Gulf War Illness (GWI). Over twenty-five years has passed since the Gulf War, but the GWI still remains one of the most critical health challenges facing GW Veterans and there still is a lack of consensus on GWI case definition. Furthermore, some, but not all, studies have suggested that GWI is more common among female GW veterans. Objective. Conduct a comparative analysis of defining GWI cases based on CDC and Kansas criteria and conduct a more in-depth comparative analyses of the prevalence of GWI and chronic illnesses in male and female veterans separately using case definitions from both criteria. Methods. We computed the prevalence of the 35 most common symptoms reported by GW veterans by deployment and gender. We tested if there is a statistical difference in the GWI rates based on case defining criteria. Multinomial logistic regression models were used to estimate the multivariate associations of categorical socio-demographic variables and deployment status with GWI case severity for the whole sample and for male and female veterans separately. Results. About 25% of the Gulf War veterans in our study met CDC’s case definition, but only 15% met the Kansas case definition. Most of this difference comes from Kansas criteria defining almost half of CDC-defined mild-to-moderate GWI cases as ‘non-case’. Regardless of case definition, GW and female veterans exhibited significantly higher risks of having GWI. Female GW veterans had higher rates of GWI severe and mild-to-moderate cases. Conclusion. Further research is needed to examine the health of female GW veterans and, to better assess the comparability of alternative GWI criteria, it is imperative for the future research to adequately capture all case defining symptoms for both criteria, particularly in longitudinal studies.
PERCEIVED RACISM AND SELF-RATED ORAL HEALTH IN US BLACK WOMEN

Yvette C Cozier* Yvette C Cozier, Yvonne P Robles, Brenda Heaton, Hanna Gerlovin, Patricia F Coogan, Lynn Rosenberg, (Slone Epidemiology Center at Boston University)

African Americans experience higher rates of poor oral health (e.g., periodontal disease, tooth loss) compared to whites, a disparity only partially explained by socioeconomic status. Evidence suggests that stress contributes to poor oral health, and perceived racism is a source of chronic stress in African Americans. We assessed the relation between perceived racism and self-rated oral health in the Black Women’s Health Study, a follow-up study of US Black women aged 21-69 at enrollment in 1995 and followed via mailed biennial questionnaires. In 1997 and 2009, participants reported frequency of “everyday racism” (e.g., “people act as if they think you are dishonest”) and “institutional racism” (ever treated unfairly due to race in housing, on the job, or by the police). In 2011 and 2015, participants rated the health of their teeth and gums as “excellent”, “very good”, “good”, “fair”, or “poor”. The 16,216 women who reported “excellent/very good” in 2011 and completed the 2015 questionnaire comprise the analytic cohort. Cox proportional hazards models were used to estimate incidence rate ratios (IRR) and 95% confidence intervals (95% CI) for racism in relation to subsequent fair/poor oral health, adjusted for age, body mass index, socioeconomic status, geographic region, smoking, diabetes, and dental cleaning. Both everyday racism and institutional racism were positively associated with incident fair/poor oral health. The IRRs and 95% CIs for women in the highest category of everyday racism or lifetime racism in both 1997 and 2009, relative to those in the lowest category, were 1.55 (1.06-2.28) (P trend= 0.08) and 1.97 (1.33-2.90) (P trend <0.001), respectively. These associations were not modified by style of coping with experiences of racism (e.g., accept as fact of life, try to do something about it). Our results suggest that racism contributes to poor oral health among Black women. Further studies to elucidate the underlying mechanism(s) are needed.
THE ROLE OF SOCIAL CAPITAL IN IMPROVED MENTAL HEALTH AND ECONOMIC WELL-BEING IN CAREGIVERS WITH DEPRESSION ON PUBLIC ASSISTANCE Pam Phojanakong, Mariana Chilton, Seth Welles, (Drexel University Dornsife School of Public Health)

Background: Public assistance programs, such as Temporary Assistance for Needy Families (TANF) has limited success in building self-sufficiency and rarely addresses psychological trauma as a barrier to employment. While research suggests that social capital may offer a promising avenue for interventions designed to promote better health and improved economic outcomes, there have been few attempts at a more theoretical understanding of social capital, limiting our ability to develop appropriate and evidence-driven interventions in public assistance.

Objective: The objective of the Building Wealth and Health Network (BWHN) was to test effectiveness of financial empowerment combined with trauma-informed peer support against standard TANF programming.

Methods: Philadelphia adults receiving TANF who are primary caregivers of a child <6 years were recruited to join The Building Wealth and Health Network for trauma-informed peer-support programming over 16 sessions (N=373). Participants responded to baseline and three-month surveys over 12 months between 2015-2018. Path analysis was used to investigate temporal patterns in social capital scores, depression, employment status, household food security, general health, child health, and TANF receipt among those who participated in BWHN compared to those who did not.

Results: Social capital was associated with greater employment ($\beta=0.10$, $p=0.01$), food security ($\beta=0.17$, $p<0.0001$), and child health ($\beta=0.13$, $p<0.0001$), as well as lowered depression ($\beta=-0.12$, $p<0.0001$) and TANF receipt ($\beta=-0.14$, $p<0.0001$). Participation in BWHN was associated with lowered depression ($\beta=-0.06$, $p<0.0001$) and increased social capital ($\beta=0.08$, $p=0.0001$). There was also a direct path from participation in BWHN to increased food security ($\beta=0.10$, $p=0.0001$). Conclusion: Social capital is associated improved mental health and economic outcomes. Trauma-informed approaches that strengthen social capital should be integrated into public assistance programs, such as TANF.

S/P indicates work done while a student/postdoc
HEALTHCARE PROVIDERS’ USE OF MOTIVATIONAL INTERVIEWING FOR CHILDHOOD OBESITY, DOCSTYLES, UNITED STATES 2015

Samantha J. Lange* Samantha Lange, Deborah A. Galuska, Latetia V. Moore, Brook Belay, Alyson B. Goodman, (Centers for Disease Control and Prevention, Division of Nutrition, Physical Activity, and Obesity)

Background: Motivational interviewing (MI) is an evidence-based counseling strategy for behavior change. Healthcare providers can use MI to facilitate patient goal-setting and encourage healthy behavior change for childhood obesity. However, it is not known how many child healthcare providers are trained in or use MI for this purpose. Methods: This cross-sectional study used data from the 2015 DocStyles panel survey. Among 1,156 U.S. child healthcare providers, we calculated 1) the prevalence of training in MI to assist with goal-setting and counseling and 2) the frequency of use of MI for childhood obesity counseling (never vs. sometimes vs. usually/always). We used logistic and multinomial regression to examine the associations between provider and practice characteristics and 1) MI training and 2) use of MI. Results: Twenty-eight percent of providers reported any training in MI. Adjusted odds of MI training were significantly higher in younger providers and those who saw more pediatric patients/week, and lower in obstetricians/gynecologists (OB-GYNs). Nearly two-thirds of providers (64%) ever used MI techniques for childhood obesity counseling (42% sometimes, 22% usually/always). Of those trained, nearly all (95%) used MI. Compared to providers who saw 40 had significantly higher odds of using MI usually/always (aOR 2.1, 95% CI 1.3, 3.4 and aOR 3.5, 95% CI 1.9, 6.4 respectively) vs. never. Pediatricians, family practitioners, and OB-GYNs all had significantly lower odds of using MI usually/always vs. never compared to internists (aOR range 0.4-0.6). Similar patterns were observed for sometimes vs. never. Conclusions: Overall, few child healthcare providers were trained in MI. Disparities in MI training and use exist. MI training may help familiarize healthcare providers with an evidence-based strategy that they can use when counseling patients and families about childhood obesity.

S/P indicates work done while a student/postdoc
VISION DIFFICULTY IN AGING HIV-INFECTED MEN AND THE HEALTH CONSEQUENCES
Alison Abraham* Alison Abraham, Ann Ervin, Bonnie Swenor, Pradeep Ramulu, Roomasa Channa, Xiangrong Kong, Michael Plankey, (Johns Hopkins School of Medicine)

Few studies have examined the prevalence and consequences of visual impairment among long term survivors with HIV. This study used data from the Multicenter AIDS Cohort Study (MACS), an aging cohort of HIV-infected (HIV+) and –uninfected(HIV-) men who have sex with men (MSM). A modified version of the National Eye Institute vision function questionnaire was administered to assess difficulty performing vision-dependent tasks (no, a little, moderate, and extreme difficulty). Among participants who answered at least one question on visual function from September 2017 to March 2018, we matched HIV+ to HIV- on exact year of age and imputed missing covariate data using 20 data sets. The relationships of self-reported visual functioning with physical and comorbidity outcomes were examined using logistic regression, regressing each outcome separately on visual function as indicator variables. There were 634 age-matched pairs out of 1700 with available data. The median age was 60 years (IQR: 54.3, 65.9) and 24% were African American. Among HIV+ men (93%) were virally suppressed (viral load<400 copies/mL). Overall, there were 51 reported eye conditions with the most prevalent being cataract (25% of reported diagnoses). HIV+ men reported more difficulty than HIV- men across all vision-related tasks (Figure). Those reporting extreme vision function difficulties had 3.7 times the odds of depressive symptoms (by CESD), 10.1 times the odds of frailty (Fried definition), 2.7 times the odds of a slow gait speed (4 m walk time longer than 80th %tile of HIV−) and 3.7 times the odds of minor or major IADL difficulty (Lawton-Brody Instrumental Activities of Daily Living Questionnaire) compared to those reporting no vision difficulties. These results indicate that difficulty with vision-related tasks is related to a larger burden of mental health and physical function consequences among older HIV+ MSM compared to HIV- MSM.
INVESTIGATION OF ADVERSE CHILDHOOD EXPERIENCES AND HIV SCREENING BEHAVIORS AMONG ADULTS IN TENNESSEE
Elaine Loudermilk* Elaine Loudermilk, Oluyemi Rotimi, Hongyun Fu, Megan Quinn, Liang Wang. (East Tennessee State University)

Background: Adverse childhood experiences (ACEs) have been linked to risk behaviors, specifically substance abuse and unprotected sex, which contribute to negative physical and mental health outcomes in adulthood. However, there is limited information discussing the impact of individual ACEs on HIV screening behaviors in the state of Tennessee (TN). Objective: Investigate the impact of ACEs on HIV screening behaviors among adults in TN. Methods: Data were obtained from the TN Department of Health Behavioral Risk Factor Surveillance System for years 2014-2016. HIV screening was answered as ever being tested for HIV (yes or no). ACEs included physical and/or sexual abuse or growing up in a dysfunctional household. Weighted descriptive statistics were calculated for all ACEs and were further categorized into abuse and household dysfunction. Weighted simple and stepwise multiple logistic regression (MLR) models were used to examine associations between ACEs and HIV screening behaviors. Overall adjusted odds ratios (aOR) were reported with 95% confidence interval (CI). Results: The final sample size was 11,971. Only 32% reported screening for HIV. MLR results found that Blacks were 3 times more likely to screen for HIV than Whites (aOR =3.14, 95%CI: 3.13-3.15). Adults who experienced abuse were 47% more likely to screen for HIV compared to those without abuse (aOR =1.47, 95%CI: 1.47-1.48). Having grown up with household dysfunction increased the odds for HIV screening by 25% compared to adults who did not grow up with household dysfunction (aOR=1.25; 95%CI: 1.25-1.26). Conclusions: Abuse and household dysfunction were found to increase screening for HIV among adults in TN. Results indicate inclusion of the ACE questionnaire in a clinical setting may be beneficial for future longitudinal studies.
Background: Poverty and income are two important determinants of diseases at population level, with poorer health indices often strongly associated with poverty. We explored how HIV prevalence varies with poverty and income inequality using country level data derived from World Bank databases. Methods: Data on HIV prevalence, GNI and Gini (for a number of countries that reported on these variables in the last 5 years) were obtained from World Bank databases and analysed for patterns, trends and relationships. Findings: We found statistically significant associations between poverty, income inequality and high HIV prevalence: countries with poor wealth (GNI) and inequality (Gini) indices tend to have higher HIV prevalence. We also found a non-linear relationship between Gini (income inequality) and HIV prevalence. Interpretation: Based on our analyses, we conclude that HIV continues to be a disease of poverty and inequality. Our findings strongly suggest that in order for HIV campaigns to be successful, they must incorporate significant elements of poverty and inequality reduction activities. The non-linear relationship observed in the analysis between income inequality (Gini) and HIV prevalence points to the existence of a Gini threshold beyond which further reductions in income inequality will translate into little (or no further) gains in HIV prevalence reduction. Finally, the linear relationship observed between HIV prevalence and country level wealth (GNI) implies that every marginal gain in country level wealth could result in a further reduction in country level HIV prevalence.
Invasive candidiasis (IC) is an important cause of nosocomial bloodstream infection and is of great concern within US healthcare facilities. While risk factors for IC such as central venous catheter (CVC) use and surgery have been identified, a large-scale evaluation of predictive factors by species is lacking. Sophisticated methods like machine learning are now available for risk prediction on large datasets. Using the Cerner HealthFacts database, we identified hospital encounters from 2009-2017 where any Candida species was isolated from any body source (excluding stool and respiratory samples). Encounters with more than one Candida spp isolated were excluded. Clinical, demographic, and microbiologic variables including diagnostic codes, medications, Candida species, patient demographics, and facility characteristics were analyzed. Dummy variables of predictors were created (R caret package), for a total of 144 variables. The outcome variable was invasive infection (i.e. in a sterile site vs a non-sterile site). Variables were assessed by comparing penalized logistic regression (glmnet), gradient boosting machine (gbm), and random forest (randomForest). Hyperparameters were optimized using 3 repeats of 5-fold cross-validation on the training set. Model comparison was done using the area under the receiver operating characteristic curve (AUC) on the test set. We identified 116,725 Candida-positive hospital encounters, 14,311 (12%) of which were invasive infections. Gbm performed the best or as well as other models, with an overall AUC of 0.81 (range 0.73-0.82). The top 20 variables for gbm can be seen in Figure 1, with a number of variables in the top 20 most important across all species including Elixhauser comorbidity index and having a CVC. This analysis demonstrates the usefulness of machine learning for detecting unique risk factors for IC across species in a large dataset. This work was supported in part by the Division of Intramural Research, NIAID, NIH.
Background: Time and motion (TAM) studies have been used to precisely quantify the time required for specific work activities, such as assembly line workers. We have used TAMs in a novel way: to quantify the increase in healthcare workers (HCW) time spent on management of latent tuberculosis infection (LTBI) following LTBI program strengthening and expansion (ACT4 Trial). Methods: HCW involved in TB care at the 24 ACT4 health facilities were invited to participate. Those who agreed were followed for a full work day, noting each of their daily activities, which were quantified into pre-determined categories such as LTBI services. To assess changes in their workload, HCW were followed before and after the intervention. Based on the number TB patients treated at ACT4 facilities, increased time on LTBI was extrapolated regionally to estimate total work-force time required for LTBI program scale-up. Results: A total of 140 HCW in five countries participated in the baseline TAM (before LTBI program strengthening). Data was available for 69 of these HCW after the intervention was implemented. For these workers there was a 7% increase in the proportion of time, corresponding to an additional 30 minutes per work day, spent on LTBI-related activities at intervention sites on average (see Table 1). Conclusions: We found that there has been a significant increase in the proportion of HCW time spent on LTBI-related activities in ACT4 intervention sites. Expressed per TB patient - this increased workload can be extrapolated to estimate workforce requirements following similar LTBI program strengthening and expansion in other settings.

Table 1: Comparison of the mean change in proportion of HCW\(^2\) time spent on all LTBI-related activities by type of site

<table>
<thead>
<tr>
<th>Type of Site</th>
<th>N</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Mean Change</th>
<th>Difference in Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>29</td>
<td>0.20</td>
<td>0.34</td>
<td>7% (-48%, 59%)</td>
<td>11% (1%, 23%)</td>
</tr>
<tr>
<td>Control</td>
<td>40</td>
<td>0.19</td>
<td>0.30</td>
<td>-4% (-95%, 61%)</td>
<td>0.05</td>
</tr>
</tbody>
</table>

\(^2\)Data presented for HCW who participated in TAMs during both Phase 1 and Phase 2

\(^p\)-value for Students’ t-test
To address an endemicity of Salmonella Enteritidis (SE) infection, a foodborne disease, in United States of America (USA), different food vehicles associated with SE outbreaks were examined in this study. Data of all SE outbreaks reported to Centers for Disease Control and Prevention (CDC) from 1990 to 2015 was retrieved from CDC website. The data included the following information about each outbreak: year, month, state, implicated food vehicles, location, and the number of SE cases. It was found that eggs-based dishes 273 (24%) were the highest reported followed by other implicated food items; meat 130 (11%), vegetables 96 (8%), chicken items 95 (8%), dairy products 55 (5%), and bakery items 8 (1%) in the country. Relative occurrence of food vehicles compared to eggs-based dishes implicated in SE outbreaks was examined by using negative binomial model which showed significant contribution of other food items in causing SE outbreaks in the country such as meat (exp(β)=0.51, 95% CI 0.37, 0.69), chicken (exp(β)=0.42, 95% CI 0.30, 0.58), vegetables (exp(β)=0.41, 95% CI 0.29, 0.55), and dairy items (exp(β)=0.27, 95% CI 0.18, 0.40). In addition, different important trends of SE outbreaks were analyzed based on the available dataset, and newly created categorical variables such as census region, HHS regions and seasons. The study enhanced the existed knowledge of other implicated food items besides eggs in the persistent occurrence of SE foodborne disease in the USA.
EFFECTS OF HEPATITIS B BIRTH DOSE ON CHILDHOOD IMMUNIZATION STATUS: AN INVESTIGATION USING COMPLEX SURVEY DATA AND PROPENSITY SCORES ESTIMATED WITH BOOSTED REGRESSION  Daniel Vader* Daniel Vader, Brian Lee, Alison Evans, (Department of Epidemiology and Biostatistics at the Drexel University Dornsife School of Public Health)

CDC national guidelines recommend administering the first dose of hepatitis B vaccine to children at birth, making it the first vaccine that many children receive. However, few studies examine how receipt of the birth dose influences adherence to the immunization schedule for all recommended vaccine series in the first 18 months of life. Publicly available national survey data are an accessible means to exploring this relationship, but accounting for confounding from interconnected healthcare and family-associated factors in the context of a complex survey design warrants a flexible statistical approach. We investigated the relationship between hepatitis B birth dose and up-to-date immunization status among 15,018 children between 19 and 36 months of age using cross-sectional survey data from the 2017 National Immunization Survey (NIS). Boosted classification and regression trees were used to calculate inverse probability of treatment weights (IPTWs), which were then combined with NIS survey weights to form composite weights. We employed these composite weights, along with multivariable survey logistic regression models, to calculate doubly robust estimates of the population average treatment effect. Children who received the birth dose had higher odds of being up-to-date on all combinations of recommended vaccines considered in our analysis, including (but not limited to): the combined 3-vaccine series (DTaP, Polio, MMR), OR 1.79 (95% CI 1.48-2.15); combined 5-vaccine series (DTaP, Polio, MMR, HiB, Hep B), OR 2.31 (1.97-2.73); and combined 7-vaccine series (DTaP, Polio, MMR, HiB, Hep B, varicella, pneumococcus), OR 2.36 (2.01-2.76). These relationships remained stable even when hepatitis B was removed from the up-to-date criteria. Though we must consider the impact of bias due to residual confounding, our results indicate that starting vaccination at birth could improve immunization schedule adherence among children in the US.
Rapid detection of Shiga toxin-producing Escherichia coli (STEC) enables appropriate treatment. Enzyme immunoassay (EIA) tests detect Shiga toxin and provide a low-cost, rapid result. Most polymerase chain reaction (PCR) tests detect STEC along with other enteric pathogens, and the cost of performing them is higher than for EIA. We synthesized available evidence to compare the diagnostic accuracy of EIA and PCR for the detection of STEC. We searched Medline, Embase, Cochrane CENTRAL Register of Controlled Trials, Cochrane Database of Systematic Reviews, PubMed, Scopus, Web of Science, and grey literature for studies of STEC EIA and/or PCR diagnostic test accuracy relative to reference standards including at least one nucleic acid amplification test (NAAT), 2005-2018. Two reviewers independently screened titles, abstracts, and full texts of retrieved studies; extracted data; and assessed risk of bias and applicability concerns with QUADAS-2. No comparative accuracy studies were identified with complete testing. For single test accuracy comparisons, we used a bivariate random effects model to meta-analyze the sensitivity and specificity of commercial STEC diagnostic tests and constructed a summary ROC curve. We identified 43 articles with a total 808 STEC-positive and 24,107 STEC-negative specimens analyzed by EIA and/or PCR. Based on 26 single test comparisons, EIA tests had a sensitivity of 0.624 (95% CI 0.532, 0.709) and specificity of 0.996 (95% CI 0.994, 0.998). Based on 28 single test comparisons, PCR tests had a sensitivity of 0.900 (95% CI 0.845, 0.937) and specificity of 0.995 (95% CI 0.992, 0.997). Existing evidence suggests that commercial PCR-based diagnostics have superior sensitivity to EIA tests for STEC without significant losses in specificity. The large difference between EIA and PCR sensitivity from single test comparisons and consistency in study populations suggests that PCR is more sensitive.
EXTRAPULMONARY NONTUBERCULOUS MYCOBACTERIA INFECTIONS — MINNESOTA, 2013–2017

Joanne K Taylor* Joanne K Taylor, Ruth Lynfield, Paula Snippes Vagnone, Kirk Smith, Jacy Walters, Nancy Wengenack, Sharon Deml, Glen Hansen, (Centers for Disease Control and Prevention and Minnesota Department of Health)

Background: Approximately 80 species of nontuberculous mycobacteria (NTM) causing disease are found environmentally and in animal reservoirs. Typically, pulmonary NTM infections are sporadic; extrapulmonary infections are commonly outbreak-associated. Recent sources of extrapulmonary NTM (ENTM) outbreaks in Minnesota include contaminated heater-cooler units used during cardiac surgery and contaminated hormone injections. We examined patient demographics and characteristics of laboratory-confirmed ENTM isolates to assess potential value of systematic laboratory-based ENTM surveillance in Minnesota. Methods: The Minnesota Department of Health requested laboratory data from Mycobacterium testing during 2013–2017 from 3 Minnesota reference laboratories that characterize Mycobacterium isolates. Using the CSTE case definition, we excluded M. tuberculosis complex, M. bovis and M. leprae isolates, and isolates from feces, lung, bronchoalveolar lavage, tracheal secretion, and sputum. Results: Of 4,017 NTM isolates, 415 (10.3%) were ENTM, representing an estimated burden of 15/1,000,000 people/year in Minnesota. Thirty-one species or complexes were identified; most common were M. avium or M. avium complex (30.6%), M. chelonae (21.7%), M. fortuitum or M. fortuitum complex (9.2%), and M. abscessus or M. abscessus complex (8.0%). Most common specimen collection sites included skin and soft tissue (41.2%), neck lymph node or tissue (14.5%), blood (13.5%), sinus (8.9%), and joint fluid (2.2%). The patient’s median age was 55 years (range: 3–98 years); 19.1% were from patients aged 65 years. Conclusions: Laboratory data can be used for ENTM surveillance in Minnesota. Implementing laboratory-based surveillance could detect ENTM cases, provide a mechanism for obtaining clinical and epidemiological information, and enable earlier identification of potential healthcare transmission or community clusters.
HEPATITIS B AND C INFECTION AMONG PARTICIPANTS OF A SYRINGE SERVICES PROGRAM IN PHILADELPHIA, PA

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Background: Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections have been increasing in association with the opioid epidemic. A cross-sectional serology study was conducted at a syringe services program (SSP) in Philadelphia to measure the prevalence of and factors associated with past or present HBV and HCV infections among people who use drugs (PWUD). Methods: PWUD were recruited at a SSP from January through April 2018. Participants provided a blood sample and completed a questionnaire including demographics and related risk factors. Past or present HCV infection (PP-HCV) was defined by a reactive HCV antibody test. Past or present HBV infection (PP-HBV) was defined by a reactive HBV core antibody test or a reactive HBV surface antigen test. Multivariate logistic regression models for PP-HBV included birth year, race/ethnicity, history of injection drug use (HxIDU), and self-reported HIV status. Multivariate logistic regression models for PP-HCV included birth year, race/ethnicity, HxIDU, and homelessness. Results: Among 353 PWUD with a successful blood draw, the median age was 34 years (range: 19-66), 256 (73%) had a HxIDU, and 196 (56%) were experiencing homelessness. A total of 82 (24%) individuals had PP-HBV and 220 (64%) had PP-HCV. Overall, 19% (n=24) had both PP-HBV and PP-HCV. Among participants with a HxIDU, 68 (27%) had PP-HBV and 208 (84%) had PP-HCV. A HxIDU was associated with an increased odds of PP-HBV (aOR: 3.32, 95% CI: 1.47, 7.54) and PP-HCV (aOR: 29.41, 95% CI: 12.96, 66.72). Self-reported HIV positivity was associated with PP-HBV (aOR: 3.09, 95% CI: 1.14, 8.35), but not PP-HCV. Homelessness was associated with PP-HCV (aOR: 2.02, 95% CI: 1.01, 4.01); whereas, homelessness was not associated with PP-HBV. Conclusion: In this cross-sectional serological study, we found considerable rates of past or present HCV and HBV infection among PWUD. Harm reduction and prevention strategies for both HBV and HCV should be targeted towards PWUD.

S/P indicates work done while a student/postdoc
GENETIC CHARACTERISTICS AND MOLECULAR EPIDEMIOLOGY OF DRUG RESISTANT AND PAN-SUSCEPTIBLE ESCHERICHIA COLI ST95 ISOLATES Yuan Hu* Yuan Hu, Sheila Adams-Sapper, Craig M. Stephens, Lee W. Riley, (School of Public Health, University of California, Berkeley, CA)

Escherichia coli sequence type 95 (ST95) is one of the most prevalent extraintestinal pathogenic E. coli (ExPEC), and a frequent cause of urinary tract infections (UTI) and bloodstream infections (BSI). A sublineage of ST95 strains remain persistently susceptible to all drugs, despite high frequency of extraintestinal infections caused by them. The mechanism of resistance to acquiring drug-resistance by persistently drug-susceptible ST95 strain is unknown, and carriage of UTI89-like plasmid (pUTI89*) is associated with pan-susceptibility. ST95 strains have also been isolated from poultry and wild birds, causing cocibacillosis. Such strains have been called avian pathogenic E. coli (APEC), hypothesized as a possible reservoir for human ExPEC strains. The purpose of this study was to determine if ST95 strains from patients with UTI carry genes previously found in APEC strains. Whole genome sequences of 44 ST95 strains isolated from BSI at San Francisco General Hospital (SFGH) (2007-2010) and a collection of 9 ST95 strains from University of Minnesota were analyzed for plasmid pAPEC-O2-ColV (ColV) sequences previously observed to be carried by APEC strains. We found that 18 (34%) of 53 ST95 isolates carried ColV plasmid, 6 (21%) of 29 pan-susceptible ST95 strains and 12 (50%) of 24 resistant ST95 strains carried ColV (p < 0.05). Also, none of the ST95 with pUTI89* carried ColV plasmid. These observations suggest that pUTI89* restricts acquisition of ColV. Pan-susceptible ST95 strains may have sources other than wild birds.

S/P indicates work done while a student/postdoc
Epidemiology students generally are taught straightforward power and sample size (PSS) calculations (e.g., tests for inequality in proportions or means between two independent populations) and advised to consult biostatisticians as needed. However, epidemiologists at state and local health departments use diverse study designs and often have limited biostatistician access. We provide consultations for study design and analysis of communicable disease epidemiology projects, including PSS calculations. During 4 years, 20 projects required 8 PSS calculation types (Figure). Half were related to tests for inequality in proportions between independent (n=8) or correlated (n=2) populations. Three projects required calculating confidence interval widths for proportions (e.g., among investigated patients newly reported with chronic hepatitis B or C, to what precision can we calculate the prevalence of certain risk factors?). Two projects related to sensitivity and specificity to a desired precision (e.g., how many medical records to review to validate surveillance-based definitions for hepatitis C treatment eligibility?). Two projects related to tests for one proportion (e.g., how many cooling towers to sample to assess whether regulations decrease the proportion testing positive for Legionella compared with baseline?). One project each related to a) non-inferiority (i.e., how many hepatitis A vaccine recipients are needed to assess if vaccine is non-inferior to immunoglobulin for post-exposure prophylaxis?), b) substantiating freedom from infection (i.e., how many persons in a hypothetical area to test to rule out local Zika virus transmission?), and c) superiority by a margin (i.e., how many patients need outreach to assess if a higher proportion in a subgroup with severe disease need linkage to care?). The diversity of PSS calculations used in public health practice suggests a need for broadened academic curricula and a forum for epidemiologists to share best practices.
ALARMIN TRENDS IN DEATHS FROM FIREARMS AMONG SCHOOLCHILDREN

Sarah Palumbo* Alexandra Rubenstein, Sarah K. Wood, Robert S. Levine, Charles H. Hennekens, (Bowdoin College)

Background: Deaths from firearms among schoolchildren are a major clinical and public health problem in the United States (US). Objective: We explored temporal trends in deaths from firearms among US schoolchildren from 1999 to 2017 among non-Hispanic whites and blacks. Methods: We utilized the Centers for Disease Control and Prevention (CDC) Wide-Ranging Data for Epidemiologic Research (WONDER) Multiple Cause of Death Files to obtain age-adjusted mortality rates and 95% confidence intervals. Results: The high rates of deaths from firearms are increasing at alarming rates in whites and even more so in blacks. These high rates are several-fold higher in ages 15 to 19 than in ages 5 to 14 years. Further, from 1999-2017, the percentages of deaths due to firearms among schoolchildren aged 15 to 19 years increased from 10% to 20% among whites and from 30% to almost 50% among blacks. Conclusions: These descriptive data indicate that from 1999 to 2017 the magnitude of the clinical and public health problem in the US of deaths from firearms in school age children is increasing. These findings are particularly prominent among blacks between the ages of 5 to 19 but are most marked among those 15 to 19. Firearm related deaths are the 3rd leading cause of death overall among US schoolchildren ages 1 to 17 years old and 62% are due to homicide. It is sobering to reflect that in the US in 2018 the numbers of deaths from homicides were 29 among active servicemen in the line of duty, 53 among police officers in the line of duty, and 68 among school age children who were the victims of predominantly assault weapons. While further analytic studies designed a priori are necessary to test the hypotheses generated by these descriptive data, we believe that combating the epidemic of homicide due to firearms without addressing firearms is the same as combating the epidemic of lung cancer due to cigarettes without addressing cigarettes.
AIR POLLUTION EXPOSURE AND THE INCREASED RISK OF VIOLENT BEHAVIOR IN THE UNITED STATES Jesse D Berman, Jesse D Berman, Jesse Burkhardt, Jude Bayham, Ellison Carter, Ander Wilson, (Division of Environmental Health Sciences, University of Minnesota School of Public Health)

Violence is a leading cause of death and a significant public health threat in the United States, particularly among adolescents and young adults. But the environmental causes of violent behavior are not well understood. Emerging evidence suggests that exposure to air pollution may promote more aggressive or impulsive responses in people. We compile air pollution monitor data from the U.S. Environmental Protection Agency and crime data from the Federal Bureau of Investigation to investigate the association between both daily fine particulate matter (PM2.5) and ozone air pollution with violent crime risk. We use a two-stage hierarchical model to estimate the change in violent and non-violent criminal behavior associated with short-term air pollution exposure. Our analysis spans 301 counties in 34 states across 14-years, representing 86.1 million people and 721,674 data days. We fine that each 10ug/m3 increase in daily PM2.5 and 10ppb change in ozone is associated with a 1.17% (95% CI: 0.90, 1.43) and a 0.69% (95% CI: 0.41, 0.78) relative risk increase (RRI) for violent crime. However, we observe no significant risk increase in non-violent property crime due to PM2.5 (RRI: 0.11%; 95% CI: -0.09, 0.31) or ozone (RRI: -0.05%; 95% CI: -0.22, 0.12). Our results are robust across community characteristics of poverty, age, and race, but different for rural regions. Exposure response curves indicate risk at air pollution concentrations well below federal regulatory standards. Our results suggest that short-term changes in air pollution may be related to population-wide violence.
REPLENISHING THE LOST GENERATION OF FIREARM RESEARCHERS: DEVELOPING AN UNDERGRADUATE PUBLIC HEALTH COURSE ON GUN VIOLENCE Anne Massey, Janet Baseman, Ali Rowhani-Rahbar, (University of Washington)

Gun violence is a public health crisis in the United States. With over 110,000 firearm-related fatal and non-fatal injuries annually and an estimated $229 billion in associated expenses, there is an immediate need for research and public health intervention to improve the situation. However, Congressional decisions in 1996 largely limited firearm-related research for the last two decades which subsequently shrunk the pool of associated researchers and practitioners, including epidemiologists. Schools and programs of public health have an important role to play in response to this emergency. Understanding the complexities of firearm injury data and policies requires fluency in epidemiologic methods and study design. Currently this type of training occurs primarily at the graduate and post-doctoral level at select institutions. However, a robust infusion of new junior researchers and public health practitioners is required to effectively address this crisis. We developed one of the first epidemiology undergraduate courses on gun violence in the country to bolster this pipeline and equip students with appropriate methodologic training. In this presentation, we will describe our course development process and review our curriculum plan. Specifically, we will explain how our findings from a landscape assessment of gun-related courses across the United States informed content decisions regarding readings, selection and sequencing of topic areas, student assignments, class activities, and guest speakers. We believe that this course will offer students a unique opportunity to develop epidemiologic training at the undergraduate level, apply those methods to firearm injury research and prevention, ground students in utilizing the public health approach—regardless of their personal or political leanings, provide exposure to disciplines across the university, and inspire a new generation of public health researchers and practitioners, including epidemiologists.
BACKGROUND: Rates of upper extremity and torso injuries are reportedly higher in professional and collegiate athletes following concussions. However, there is a dearth of evidence on this relationship in other groups such as tactical athlete and community populations. OBJECTIVES: To examine the risk of acute upper extremity and torso injury in Soldiers within 3 years of an incident concussion, compared to matched nonconcussed Soldiers. METHODS: This was a matched-cohort study that used the medical encounter and personnel data of active-duty US Army Soldiers from 2008 to 2013. Incident concussions were identified using International Classification of Diseases-Ninth Revision (ICD-R) codes in medical encounter data of all Soldiers from 2008 to 2013. One nonconcussed Soldier in the US Army during the same month was matched by age, sex, rank, length of service, deployment status, and military career field to each concussed Soldier. Nonconcussed Soldiers were defined as not having an ICD-R-coded concussion at any point previous to the time of matching. Hazard ratio (HR) and 95% confidence interval (CI) were calculated for the risk of upper extremity and torso injury within 3 years of the incident concussion, adjusting for race/ethnicity and educational attainment.

RESULTS: A total of 23,526 individuals (11,763 concussed and 11,763 nonconcussed) were included in the study. Within 1 year of concussion, the hazard of upper extremity and torso injury was 57% greater in concussed compared to nonconcussed Soldiers (HR, 1.57; 95% CI: 1.45, 1.71), within 2 years of concussion the hazard of upper extremity and torso injury was 48% greater (HR, 1.48; 95% CI: 1.38, 1.59), and within 3 years of concussion, the hazard of upper extremity and torso injury was 43% greater (HR, 1.43; 95% CI: 1.32, 1.54).

CONCLUSION: The rate of upper extremity and torso injury among this population of physically active adults is higher following concussion, and the risk remains elevated for 3 years following injury.
Background: Rates of self-inflicted injuries and suicide have increased significantly in recent years among adolescent females. Concerns regarding the effects of excessive media screen time, such as the use of smartphones and social media, on psychological wellbeing have been raised. We examine trends in the population attributable fraction (PAF) of excessive screen time on suicide attempts. Methods: We used data from 2009-2017 biennial Youth Risk Behavior Survey to calculate the percentage of non-Hispanic white high school females who attempted suicide in the past year for each survey wave. Using multivariate logistic regression, we assessed the association between excessive screen time (i.e., spending ≥5 hours/day on computers, smartphones, social media, or gaming) and suicide attempt. Models also assessed for other risk factors including bullied at school, electronic bullied, substance misuse, feeling unsafe at school, and sleep<6 hours per day. The PAF of each risk factor on suicide attempts was calculated for each survey year and trends were examined. Results: The incidence of suicide attempt increased 51.9% from 7.7% in 2009 to 11.7% in 2015 (p<0.01), and then dropped to 8.9% in 2017. Excessive screen time use among this population almost tripled during 2009-2017 (11.9% to 34.1%). In 2017, 11.3% of the burden of suicide attempts was attributable to excessive screen time, doubled from 5.4% in 2009. The contribution of other risk factors in 2017, including bullied at school (PAF=26.8%), feeling unsafe at school (PAF=26.1%), substance misuse (PAF=20.0%) and electronic bullied (PAF=17.4%) were greater than risk due to screen time. Conclusions: Excessive screen time is rapidly increasing among high school youth and contributes to an increasing share of suicide-related risk; however this contribution remains less than other risk factors for suicide. Comprehensive strategies addressing all identified risk factors are important for suicide prevention.
Nationally, motor vehicle accidents (MVA) are the number one killer of youth age 10-19. Minnesota has had a significant reduction in MVA deaths since 2012, but overall death rates (including those by natural causes) for youth have remained stable. We examined the causes of death contributing to the stable death rate of MN youth in light of much lowered MVA deaths. Data for MN youth age 10-24 who died in 2011-2017 (n=2,799) were examined. ICD10 codes were used to determine leading cause of death. Rates were calculated using summary statistics and crosstabs. Logistic regression was used to estimate the increased odds of dying by various causes among different groups. For MN youth age 10-24, the rate of MVA death dropped from 8.2 to 5.4/100,000 from 2011 to 2017—a 34.6% reduction. The total death rate increased 3.4%, while deaths by natural causes dropped 4.1%. Preliminary data suggest increases in other accidents and suicides explain the stable overall death rate. 71.4% (n=1996) of youth who died in 2011-2017 had a certified manner of death from injury and/or violent death: accident (37.4%), suicide (26.1%), & homicide (7.9%). Suicide was the most prevalent (23%) followed by MVA accident (19%) and other accident (19%). Of those who committed suicide, most used firearms (43%). Of those youth who died by accident (not MVA) 64.4% died by accidental poisoning of drugs/alcohol. 81% of homicides used firearms. Causes of death differed by age, gender, race & ethnicity, and level of urbanization. Of note, males faced a greater risk of dying by injury and/or violent death (OR=1.9; 95% CI 1.6-2.3). American Indian/Alaskan Native youth had greater risk of suicide (OR=2.4; 95% CI 1.4-4.4) and black youth had greater risk of homicide (OR=6.9; 95% CI 4.4-10.9) compared to white youth. Preliminary data suggest suicides and other accidental deaths have increased among MN youth. Different risks exist among different populations. Multiple and varied targeted interventions may be needed.
PREVALENCE OF, AND FACTORS ASSOCIATED WITH UNINTENTIONAL HOME INJURIES AMONG ADULTS IN IBADAN NORTH LOCAL GOVERNMENT AREA, OYO STATE, NIGERIA
Nwofor Clement Ugochukwu* Nwofor Clement Ugochukwu, Adedokun Babatunde, (University of Ibadan, Ibadan)

Introduction: Unintentional injuries account for more than 3.9 million deaths yearly, which is responsible for 6.6% of the global mortality. Notwithstanding, there is paucity of literature and data on unintentional home injuries in Nigeria. This study assessed the prevalence, pattern and factors associated of unintentional home injuries in rural and urban communities in Ibadan North Local Government Area of Oyo State. Methodology: A community-based cross-sectional survey of was conducted among 404 respondents in Ibadan North Local Government Areas using a multistage sampling technique. Structured interviewer-administered questionnaires were used to obtain information from respondents. Descriptive, bivariate and multivariate analyses were performed at a significance level of 0.05. Results: The mean age of the respondents was 28.7±9.6 years. The respondents were predominantly females (72.3%). Most of the respondents 328 (81.2%) were Christians, about a third were Yoruba (75.2%) and one hundred and seventy (42.1%) respondents were unemployed. One hundred and eighty-two respondents (45%) lived in rented apartments, of which more than half of the respondents (54.8%) lived in more two rooms. More than three-quarters of the respondents (77.0%) sustained unintentional home injury. The most reported forms of unintentional home injury were falls (41.8%), cuts 98 (31.5%) and burns. Sex (OR = 2.22, 95% CI, 1.33 – 3.69), ethnicity (OR = 3.20, 95% CI, 1.09 – 9.37) and place of residence (OR = 2.22, 95% CI, 1.33 – 3.70) predicted experience of unintentional home injury. Conclusion: The prevalence of unintentional home injury was high among respondents in this study. Socio-demographic characteristics of respondents such as sex, ethnicity and place of residence were associated with unintentional home injury. There is need to create awareness on home injury prevention and develop appropriate household safety programmes targeted at injury reduction.
IMPACTS OF REHABILITATION AFTER HOSPITAL DISCHARGE ON FUNCTIONAL AND QUALITY-OF-LIFE OUTCOMES IN CHILDREN WITH SEVERE TRAUMATIC BRAIN INJURY (TBI) Shiyou Gao* Shiyou Gao, Anthony Fabio, Bedda Rosario-Rivera, Stephen Wisniewski, (Department of Epidemiology, University of Pittsburgh)

Given the few studies on the effectiveness of traumatic brain injury (TBI) rehabilitation in children, we aimed to examine whether rehabilitation after hospitalization improves functional and quality-of-life (QoL) outcomes in children with severe TBI. We analyzed data collected at one-year follow-up from the Approaches and Decisions in Acute Pediatric TBI (ADAPT) trial, a multisite longitudinal study of children with severe TBI (Glasgow Coma Scale ≤ 8). A total of 216 children (4-17 years) who were enrolled from the US, UK, Australia and New Zealand were included. Rehabilitation use after hospitalization was measured by interviewing a primary caregiver. Functional outcome was assessed using the Glasgow Outcome Score Extended for Pediatrics (GOS-E Peds) to compare “poor” (GOS-E Peds 3-7) to “good” (GOS-E Peds 1-2) outcomes. Domain-specific QoL was measured using both the caregiver- and child-reported Pediatric Quality of Life Inventory. We used a generalized boosted model to generate propensity scores (PS) for receiving rehabilitation as a way to adjust for confounding. Then we compared frequencies of poor functional outcome and QoL scores between children with and without rehabilitation using inverse probability of treatment weighting of the PS. Most children (86%) were reported having received rehabilitation after hospital discharge. Rehabilitation was associated with a small, non-significant increase in the odds of poor functional outcome in PS adjusted analysis (aOR=1.28, 95%CI 0.30-5.35). We found a statistical trend for rehabilitation to improve caregiver-reported physical QoL (aBeta=14.86, 95%CI -0.04-29.76), while associations of rehabilitation with caregiver-reported QoL in other domains and child-reported QoL were not statistically significant. Our analysis shows that rehabilitation may benefit children’s physical health at one year after severe TBI. Larger studies with more precise measures of the type and amount of rehabilitation will be essential to extend current results.
TRENDS IN MINNESOTA NON-FATAL SELF-INFlicted INJURY
Melissa Heinen* Soniya Coutinho, Melissa Heinen, Jon Roesler, (Minnesota Department of Health)

The objective of this research was to describe patterns of non-fatal self-harm and suicide attempts, referred to as self-inflicted injury (SII), in Minnesota to develop effective suicide and SII prevention efforts. This research sought to identify characteristics of groups within the population most impacted by SII. Data from the Minnesota Injury Data Access System (MIDAS), which provides data on hospital-treated injuries, were analyzed for 2012-2017. Data were analyzed with respect to patterns of age, gender, mechanism of injury, and type of care (hospitalization vs. emergency department visits). In 2017, there were 9,581 cases of non-fatal self-inflicted injury in Minnesota. This number has been increasing over the past five years, up from 6,552 cases in 2012. Of the total cases of SII in 2017, 66.1% were female, reflecting trends from previous years. The age group of 10 to 24 year olds showed higher numbers of SII (52%) than the number of cases of SII for all individuals aged 25 or older. Specifically, 15 to 19 year olds accounted for 27% of all SII. Furthermore, of the 10- to 24-year-old age group, 72% of SII cases were female, a higher proportion than among all SII cases. The most common mechanisms of non-fatal SII were poisoning (60.1%), and cutting/piercing (27.0%). Among 10 to 24 year olds, poisoning cases of SII typically resulted in hospitalization, whereas cutting/piercing cases of SII typically resulted in emergency department visits. This trend held for poisoning across all age groups, and for cutting/piercing across nearly all age groups. The high number of hospital-treated non-fatal SII among females aged 10 to 24 years old shows the need for continued prevention efforts against SII targeted at this population, and in particular SII by means of poisoning and cutting/piercing. Further research is needed on the 10- to 24-year-old age group to determine best practices for youth suicide and self-harm prevention efforts.
Background: Among legal purchasers of firearms, those with a prior criminal history are at increased risk for future firearm violence, and that risk is also associated with the type of firearm purchased. However, these and other characteristics of firearm purchasers have never been described in a large population. We characterize the criminal histories, purchasing patterns, and demographic features of legal purchasers of handguns in California in 2001. Methods: Dealer Record of Sale data were used to identify all legal handgun purchasers in California in 2001, aged 21-49, and to identify previous purchases going back to 1985. Arrest and conviction data were linked to the study cohort probabilistically. Unadjusted differences between those with and without a criminal history were determined with chi-square or t-tests, as appropriate, and log-linear regressions were used to determine what characteristics were predictive of having a criminal history at the time of purchase. Results: Of 79,927 legal handgun purchasers, 13,291 (16.6%) had a previous arrest or conviction at the time of purchase. Of those with a criminal history, 31.0% had been charged with a violent crime and 16.7% had been charged with a Crime Index violent crime (murder, rape, robbery, or aggravated assault). Additionally, 16.1% had been charged with a firearm-related offense. Black, Hispanic, and Native American race/ethnicity (relative to white), male sex, and nonmetropolitan residence were associated with increased risk of having a criminal history at the time of purchase, but the association with age was not significant. Owning additional firearms was associated with decreased risk of having a criminal history. Conclusions: In a state with relatively strict eligibility criteria for firearm ownership, substantial proportions of owners have been charged with violent or firearm-related crimes. Proportions will likely be higher in states with more permissive criteria.

S/P indicates work done while a student/postdoc
MALE PATTERN BALDNESS AND MORTALITY AND CANCER OUTCOMES: A PROSPECTIVE ANALYSIS IN THE PROSTATE, LUNG, COLORECTAL, AND OVARIAN CANCER SCREENING TRIAL Wen-Yi Huang* Wen-Yi Huang, Michael B. Cook, Sonja I. Berndt, (National Cancer Institute, National Institutes of Health)

Male pattern baldness, usually linking to androgenetic alopecia, has been associated with aggressive prostate cancer and coronary heart disease. It is unclear how male pattern baldness is associated with other cancers and mortality outcomes. We included 46,742 male participants aged 55-74 years who were randomized to either the screening or control arm of the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial between 1993-2001 and completed a supplementary questionnaire between 2006-2007 that asked about hair-loss patterns at age 45 years. Men were followed for mortality and cancer outcomes for a median of 2.8 years. Participants with a prior cancer diagnosis were excluded from the analyses of cancer outcomes. Hazard ratios (HRs) and 95% CIs were estimated by using Cox proportional hazards regression models, adjusting for age, race, cigarette smoking, body mass index, and trial arm. A total of 2,147 deaths and 2,454 cancers occurred during the follow-up. Compared with no baldness, frontal plus severe vertex baldness was associated with an increased risk of total mortality (HR: 1.36, 95% CI: 1.15-1.60) and cardiovascular disease mortality (HR: 1.43, 95% CI: 1.07-1.90), but not cancer mortality. While baldness patterns were not associated with cancer incidence overall, frontal plus moderate vertex baldness, as we reported previously, was associated with an increased risk of aggressive prostate cancer (defined as Gleason ≥8, stage III or greater, or fatal; HR: 1.79, 95% CI: 1.22-2.62). In addition, frontal plus mild vertex baldness was associated with an increased risk of lung cancer (HR: 1.57, 95% CI: 1.12-2.20). No significant associations were found for other common cancers. Subtypes of male pattern baldness at age 45 years were positively associated with several mortality and cancer outcomes. Future prospective studies are warranted to confirm our results and understand the biological mechanisms underlying these observed associations.
POSTTRAUMATIC STRESS DISORDER FOLLOWING 9/11/2001 AND SELF-REPORT OF COGNITIVE DECLINE IN WORLD TRADE CENTER RESCUE AND RECOVERY WORKERS
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Background Firefighters and emergency medical service workers who were exposed to the World Trade Center (WTC) disaster on 9/11/2001 (9/11) experienced Posttraumatic Stress Disorder (PTSD) symptoms. PTSD has been associated with cognitive decline. Objective To determine if post-9/11 PTSD is associated with self-reported cognitive decline in WTC-exposed Fire Department of the City of New York (FDNY) rescue/recovery workers. Methods The study population included 5,224 WTC-exposed rescue/recovery workers who completed a cognitive function questionnaire, the Cognitive Function Instrument (CFI), in 2018. Participants indicated whether they had experienced an increase in cognitive problems in the past year. Scores ranged from 0–14, with higher scores indicating greater self-perceived decline. PTSD symptoms were evaluated during annual medical monitoring exams, as were depression and alcohol use. Logistic regression analyses assessed the association between post-9/11 PTSD symptoms and CFI score in the top quartile (≥2). A sensitivity analysis excluded patients who were taking sleep medications that may affect cognitive function (N=218). Models were adjusted for age, gender, race, WTC exposure level, smoking, current depression and alcohol abuse. Results Mean participant age at the time of CFI completion was 56.5±7.6. PTSD in the year following 9/11 was associated with top quartile CFI score (OR: 1.43, 95%CI: 1.13-1.81), adjusting for current PTSD, depression and other potential confounders. Those with high-intensity WTC exposure had a significantly greater risk of elevated CFI score than the low exposure group (adjusted OR: 1.39, 95%CI: 1.06-1.82). Exclusion of patients on sleep medications did not change the observed associations. Conclusions Both early post-9/11 PTSD and high WTC exposure were independently associated with self-reported cognitive problems in WTC rescue/recovery workers. This suggests that these WTC-exposed groups may benefit from additional cognitive evaluation.

Risk Factors for Cognitive Complaints on CFI in World Trade Center-Exposed FDNY Workers
Suicide has become the tenth leading cause of death in the U.S. Healthcare settings, especially emergency departments (EDs), may play an important role in the response to this crisis because many suicide decedents receive ED services prior to their deaths. The absence of reliable data on suicide mortality among ED patients, however, has hampered clinical decision-making and suicide prevention programming. We used statewide, all-payer, longitudinal linked ED and death data from California (2009-2012) to examine 12-month incidence of suicide among all patients aged ≥10 years who presented for deliberate self-harm, suicidal ideation, or any other condition (a random subsample). Patient groups were defined using diagnostic codes. Within each group, we also tested how patient sociodemographic and clinical characteristics affected suicide risk. The study population experienced a cumulative 907 suicide deaths during follow-up. Suicide rates were 693.4 per 100,000 among self-harm patients (n=83,507), 384.5 per 100,000 among suicidal ideation patients (n=67,379), and 22.5 per 100,000 among other patients (n=376,632). In all groups, male, older, and White individuals were at higher risk of suicide. In self-harm patients, using a violent method at index event substantially increased suicide risk (adjusted RRs ranged from 2.7 to 3.8, p<.01), as did comorbid diagnosis with anxiety or mood disorder. In ideation patients, no clinical factors predicted suicide risk. In other patients, comorbid diagnosis with anxiety disorder, alcohol disorder, and drug disorder were all associated with higher risk for suicide, though 95% CIs were wide. Our findings suggest that suicide rates are 1.6 to 50 times higher in ED patients compared to the general population, with notable variability by patient subgroup and demographic and clinical characteristics. These benchmark estimates may be useful for health systems seeking to improve their suicide prevention efforts and target resources effectively.
Depression is one of the most common mental disorders in the United States among both civilian and military populations. Despite our knowledge of characteristics associated with depression on a population level, traditional statistical methods fall short on individual-level prediction. Machine learning, with its flexibility to identify complex interactions between predictors, can improve on traditional methods for individual-level prediction, but has not yet been applied to incident depression in a military context. We used data from a cohort of Army National Guard members (n = 1951 men and 298 women with no history of depression at baseline) to identify the predictors of incident depression over 5 years of follow-up. We used classification trees followed by random forest models with 1000 trees, at least 20 observations per split, and 26 predictor variables with 5 sampled at each node (including all data collected from baseline surveys, except for variables that had fewer than 5 people with depression per cell). Incidence of depression over follow-up was 15% among men and 25% among women. The most important variables selected for men included childhood adversity, lower psychosocial support, lifetime stressful and traumatic events, deployment to an area of conflict, smoking history, employment status, posttraumatic stress disorder, poor self-reported general health, and head injury during deployment. For women, lifetime alcohol abuse, poor general health, longer time in service, lifetime stressful and traumatic events, lower education, and deployment to an area of conflict were identified. Although results largely align with population-level studies, this is an important first step at identifying novel interactions between predictors (see Figure), using machine learning methods to bridge the gap between population-level and individual-level prediction of depression. Future research should further refine and explore interactions between identified variables.

PTSD = Posttraumatic stress disorder; CA = childhood adversity; LT = lifetime. Boxes show the number of male soldiers with each combination of attributes, and the predicted probability of incident depression (0 = no depression, 1 = depression) for each group based on the classification tree model.
WHO IS STRESSED? USING TRADITIONAL REGRESSION AND CONDITIONAL INFERENCE TREES TO REVEAL FACTORS ASSOCIATED WITH STRESS AMONG PARENTS

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Introduction: Sustained stress is associated with serious health problems. Parenting can be a stressful period of the life course. Identifying modifiable intervention factors and parent sub-groups at greatest risk is important. A broad range of factors are associated with stress among parents. However, the arrangement of these factors and how they lead to differences in stress are unknown. Thus, we aimed to understand how these factors individually and jointly contribute to stress among parents.

Methods: Data for this cross-sectional analysis consisted of 726 partneried parents surveyed in 2015-16 and were drawn from Project EAT-IV (Eating and Activity in Teens and Young Adults), a population-based study of adults aged 25-36 years. Measures included are age, gender, race/ethnicity, education, household income, number and age of children, partner relationship strength, family functioning, employment/student status, difficulty living on income and weight status. The association of factors on stress was assessed first using traditional regression and then via supervised machine learning with conditional inference trees.

Results: Traditional adjusted linear regression indicated lower relationship strength, lower family functioning, student status, more difficulty living on income, working > 40 hours/week, and obesity were associated (p<0.01) with higher stress. Conditional inference trees (see figure) indicated highest stress among a parent sub-population (n=72) with lower family functioning, very low relationship strength, and obese weight (mean=7.6); whereas, lowest stress occurred among parents (n=144) with high family functioning and little or no difficulty living on income (mean = 4.6).

Discussion: Extensions to traditional regression, such as conditional inference trees, reveal the arrangement of factors, modifiable intervention factors (e.g. family functioning) and parent sub-groups at greatest risk providing a more complete understanding of who is stressed.

* S/P indicates work done while a student/postdoc
FEASIBILITY AND ACCEPTABILITY OF A MOBILE MINDFULNESS MEDITATION INTERVENTION AMONG LOUISIANA WOMEN  

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To explore the feasibility and acceptability of a commercially available mindfulness meditation smartphone application (HeadspaceTM) and whether its use improved mindfulness and psychological well-being among women. 236 women were recruited from the WaTCH Study cohort in southern Louisiana. Data on mindfulness and psychological well-being were collected via online baseline and follow-up surveys. Subjects were asked to use the self-guided app for 30 days, 10 minutes/day. They were given $10 upon completion of each survey and free access to the app for a year. The majority of subjects were white, had at least a high school diploma, and a household income under $50,000/year. Mean age was 46 yrs (SD 10.0). During the 30-day window, 14.5% of participants used the app at least once. Compared to non-users, those who used the app tended to be college educated and employed, had an income $50-$80K/yr, had fewer children living at home and used the app on average 24 of the 30 days (SD 36.1). 74% of users were pleased with the app, and 86% would recommend it to others. The greatest barriers to app use were lack of time (37%-49%) and lack of privacy (19%-11%). After adjustment for baseline scores, app use had no impact on follow-up mindfulness scores; however subjects at follow-up were less likely to be depressed, more likely to participate in moderate/very hard physical activity, experience adequate sleep duration, and have better sleep latency relative to baseline. No effects were found for other components of the sleep index or perceived stress. Use of the app was relatively low in this population, but those who did use it found it acceptable. The program had little impact on mindfulness scores, likely due to the short duration of follow-up time. It did seem to have a beneficial impact on depressive symptoms, physical activity, sleep duration, and sleep latency. Mobile mindfulness apps may be a feasible and acceptable intervention in a targeted sector of this population.
ASSOCIATIONS BETWEEN PERCEIVED EVERYDAY DISCRIMINATION AND BINGE EATING AMONG HISPANIC/LATINA WOMEN: RESULTS FROM THE 2002-2003 NATIONAL LATINO AND ASIAN AMERICAN STUDY Ariel Beccia* Ariel Beccia, William Jesdale, Kate Lapane, (University of Massachusetts Medical School, Department of Population and Quantitative Health Sciences)

Hispanic/Latina women are disproportionately affected by binge eating (BE), although the reasons for this disparity are not well understood. Psychosocial stressors such as discrimination may contribute to the elevated rates of BE among minority groups, however, few studies have examined this relationship among Hispanic/Latina women. This study used data from the National Latino and Asian American Study (NLAAS), a nationally representative cross-sectional survey of Latino and Asian adults, to quantify the association between everyday discrimination and BE among Hispanic/Latina women (n=1,427) and to evaluate the degree to which this association differs across perceived basis (gender, ethnicity, other) for discrimination (n=1,361).

Discrimination was assessed using the Everyday Discrimination Scale (EDS) and BE was assessed with question that asked about life history of BE, per DSM-5 criteria. Associations between everyday discrimination and perceived basis for discrimination with history of BE in the weighted sample were estimated using logistic models. The average age of the sample was 39.1 years (SD: 16.8), 56.9% were first-generation immigrants, 6.3% reported BE, and 68.5% reported everyday discrimination. After adjustment for sociodemographics, Hispanic/Latina women reporting higher EDS scores (2nd-4th quartile) had elevated odds of BE compared to women whose EDS score fell within the 1st quartile (adjusted OR (aOR) (95% confidence interval (CI)): 2nd quartile: 4.09 (1.44-11.61); 3rd quartile: 2.00 (0.66-6.10); 4th quartile: 7.62 (3.02-19.21)). Compared to those reporting no discrimination, BE was more common among Hispanic/Latina women who reported gender-based (aOR: 3.47 (95% CI: 0.68-17.78)), racial/ethnic-based (aOR: 2.04 (95% CI: 0.68-6.11)), or other forms of discrimination (age and/or appearance-based) (aOR: 3.59 (95% CI: 1.25-10.34)), although confidence intervals were wide. Experiencing discrimination is related to BE, which may help explain disparities.
Attempted suicide is strongly associated with risk of future suicide, however there is no consensus on the effectiveness of interventions to prevent future attempts. Here we used inverse probability of treatment weighting by propensity scores to compare three programs that aimed to lower the risk of relapse following an initial suicide attempt. This observational study, conducted from 2013 to 2017, followed 1,492 individuals after an initial suicide attempt from three catchment areas in Madrid, Spain. Relapse was defined as a return to the Emergency Department after a new attempt within one year of the initial attempt. Propensity scores Inverse probability of treatment weights were obtained following the creation of propensity score of treatment; Cox proportional hazard regression models were then used to estimate the hazard of relapse. to estimate unadjusted and adjusted risks of relapse by intervention. Gender and age-stratified analyses were also conducted. Covariates were age, gender, history of suicide attempts, history of psychiatric disorders, main psychiatric ICD-10 diagnostic groups, medical comorbidities and family support. Results: A total 133 (8.9%) subjects relapsed. The psychotherapy group had a lower presence of known risk factors for suicide attempt. Individual psychotherapy and enhanced contact were more effective at reducing suicide reattempt than a single priority appointment, with a 40% lower relapse risk in adjusted models. Results did not differ after gender and age-stratification. Conclusions: In a naturalistic clinical setting, patients exposed to individual psychotherapy or an enhanced contact intervention had a similar, lower relapse risk than the single priority appointment group.
Background: In 2016, 525 suicides were reported in New York City (NYC), exceeding the number of homicide deaths and motor vehicle fatalities. Our objective was to describe trends in suicide mortality from 2007 to 2016 in NYC and compare to national estimates. Methods: Suicide deaths in NYC were identified using 2007-2016 NYC DOHMH Bureau of Vital Statistics mortality data. National data was queried through CDC WONDER. We assessed differences by demographic characteristics, using rates and proportions. Joinpoint Regression was used to calculate average annual percent changes in rates. Results: In 2016, the suicide rate in NYC was 5.8 per 100,000 people, less than half the national rate (13.5 per 100,000). While suicide rates among both US males and females increased from 2007 to 2016, the rate among NYC males increased from 2007 to 2013 but declined thereafter (9.8 to 8.5 per 100,000), with an average annual decrease of 4.9%. Comparatively, the suicide rate among NYC females increased from 2007 to 2016 (2.9 to 3.5 per 100,000), with an average annual increase of 3.9%. New Yorkers ages 45 to 64 years had the highest suicide rate in 2016 (9.2 per 100,000), consistent with national data. Non-Hispanic Whites had the highest suicide rate in the past 10 years in NYC, while American Indian/Alaska Natives had the highest rate nationally. In 2016, the most common method of suicide in NYC was hanging, strangulation, and suffocation (35.6%). Jumping from a high place was the second most common method (19.6%), about eight times the proportion nationwide (2.5%). Use of a firearm accounted for 10.7% of suicides in NYC but was the most common method of suicide nationwide (51.0%). Conclusion: The groups highlighted should be considered for future suicide prevention interventions in NYC. NYC’s low suicide rate may be attributed to the city’s strict laws and high penalties for illegal possession of firearms. Regional differences emphasize the need to conduct region-specific analyses.
EXAMINING INTERACTIONS BY MENTAL COPING ABILITY AND CLEANUP PARTICIPATION IN THE RELATIONSHIP BETWEEN OIL SPILL EXPOSURE AND DEPRESSION SEVERITY

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Prior studies of the Deepwater Horizon oil spill and other oil spills have reported adverse impacts on mental health, but there is inadequate understanding of effect modifiers that could inform disaster responses. In this cross-sectional analysis of complex sample survey data from the 2010-2011 Gulf States Population Survey performed in Alabama, Florida, Louisiana, and Mississippi, we assessed the association of oil contact following the Deepwater Horizon oil spill with depression severity, and interaction by psychological coping ability (i.e. self-mastery), emotional support, and participation in cleanup efforts. Depression severity was assessed via the 8-item Patient Health Questionnaire, which produces scores from 0 to 24. We used Tobit regression to model depression severity scores, assuming an underlying normal distribution of severity in the population. We used multiple imputation to account for missing data, and survey statistics to account for the complex survey design. We adjusted models for demographic factors, health behaviors, emotional support, and income. Oil contact was associated with increased depression severity ($\beta=2.10; 95\% \text{ CI: 0.44, 3.77}$). Among those with oil contact, depression was twice as severe for those with lower self-mastery ($\beta=2.30, 95\% \text{ CI: 0.80, 3.80}$) compared to those with higher self-mastery ($\beta=1.17, 95\% \text{ CI: -0.04, 2.39}$). However, respondents with oil contact had lower depression severity if they participated in cleanup efforts, compared to exposed individuals who did not participate ($\beta=-2.77; 95\% \text{ CI: -4.92, -0.61}$). This potential protective effect was larger for respondents with lower self-mastery (factor score -0.5, $\beta=-3.68, 95\% \text{ CI: -6.15, -1.22}$) than for those with higher self-mastery (factor score +0.5, $\beta=-1.13, 95\% \text{ CI: -3.49, 1.22}$). Our results contribute to the literature on potential mental health impacts of catastrophes and response participation, though prospective studies could provide stronger evidence to inform planning.
SYSTEMATIC REVIEW OF MULTIPLE SCLEROSIS PROGRESSION AND MENTAL HEALTH AMONG SMOKERS Michaela F. George* Michaela F. George, Farren B. S. Briggs, (Dominican University of California)

Background: Multiple sclerosis (MS) is a debilitating disease of the central nervous system, with little understanding of progressive course. Smoking has been shown to increase physical progression of the disease, however, there is not consensus on how smoking effects the mental health of an individual with MS. The aim of this systematic review was to evaluate the relationship between tobacco smoke and mental health disability among individuals with MS. Methods: The literature search was conducted by using PubMed and Web of Science in Sept 2018. Five English-language studies met inclusion criteria. All studies were conducted in distinct human populations, had an observational study design, and were of high methodological quality. All studies used unique measurement tools for depression, anxiety and/or self-report health. Results: Current smoking was associated with higher depression and anxiety scores in three of five studies. One study found as high as a 2.3 fold increase in depression among current smokers after adjusting for age, gender, marital status, education, disease duration, number of comorbidities, level of physical disability, and clinically significant fatigue. Additionally, ever smoking was significantly associated with depression and anxiety in this study. Two studies found no difference in mental health outcomes among MS smokers, however, depression and anxiety were both higher among MS cases than healthy controls. Discussion: These results suggest that current smoking may confer risk for poor mental health outcomes in individuals with MS. However, smoking cessation remains critical for improving mental health and has prompt clinical implications. The lack of comparable quantitative data remains a limitation, and further research is needed.
LACK OF ASSOCIATION BETWEEN SEX AND DISCLOSURE OF A NEED FOR WORKPLACE ACCOMMODATIONS FOR MENTAL HEALTH DISORDERS Nyasha Makuto* Nyasha Makuto, Vicki Kristman, (Lakehead University)

Background/objective: Workplace accommodations may ameliorate the impacts of mental health disorders (MHDs) though men may be less likely than women to request these services due to social barriers. The objective of this study is to determine the association between sex and disclosure of a need for workplace accommodations. Methods: Cross-sectional surveys were distributed to workers from 31 randomly-selected employers, across 10 industrial sectors, in Manitoba and Northwestern Ontario. Odds ratios and 95% confidence intervals were calculated to determine sex differences in the disclosure of a need for workplace accommodations. Results: Out of 1,073 workers, 137 had MHD diagnoses and 163 had symptoms of MHDs. Although not a statistically significant difference, women with MHD diagnoses disclosed a need for workplace accommodations twice as often as men (OR 2.10, 95% CI: 0.80-5.67). There was no statistically significant difference for women versus men with MHD symptoms in terms of disclosure for workplace accommodations (OR 0.88, CI: 0.20-3.70). Both sexes in the MHD-diagnosed group reported no need for accommodations as the most common reason for why their MHD was not disclosed at the workplace. Both sexes in the symptomatic group reported “other” as their primary reason for non-disclosure. Conclusion: The need for disclosure among the sexes seems to vary by whether or not the individual is diagnosed with a MHD or only experiencing symptoms. Further studies with larger sample sizes of people with MHDs are needed to confirm these findings.
THE EFFECT OF SELF-PERCEIVED HOPE ON POSTTRAUMATIC STRESS SYMPTOMS AMONG YOUTH SURVIVORS OF THE 2015 NEPAL EARTHQUAKES Sarah Forthal*, Sarah Forthal, Sabrina Hermosilla, Kathleen Pike, Janna Metzler, Alastair Ager, (Columbia University Mailman School of Public Health, Department of Epidemiology, New York, NY, USA)

Posttraumatic Stress (PTS) is one of the most common mental health problems among earthquake survivors of all ages, worldwide. Higher levels of self-perceived hope have been linked to reduced PTS among youth survivors of trauma, though the mechanisms driving this relationship are not well understood. Using data from a prospective longitudinal study evaluating a psychosocial intervention for youth survivors of the 2015 Nepal earthquakes, we tested the hypotheses that (1) higher levels of self-perceived hope one month after the earthquakes (T1) are associated with fewer PTS symptoms ten to twelve months later (T2); and (2) the relationship between self-perceived hope at T1 and PTS symptoms at T2 is stronger for younger compared to older children, girls compared to boys, and rural compared to urban residents on the additive scale. The final sample included 570 youths aged nine to 17 who were registered for the intervention and were interviewed at T1 and T2. Multiple linear regression was used to test the association between child hope and PTS symptoms. Additive interactions were assessed using the t test for cross-product terms. Overall, there was a decrease in PTS severity between the two time points, with 68.60% meeting criteria for possible posttraumatic stress disorder at T1 and 58.70% meeting the criteria at T2. Hope at T1 was significantly associated with a lower level of PTS at T2 in the unadjusted model (=-0.31; 95% CI: -0.51, -0.12); however, the relationship ceased once potential confounders were accounted for. The effect of hope on PTS did not vary significantly by age, gender, or residence in adjusted models. These results suggest that levels of hope one month after an earthquake have no effect on PTS symptoms ten to twelve months later. Future research is needed to better understand which, if any, psychosocial traits are associated with better PTS outcome in youth earthquake survivors.
TRENDS IN INCIDENCE OF MENTAL DISEASE WITH SLEEP DISORDER IN TAIWAN: A 14-YEAR LONG TERM DESCRIPTIVE STUDY Yu-Chan Liao* Yu-Chan Liao, Chien-An Sun, Yu-Ching Chou, (School of Public Health, National Defense Medical Center, Taipei)

Background: Sleep disorders other mental diseases were frequently reported, and both were associated with adverse mental and physical health outcomes. This study was to identify the incidence of mental disease in patients with sleep disorder by sex and different age groups in a long term, population-based Taiwanese cohort.

Methods: Using data extracted from the National Health Insurance Research Database, we selected patients diagnosed with sleep disorder, during the period from January, 2000 to December, 2004. All were observed until a diagnosis of mental disease, death, or December, 2013. Results: Overall, the incidence rate of mental disease among patients with sleep disorder was 314.8 per 10,000 person-years, with 262.4 per 10,000 person-years in male and 352.2 per 10,000 person-years in female. The incidence rates of depressive disorder, anxiety, bipolar disorder and suicide were 714, 269.6, 4.5 and 0.1 per 10,000 person-years, respectively. On the other, the incidence rates were 268.2, 317.9, 339.7, 348.6 and 302.3 per 10,000 person-years in each age group (18-29, 30-39, 40-49, 50-59 and > 60 years). Also, patients with sleep disorder who had comorbidities had lower incidence rates of mental disease compared to patients without comorbidities. In addition, patients had higher incidence rate of mental disease as their frequency of sleep disorder visiting records increased. The incidence rates were 148.2, 256.0, 320.0 and 602.1 per 10,000 person-years in visiting record frequency 1-3, 4-5, 6-10 and >10, respectively. Conclusion: The results of this study suggested that the incidence rate of mental disease with sleep disorder was higher in female than male. Also, the incidence rate was increasing as age and sleep disorder visiting records increased. Future research is needed to indicate whether there is a positive correlation between mental disease and sleep disorder.

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THE MEDIATING EFFECT OF SLEEP DISTURBANCE ON THE RELATIONSHIP BETWEEN ASTHMA ATTACK AND COGNITIVE IMPAIRMENT IN ADULTS WITH ASTHMA Zheng Li* Zheng Li, Wei Geng, (Valparaiso University)

Background: Literature suggests asthma attack is associated with poor sleep and cognitive impairment among asthmatic adults. However, the relationships among asthma attack, sleep disturbance, and cognitive impairment are still unclear. Aim: This study aimed to examine the direct and indirect effects of asthma attack on self-reported cognitive impairment through the mechanism of sleep disturbance. Methods: Data from the 2016 National Health Interview Survey were used for analyses. Asthma attack was determined if the participants reported having an episode of asthma or an asthma attack in the past 12 months. Sleep disturbance was measured by asking the participants if they had difficulty staying asleep at night. A single item measuring if the participants had difficulty remembering or concentrating was used to determine cognitive impairment. Mediation analyses were performed to test the effect of asthma attack on cognitive impairment through sleep disturbance. Results: Of adults with asthma (n=2,806), 1,271 (45.3%) had at least one asthma attack in the past 12 months, 2,000 (71.3%) experienced sleep disturbance, and 382 (13.6%) reported having difficulty remembering or concentrating. Multivariate analyses suggested participants who had at least one asthma attack and sleep disturbance were more likely to have difficulty remembering or concentrating (all Ps<.05). Mediation analyses revealed that asthma attack was directly associated with self-reported cognitive impairment (p<.05), however, the effect of asthma attack on cognitive impairment was indirectly affected by sleep distance (all Ps<.05), in which sleep disturbance explained 15% of the total variance in the association of asthma attack with cognitive impairment. Conclusion: Asthma attack is associated with self-reported cognitive impairment, and this association is mediated by sleep disturbance. Interventions are warranted to improve cognitive function by addressing sleep disturbance for asthmatic adults.

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Background: Depression is associated with a number of biological alterations and behaviors that can increase the risk of metabolic syndrome (MetS). Antidepressant (AD) medications are frequently used to treat depressed patients, but it often has side effects such as metabolic abnormalities. MetS is a well-known risk factor for cardiovascular diseases (CVD). However, it is unclear how clinical depression (CD), AD use, and MetS are associated with CVD. Objective: To explore the relationship between CD, AD use, MetS, and CVD among Canadian older adults. Methods: The baseline data of the Canadian Longitudinal Study on Aging Comprehensive cohort of 26,027 men and women (aged 59.5 ± 10.4 years) was used in this analysis. CD was defined by clinical diagnosis of depression. Current treatment (CT) type was categorized into 4 groups: 1) AD, 2) combined/other therapy, 3) no CT but had previous therapy, and 4) no CT nor previous therapy. MetS was defined using criteria developed by the IDF and AHA/NHLBI. Logistic regression was used to estimate the odds of CVD on the basis of the joint distribution of CD, CT types, and MetS. Those without CD, treatments, and MetS will be used as a reference group. Results: 17.4% of participants had CD, 25.7% had MetS, and 15.6% were with CVD. Of those with CD, 48.5% were using AD. Among the participants without CD, MetS was associated with CVD (Odds ratio (OR) [95% CI]: 1.49 [1.35, 1.65]). Within those with CD and using AD, the OR of CVD was 1.53 [1.15, 2.04] for MetS and 1.21 [0.94, 1.56] for no MetS. Among those with CD, previous therapy was associated with CVD in those with MetS (1.82 [1.35, 2.47]) and without MetS (1.32 [1.02, 1.70]). For those with CD but without any therapy, the OR of CVD was 1.88 [1.02, 3.48] for MetS and 1.80 [1.16, 2.79] for no MetS. Conclusion: CD and AD use is associated with CVD but the association is dependent on MetS. The absence of CT is associated with CVD and is independent of MetS.
QUANTILE TREATMENT EFFECTS (QTE) AS A NON-PARAMETRIC METHOD FOR POTENTIAL OUTCOMES Hayden Smith* Hayden Smith, Dana M. Lowry, William M. Pruett, (UnityPoint Health - Des Moines)

INTRODUCTION: Medical treatments can be examined using the Neyman-Rubin potential outcomes framework. Traditional average treatment estimates (ATE) provide information on the mean potential differences. Distributions of mean effects between treatment groups may differ (e.g., treatment heterogeneity) and should be visually inspected for masked rank invariances and stochastic dominance. Quantile treatment effects (QTE) are a non-parametric counterfactual option to using ATE. Objective: to provide a QTE example for examining treatment distribution differences across ranks.

METHODS: A retrospective cohort sample was collected from three Midwestern hospitals for adults admitted with complicated parapneumonic infection in 2014-2018. Treatment included a chest tube with twice daily instillation of tPA/dornase for >/= 3 consecutive days. Protocol non-adherence was defined as a deviation from the treatment protocol. Analyses included the calculation of ATE and 50% QTE for treatment adherence status on length of stay (LOS) after adjusting for time-fixed covariates (i.e., age and sex) via propensity scores. QTEs for deciles were calculated and plotted with 95% bootstrap confidence intervals.

RESULTS: The study included 191 unique patients with 125 (65%) classified as non-adherent. Unadjusted median LOS was 12 (IQR: 8-19) versus 12 (IQR: 8-18) days based on treatment adherence vs non-adherence, respectively. A review for rank invariances showed no major variations (Figure). The ATE for protocol adherence on LOS was -1.2 (SE: 1.8) and QTE 1.0 (SE: 1.9). Of note, the 10th and 90th percentile differences were -2.0 (SE: 0.7) and -4.0 (SE: 6.7), respectively.

CONCLUSIONS: QTE modeling provides a non-parametric mechanism to examine for rank invariances and treatment heterogeneity. The process can unconfound treatment assignment when there are known exogeneity concerns. Covariate balancing can be based on any preferred prediction algorithm (e.g., stacked ensembles) for the calculation of propensity scores.

Figure: Quantile treatment effects per rank (i.e., 0.10-0.90 by 0.10) for effect of treatment adherence on length of stay, adjusting for patient age and sex (i.e., via propensity scores) for inpatients with parapneumonic infection collected from three hospitals (n=191).
IMPLEMENTATION OF DATA QUALITY STRATEGIES IN THE NATIONAL SPINA BIFIDA PATIENT REGISTRY

Priya Patel* Priya Patel, Tiebin Liu, Katherine Ong, Elisabeth Ward, Rodolfo Valdez, Judy Thibadeau, Kimberly Newsome, (Oak Ridge Institute for Science and Education (ORISE), Oak Ridge, Tennessee)

The National Spina Bifida Patient Registry (NSBPR) is a clinic-based registry that has enrolled over 9294 participants since 2009 from 37 clinics across the US. Here we summarize the data quality strategies we have implemented and evaluated in the NSBPR. NSBPR data are collected on standard forms using medical records and patient/parent interviews, entered into a web-based medical record database, and sent to CDC for assessment of their quality and analysis. To promote quality data, the NSBPR team introduced multiple strategies, including standardized data collection forms, clinic staff training, monthly data quality checks performed at CDC, and evaluation of data re-abstraction at each clinic. In August 2016, the program implemented a quality improvement protocol that included monthly summaries of data quality checks to participating clinics. Since then, the cumulative percent of items requiring quality checks from data submitted by clinics each month remained consistently low over time (a median of 5% per month). Also, the percent of data quality issues resolved increased from 13% (84 of 648 issues) in August 2016 to 62% (117 of 189 issues) in September 2018. From October 2017 to September 2018, each clinic randomly re-abstracted data for 5% of their patients whose data were previously submitted in quarterly reports, and marked the areas of disagreement for 37 questions. Twenty clinics reviewed a total of 514 reports. There was 2.8% disagreement between previously abstracted and re-abstracted data (538 of 19,018 questions examined). The NSBPR data quality strategies follow guidance for collecting quality data from experts in the field. The monthly data quality summaries and the re-sampling of select registry reports will continue. These activities will allow us to develop additional strategies to continue improving data quality, including more robust and consistent training for clinic staff. These strategies are applicable to other rare diseases registries.

Figure 1. Trend in the resolution of monthly issues in the NSBPR, August 2016-September 2018
THE K NEAREST NEIGHBOR ALGORITHM FOR IMPUTATION OF MISSING PRENATAL ALCOHOL DATA IN A LONGITUDINAL STUDY

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Missing data can introduce bias in many epidemiologic studies. This is particularly problematic in alcohol research where mechanism of missingness is not random as it depends of drinking status and magnitude. The Safe Passage Study was a prospective investigation of alcohol exposure and fetal/infant outcomes among pregnant women from Cape Town, South Africa (n=6409) and Northern Plains (NP), USA (n=4674). Daily prenatal alcohol consumption for last reported drinking day and 30 days prior was recorded using the validated Timeline Follow-Back method. Out of 3.2 million person-days, data were missing for 0.36 million (11.4%). We imputed missing exposure data using a machine learning algorithm called the “K Nearest Neighbor” (K-NN) algorithm. K-NN imputes missing values for a participant using values of participants with patterns of exposure closest to them. We validated our approach by randomly deleting non-missing data for 5-15 consecutive days and quantifying prediction of deleted segments. Since participants with complete data may not be comparable to those with missing data (non-completers), segments of complete data from non-completers were included as reference. Imputed values were weighted for the distances from the nearest neighbors and matched for day of the week. We found that K=5 and segments of 55 days provided the best estimates. Across both study sites, 64% of deleted segments had no differences between actual and predicted values. For 31% of segments, imputed data were within +/-1 drink/day of the actual. As the algorithm was more efficient in predicting no drinking, it’s prediction accuracy increased with the length of gestation. It performed better for the South Africa cohort where the magnitude of drinking was lower than NP and weekend drinking was the norm. K-NN's performance depends on the amount of drinking in the population. It can be used to impute missing data in longitudinal studies of alcohol use during pregnancy with high accuracy.
CAN CASE-CONTROL DATA BE USED TO STUDY COMMON EFFECTS? Julie M. Petersen* Julie M. Petersen, Martha M. Werler, Samantha E. Parker, (Boston University School of Public Health)

Introduction. Data from case-control (C-C) studies present an opportunity to study outcomes that occur after case status (e.g., birthweight in a C-C study of birth defects). Objective. To investigate whether C-C data can be used to obtain an unbiased measure of association between an exposure and an outcome that occurs after the development of the case disease. Methods. We simulated a source population of 10,000,000 with fixed prevalence of exposure (E), case status (M), and common effect (D) as 15%, 1%, and 8%, respectively. We varied the strength of the E-D association and whether there was partial, no, or complete mediation by M (Figure 1). We randomly selected 10,000 cases and 40,000 controls to represent a C-C study. We used logistic regression to estimate risk ratios (RRs) for the E-D association using (1) all cases and controls, (2) controls only, and (3) all data reweighted to represent the distribution of M (1%) in the source population. Results. When M was a partial mediator of E-D, the bias due to including all cases and controls without reweighting was strongly related to the relative strength of the mediated (indirect) effect; restricting to controls led to estimates within 10% unless the mediated effect was much stronger than the direct effect; and re-weighting always closely approximated the E-D association (total effect) in the source population. When the effect was completely mediated by M (total effect=indirect effect), using all cases and controls led to biased results when the E-D association was moderate-to-strong; restricting to controls yielded a RR of 1; and the reweighted data most closely approximated the truth. When there was no mediation (total effect=direct effect), all methods yielded approximately the same effect estimates. Conclusion. C-C data can produce valid measures of association between an exposure and an outcome that occurs after case status when reweighted to represent the prevalence of case status in the source population.

* indicates work done while a student/postdoc

Figure 1. Directed Acyclic Graphs of Simulated Scenarios. The total effect between exposure (E) and the disease (D) is the primary effect of interest. RR_{ED} is the direct effect of the association between E and D. When an indirect effect is present, it is through the mediator (M). Three scenarios were modeled, with varying strengths; specifically, A) M is a partial mediator of the E-D association (total effect = direct effect + indirect effect), B) M is a complete mediator of the E-D association (total effect = indirect effect), and C) M is not on the pathway between E and D (total effect = direct effect).
DATA MISSING AT RANDOM (MAR) AS A MACHINE LEARNING PREDICTION PROBLEM
Hayden L. Smith*, Hayden L. Smith, , (UnityPoint Health - Des Moines)

INTRODUCTION: Epidemiologists have used machine learning (ML) algorithms to create baseline covariate balance in observational comparative research. The process is conducted prior to outcome modeling and focuses on the predictive attributes of ML toward treatment assignment. A comparable area where ML can be implemented is in the classification of data as missing at random (MAR), which is also a non-inferential prediction problem. Objective: to present an automated ML (autoML) process to determine the best predictive model for MAR status. METHODS: Three years of data from a Midwestern level I adult trauma registry (2015–2018) were ascertained and partitioned into a training (60%) or test set (40%), see Figure. Training data were used in autoML (R package: h2o) to model the probability of vital sign missingness conditional on registry data. Supervised algorithms used outcome balancing and outputted model accuracy measures. The top leaderboard model was used to score missingness status in the test set. RESULTS: Sample included 4,090 patient encounters with missing data for initial heart rate: 1.6%; blood oxygen saturation (SPO2): 4.4%; and respiratory rate: 3.3%. SPO2 data was selected for MAR examination due to its missingness prevalence. Top five leaderboard models were gradient boosting machines. Model leader had a sensitivity: 0.36 (SE: 0.09); specificity: 1.00 (SE: 0.00); and accuracy: 0.96 (SE: 0.01). Test set scoring revealed a sensitivity: 0.49 (95% CI: 0.46, 0.51); specificity: 0.99 (95% CI: 0.99, 1.00); and accuracy: 0.97 (95% CI: 0.96, 0.98). Also presented will be an overview of post modeling methods to examine global and local input interpretability for blackbox algorithms. CONCLUSIONS: The presented study used autoML for MAR classification. Such applications should include epidemiologic processes (e.g., structural causal models and graphs) to mitigate data leakage. Further research is needed to understand future steps for incorporating blackbox results into imputation processes.

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Collider stratification bias, a form of selection bias, may occur when conditioning on a common effect of an exposure and an outcome. The effect of conditioning on a misclassified collider compared to conditioning on a correctly classified collider is unknown. We evaluated the effect of conditioning on a misclassified collider using simulation. We simulated both non-differential and differential misclassification of a collider in 300 scenarios with 1,000,000 iterations each. For each scenario, we used a dichotomous exposure, outcome, and collider. We examined effects on the risk difference scale. Sensitivity and specificity of the misclassification ranged from 0.10 to 0.99; the prevalence of the exposure, outcome, and collider ranged from 0.10-0.50; and the strength of association between exposure and collider, outcome and collider, and exposure and outcome ranged from 0.10-0.60. We found that when adjusting for a non-differentially misclassified collider, adjusted estimates were consistently closer to the truth compared to estimates when adjusting for a correctly classified collider (Figure). Additionally, a strong association between the outcome and collider or exposure and collider resulted in more overall bias, and adjusting for a misclassified collider provides a closer estimate to the truth compared to adjusting for a correctly classified collider. When collider misclassification is differential, the direction and magnitude of the correction is less predictable. Adjusting for a differentially misclassified collider may lead to more or less biased results compared to adjusting for a correctly classified collider depending on sensitivity, specificity, and strength of associations between parameters. When a collider is misclassified, the strength of the association between the exposure and collider or outcome and collider weakens, typically resulting in less biased results when adjusting for a misclassified collider compared to a correctly classified collider.
SENSITIVITY ANALYSIS FOR THE RISK FUNCTION Alexander Breskin* Alexander Breskin, Stephen R. Cole, Adaora A. Adimora, (University of North Carolina at Chapel Hill)

When exchangeability between groups cannot be ensured by study design features, e.g., randomization, untestable assumptions are needed to estimate causal effects. We propose a framework to describe the sensitivity of the risk function to exchangeability assumptions that introduces one parameter for each source of missing data. For instance, in a randomized trial, our framework involves a single parameter – the probability of an event had you been treated, given you were treated and lost to follow-up. For an observational study, an additional parameter is introduced – the probability of an event had you been treated, given you were not treated. These parameters achieve several desiderata: 1) they are independent of the data, 2) with the data, they just nonparametrically identify the parameters of interest, 3) they asymptote at the nonparametric bounds, and 4) they have meaningful reference values. Regarding desideratum (4), an Achilles’ heel of many proposed sensitivity analyses is that there is often no defensible position to summarize over the distribution of the sensitivity parameters and the data. Using our framework, we propose two natural reference values based on a beta distribution for the parameters: a maximally optimistic position (which by happenstance is the standard operating procedure), in which the beta distribution corresponds to Dirac delta function centered at the value implied by exchangeability, and a maximally pessimistic position, in which the beta distribution has maximum variance and corresponds to a binomial distribution centered at the value implied by exchangeability. We apply our approach to two scenarios: 1) using data from the randomized ACTG 320 trial, we estimate the risk of AIDS or death had all participants used 3-drug antiretroviral therapy, and 2) using data the observational Women’s Interagency HIV Study, we estimate the risk of AIDS or death had all of the women refrained from injection drug use.
RISK RATIO MODELS FOR ANALYZING MULTINOMIAL OUTCOMES Alok Kumar Dwivedi*, Alok Kumar Dwivedi, Muditha Perera, Jennifer Salinas, Navkiran Shokar, (Texas Tech University Health Sciences Center El Paso)

Multinomial outcomes are frequently observed in epidemiological research. The standard approach of analyzing such data using multinomial logistic regression provides a probability ratio, which is different to the risk ratio. Investigators are often interested in estimating effect size in terms of risk ratio in studies with multinomial outcomes. Separate binomial or Poisson regression models can be used for estimating risk ratio for multinomial outcome data, however, convergence issues and out of range predictions may occur with these approaches. We suggest some alternative approaches for estimating the risk ratio for multinomial outcomes. The performance of different approaches for estimating the risk ratio for multinomial outcomes was calculated using simulation studies. We also evaluated descriptive comparisons of different approaches in determining the effect of young age for average-risk screening on stage presentation (local, regional and distant) among colorectal cancer patients stratified for different races using the Surveillance, Epidemiology, and End Results registry. Our study suggests that the probability ratio obtained using standard multinomial logistic regression overestimates the appropriate effect size. Risk ratio models should be preferred for analyzing studies with multinomial outcomes. The suggested risk ratio methods may be extended for studies with ordinal outcome data, time dependent clustered data, and complex survey sampling data as well.
CASE-CONTROL ANALYSES USING NEAREST-NEIGHBOR MATCHING Beau B Bruce* Beau B Bruce, Ellyn Marder, LaTonia C. Richardson, Zhaohui Cui, (Enteric Diseases Epidemiology Branch; Division of Foodborne, Waterborne, and Environmental Diseases; National Centers for Emerging and Zoonotic Infectious Diseases; Centers for Disease Control and Prevention)

Background: Case-control studies aim to produce unbiased estimates of the effect of exposures on an outcome. Identifying food, water, and other exposures as risk factors for enteric diseases is particularly challenging, primarily from substantial correlation among exposures, making multivariate confounding control difficult. This was the suspected cause of findings in case-control studies that were inconsistent with evidence from other analyses. We created and explored a nearest-neighbors matching method using data from two case-control studies. Methods: We studied 943 non-O157 Shiga toxin-producing E. coli (STEC) and 1241 Campylobacter cases with age- and location-matched controls. We analyzed age, sex, state, and binary exposures of interest (638 STEC, 337 Campylobacter). Iterating through each exposure, up to 20 controls were matched to each case using Gower's distance calculated from all other variables. Controls were only matched if within a threshold distance to the candidate case established by logistic regression comparing the distance between the closest control to the case vs. a randomly selected one. Algorithmic approaches were used to merge strata and ensure each control was in only one stratum. Mantel-Haenszel odds ratios were calculated. Results: Most (74% of STEC, 82% of Campylobacter) controls were outside our threshold for similarity to their originally matched case. Compared with the results using the original match, the new method resulted in substantial changes in the magnitude and direction of estimated odds ratios and more consistency with expectations from other evidence. The new matching method identified a risk factor (chicken liver consumption) for Campylobacter confirmed after the original case-control analysis. Conclusion: Nearest-neighbors matching appears to improve control of confounding in case-control analyses and may provide an improved method for risk factor evaluation among a large set of correlated exposures.

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USE OF RISK BOUNDS TO QUANTIFY POTENTIAL BIAS IN ABSOLUTE RISK ESTIMATES DUE TO COMPETING EVENTS: AN APPLICATION TO SURVIVAL WITH BIRTH DEFECTS
Dominique Heinke*, Dominique Heinke, Sonja Swanson, Paige L Williams, Wendy N Nembhard, Mahsa M Yazdy, (Massachusetts Department of Public Health)

Competing events can lead to significant bias in certain risk estimates, yet few studies employ methods to address this bias in part because of their complexity and difficult interpretations. Risk bounds (RBs) describe the lower and upper bounds of a risk estimate given observed data without additional assumptions. We propose incorporation of RBs into standard analyses to quantify potential risk sizes consistent with the data in the absence of the competing event, and therefore also potential bias due to competing events. We discuss strengths and limitations. As an example, we demonstrate the use of RBs to account for bias due to pregnancy termination when estimating the absolute risk of stillbirth among fetuses with major birth defects. Because termination is strongly driven by defect severity, standard risk estimates may be biased downward through depletion of susceptibles. Using data on over 18,000 cases from a population-based study of birth defects, we calculated the risk of stillbirth as the number of stillbirths divided by the number of non-terminated pregnancies. RBs were calculated by estimating stillbirth risk assuming the logical extremes where all terminated pregnancies had in fact not been terminated: i.e., including terminated pregnancies in the denominator but not numerator (lower bound) or in both the numerator and denominator (upper bound). Potential relative bias was calculated by dividing the lower and the upper RB by the stillbirth risk estimate. The absolute difference of the upper risk bounds to stillbirth risk estimates ranged from 0 to 17.8%. Relative potential bias of over 3 fold was identified for spina bifida, sacral agenesis, holoprosencephaly, and intercalary limb deficiency based on upper RB. We identified several birth defects whose RB estimates are consistent with potential bias magnitudes sufficient to change clinical care of pregnancies. However, RBs may be uninformative and/or require additional assumptions in other contexts.
THE RASCH MEASUREMENT OF THE BRIDGING SOCIAL CAPITAL QUESTIONNAIRE Ester Villalonga Olives* Ester Villalonga Olives, Tim Pickles, Ichiro Kawachi, (Pharmaceutical Health Services Research Department. University of Maryland School of Pharmacy. Baltimore (MD), USA.)

Introduction Bridging social capital is defined as the connections between individuals who are dissimilar with respect to socioeconomic and other characteristics. Bridging social capital is crucial for the immigrant communities with lower socioeconomic backgrounds to be connected to opportunities that may facilitate ascendant social mobility. We developed a Patient Reported Outcome Measure (PROM) in English and Spanish to measure it in Latino immigrants living in the US. Our objective is to validate the PROM with Rasch analysis.

Methods The structure of the questionnaire comprised the following subscales: Socialization in the job place (5 items); Membership in community activities (16 items); Participation in community activities (5 items); Contact with similar/different people (7 items); Assistance (17 items); Trust of institutions and corporations (14 items) and Trust of intimate people (3 items). We collected data online and randomly selected respondents from a national database. N=120 Latino immigrants living in the US (age ≥18 years, migration to the US ≥2 years prior and fluent in English or Spanish) participated in the study. 50.8% of participants used the English version and 64.2% were females. We assessed fit to the Rasch model, reliability, local dependency, unidimensionality, differential item functioning (DIF) and targeting. Results Fit to the Rasch model revealed overall and individual item misfit and low reliability in four subscales. Local dependency was evident in four subscales and one scale was not unidimensional. Multiple items had DIF by questionnaire language, age group and gender. Targeting demonstrated some floor and ceiling effects. Discussion Further work has to be implemented through the Rasch analysis framework, such as subtests, item splits, item deletions or item rescoring, to overcome the problems of the PROM to fit the Rasch model.

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MULTILEVEL TEMPORAL ANALYSIS OF REPEATED CROSS-SECTIONAL SURVEY DATA - DIABETES AND THE COUNTY ENVIRONMENT  Justin Feldman* Justin Feldman, David Lee, (NYU School of Medicine, Dept. of Population Health)

Introduction: Random-effects within-between (REWB) models can incorporate temporality in analyses of repeated cross-sectional surveys, but have rarely been used in epidemiology. In an REWB model, within-group coefficients are equivalent to an econometric fixed-effect estimator – both estimate the effect of a change in a group-level variable on growth in a dependent variable. These within-group estimates are less vulnerable to time-stable confounding. Methods: Using data on 3.4 million respondents to the CDC Behavioral Risk Factor Surveillance Survey (2003-2012), we employ an REWB logistic model to estimate associations between diabetes and county measures of active commuting (% who walk, cycle, or take transit to work), unemployment, and food environment (fast food / total restaurants; convenience stores / all food stores). We compare results to a standard mixed model that pools across county-years. All models controlled for a national time trend, smoking, and socio-demographic variables. Results: Associations for odds of diabetes estimated by the pooled model were in the hypothesized directions (positive for unemployment, fast food, and convenience stores; inverse for active commuting). Results from the REWB model were more ambiguous. A within-county increase of 1 standard deviation in active commuting was associated with an 8% reduction in odds of diabetes, but this estimate was imprecise (OR: 0.92; 95% CI: 0.82, 1.02). We found no evidence that within-county change in food environment predicted growth in county diabetes. The within-county effect of unemployment was inestimable due to its collinearity with time (there was a strong national trend of increasing unemployment over the study period). Conclusion: The REWB model, which provides for stronger causal inference vs. a pooled model, failed to provide evidence supporting the effects of county food environment on diabetes, but offered marginal evidence for a beneficial effect of increased active commuting.
Background: The dependency induced between two independent events when conditioning on a common result has the potential to cause serious interpretational problems for causal analyses. Termed ‘collider bias’, it often produces paradoxical results which are contrary to intuition and/or scientific feasibility. Although recognised and considered in several epidemiological contexts, there has been limited consideration of collider bias as it pertains to compositional data – a type of data which comprises the parts of some whole, and for which all parts (components) sum to that whole. Methods: We use directed acyclic graphs to illustrate and consider collider bias in the context of compositional data. Where interest lies in estimating the effect of a particular component on a subsequent outcome, we identify two distinct effects which may be of interest: (1) the ‘unbiased’ effect, and (2) the ‘collider biased’ effect. We consider these effects in the context of several example scenarios. Results: Where the value of the ‘whole’ is allowed to vary across individual units of analysis (e.g total energy intake), both the ‘unbiased’ and ‘collider biased’ effects may be estimable as well as causally meaningful, dependent upon context. However, only the ‘collider biased’ effect is estimable and meaningful where the ‘whole’ is fixed (e.g. hours in a day). Conclusion: For compositional data, there are circumstances in which collider ‘bias’ may be desirable and other instances in which it is in fact unavoidable. Nevertheless, care must be taken when interpreting a ‘collider biased’ effect, as it represents the effect of one component relative to the component(s) which have been omitted from the analysis. Researchers should be explicit about which effect is sought and how it is to be interpreted, as the ‘unbiased’ and ‘collider biased’ estimates may be radically different even if both are causally meaningful.
MEASUREMENT ERROR CORRECTION OF SELF-REPORTED SMOKING IN THE GULF LONG-TERM FOLLOW-UP (GULF) STUDY USING ENSEMBLE MACHINE LEARNING. Nathaniel MacNell* Nathaniel MacNell, Emily Werder, Matthew D. Curry, Richard K. Kwok, Lawrence S. Engel, Dale P. Sandler, (Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina; Social and Scientific Systems Inc., Durham, North Carolina)

Introduction: Methods are available to correct for measurement error using validation data from a sub-cohort, but correction relies on the assumption that the validation sub-cohort is a random sample of the full cohort. Frequently, this assumption is not met due to various operational factors. We assessed a novel application of machine learning to correct for measurement error in self-reported smoking using data from a non-representative validation sub-cohort with biomarker measures. Methods: We analyzed data from 32,608 participants in the GuLF STUDY, a prospective study of the health effects of the Deepwater Horizon oil spill. We estimated the prevalence of smoking corrected for measurement error using extreme gradient boosting, an ensemble machine learning method. Training data were obtained from a validation sub-cohort of 1,041 participants with serum cotinine measurements (≥ 3.08 ng/L). Feature data for ensemble learning consisted of 163 covariates drawn from an enrollment questionnaire. Model fit was cross-validated within the validation cohort. Results: In the validation sub-cohort, 28% of participants self-reported smoking, and 55% had cotinine levels consistent with current smoking. In the full cohort, 30% of participants self-reported smoking. Based on validation data, ensemble models estimated that the prevalence of smoking in the full cohort was 46% (95% CI: 43% to 50%) when accounting for measurement error. Smoking status discordance (18%) was associated with multiple measures of socioeconomic status and health, which also differed between full and validation cohorts (particularly educational attainment). Conclusions: Current smoking was estimated to be substantially under-reported in both the full and validation cohorts, potentially due to socioeconomic factors and the mode of survey administration. Novel applications of machine learning approaches may offer opportunities to improve assessment of confounders measured with error.
ESTIMATION OF TIME-DEPENDENT PREDICTIVE ACCURACY IN THE PRESENCE OF COMPETING RISKS

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Evaluating a candidate biomarker or developing a predictive model score for event-time outcomes is one of the significant biomedical goals. In competing risks, the event time for an individual can be classified as one of the several distinct causes. The incidence/dynamic cause-specific area under the receiver operating curve (AUC) proposed by Saha and Heagerty (2010, Biometrics 66(4), 999-1011) is an appealing measure to express the predictive accuracy of a model or marker. In this presentation, we proposed two estimators to estimate the cause-specific AUC when we have censored survival times and competing risks. The first proposed estimator- weighted mean rank (WMR)- is a local average of time-specific observed cause-specific AUCs within a neighborhood of time. The second estimator- Fractional polynomials (FPL)- is based on modelling the cause-specific AUC as a function of time through the fractional polynomials. The proposed estimators extend the Saha and Heagerty (2013, Biostatistics 14(1), 42-59) and Shen, Ning and Yuan (2015, Biometrics 71, 439-449). We investigate the performance of the proposed WMR and FPL estimators through both simulation studies and real-life data analysis.
ESTIMATING COUNTERFACTUAL RISK OF ISCHEMIC HEART DISEASE MORTALITY UNDER HYPOTHETICAL INTERVENTIONS ON PARTICULATE MATTER EXPOSURE IN THE AMERICAN MANUFACTURING COHORT

Sadie Costello*, Sadie Costello, Sally Picciotto, Andreas M Neophytou, Holly Elser, Elizabeth M Noth, Mark R Cullen, Ellen A Eisen, (UC Berkeley)

Little is known about the mortality risk due to heart disease associated with long-term, occupational (as opposed to ambient) exposure to particulate matter with aerodynamic diameter of 2.5 µm or less (PM2.5). In fact, published estimates of heart disease mortality from occupational exposures often suggest a lack of an exposure-response relationship, possibly due to downward bias from the healthy worker survivor effect. We estimated counterfactual risk of ischemic heart disease (IHD) mortality under hypothetical interventions to limit concentrations of annual PM2.5 exposure among aluminum fabrication and smelting workers in the American Manufacturing Cohort (AMC). We applied the parametric g-formula, an approach that addresses healthy worker survivor bias by correctly adjusting for time-varying confounding affected by prior exposure. We analyzed data on 15,579 workers at nine US facilities from 1998-2013. There were 123 observed IHD deaths in this relatively young cohort, with the oldest IHD death occurring at age 73. The risk ratio comparing the cumulative mortality risk under a hypothetical scenario in which annual exposure to PM2.5 was never higher than 200 µg/m³, the median annual exposure in this population, to the risk under observed exposures was 0.95 (95% CI 0.85, 1.05). Lowering the hypothetical limit to 50 µg/m³, approximately the 10th percentile of annual exposure, resulted in a risk ratio of 0.92 (95% CI 0.76, 1.11). Our findings are consistent with the hypothesis that interventions to reduce PM2.5 in occupational settings would reduce IHD mortality risk.
DUPLICATE PATTERN AND DUPLICATE PUBLICATION BIAS AMONG CHINESE-SPONSORED DRUG-RELATED RANDOMIZED CONTROLLED TRIALS Yuanxi Jia* Yuanxi Jia, Doudou Huang, Jiajun Wen, Lin Wang, Yanjun Duan, Stephan Ehrhardt, David Celentano, Joel Gagnier, (Bloomberg School of Public Health, the Johns Hopkins University)

Data Collection We conducted a retrospective cohort study among Chinese-sponsored drug-related randomized controlled trials (CS-D-RCTs) which were prospectively registered in three trial registries and published as journal articles. We collected eligible records of CS-D-RCTs conducted from January 1, 2008 to December 31, 2014. The eligible records were mapped to journal articles indexed in seven bibliographic databases. Analysis plan The journal articles corresponding to one CS-D-RCT form a cluster. The main article was defined as the one with the largest sample size or the earlier publication date. A duplicate was an article overlapped with a previous one without cross-reference. We compared the participants, interventions, and outcomes between the main article and the duplicates to determine the duplicate pattern. A CS-D-RCT was considered positive if at least one of the reported primary outcomes was positive. Logistic regression models were used to evaluate the duplicate publication bias adjusting for covariates. Result There were 924 CS-D-RCTs registered in the three registries, 417 (51%) were published, 83 (19.8%) have at least one duplicate. Among the 550 journal articles, 133 (24.2%) were duplicates. Among the 83 clusters with duplicates, 26 were translations without cross-reference; 17, 8, 6 were SALAMI publications with a subset of outcomes, interventions, and participants from the main article, respectively; 14 and 6 were IMALAS publications with increasing sample size and interventions, respectively. Adjusting for covariates, the odds of having duplicates among CS-D-RCTs with positive results were 5.71 (95%CI: 4.34-6.67) times the odds among CS-D-RCTs with negative results.

Conclusion The three prevailing duplicate patterns among CS-D-RCTs are translations, SALAMI, and IMALAS publications. CS-D-RCTs with positive results were more likely to have duplicates. Systematic reviewers should be alert of the possible duplicates when including Chinese-sponsored RCTs.
SYSTEMIC INFLAMMATION AND RISK OF ALZHEIMER’S DISEASE: A BI-DIRECTIONAL MENDELIAN RANDOMIZATION STUDY

Chris Ho Ching Yeung* Chris Ho Ching Yeung, Shirley Siu Ming Fong, Catherine Mary Schooling, (School of Public Health, The University of Hong Kong)

Introduction: Systemic inflammation had been proposed as a possible cause of Alzheimer's disease. We assessed the direction of association between systemic inflammatory factors and risk of Alzheimer’s disease using a bi-directional Mendelian Randomization design. Methods: Inverse variance weighting estimates were obtained by applying genetic predictors of systemic inflammatory factors from the latest genome-wide association study (GWAS) in 2017 to the largest GWAS on Alzheimer's disease from the International Genomics of Alzheimer's Project (with 17 008 cases and 37 154 controls) on the one hand and applying genetic predictors of Alzheimer's disease to the GWAS of systemic inflammatory factors on the other hand. Sensitivity analyses were performed using MR-Egger, weighted median, MR-PRESSO and removing pleiotropic SNPs. Results: Eleven systemic inflammatory factors had more than three independent genetic predictors for analysis, including interleukin 16, interleukin 18, cutaneous T-cell-attracting chemokine, monocyte chemoattractant protein 1, eotaxin, stem cell growth factor beta, interleukin 12p70 (IL12p70), platelet-derived growth factor, TNF-related apoptosis-inducing ligand, vascular endothelial growth factor and macrophage inflammatory proteins-1β (MIP1b). Generally no association with Alzheimer's disease was found before and after correcting for multiple comparisons. Similar results were obtained after removing pleiotropic genetic predictors. Alzheimer’s disease was positively associated with six systemic inflammatory factors including fibroblast growth factor 2, granulocyte-colony stimulating factor, interferon gamma, interleukin 10, IL12p70 and MIP1b before correcting for multiple comparisons but not after correction. Conclusion: Genetically predicted Alzheimer’s disease may be associated with higher level of systemic inflammatory factors but genetically predicted higher systemic inflammatory factors were not associated with risk of Alzheimer’s disease.
EMULATING A TARGET TRIAL OF STATIN INITIATION AND RISK OF DEMENTIA  Ellen C. Caniglia* Ellen C. Caniglia, L.P. Rojas Saunero, Saima Hilal, Silvan Licher, Bruno Stricker, M. Arfan Ikram, Sonja A. Swanson, (NYU School of Medicine)

Background: Observational data can be used to attempt to emulate a target trial of statin initiation and estimate analogues of intention-to-treat (ITT) and per-protocol (PP) effects on dementia. Methods: Using data from the Rotterdam Study, a prospective cohort study in the Netherlands, we conceptualized a sequence of “trials” in which eligible individuals ages 55-80 years were classified as statin initiators or non-initiators each month from January 1993 to December 2007 and were followed until diagnosis of dementia, death, or loss to follow-up. We estimated two types of effects of statin use on dementia and a combined endpoint of dementia or death: the ITT effect of initiation versus no initiation and the PP effect of sustained use versus no use. We fit pooled logistic regression models and estimated risk by statin treatment strategy over time. We used inverse-probability weighting to account for treatment-confounder feedback (e.g. by cholesterol) in estimation of the PP effects. To investigate residual confounding, we evaluated heart disease (HD) as an outcome. Results: Of 233,526 eligible person-trials (6,373 individuals), there were 622 initiators and 232,904 non-initiators. Comparing statin initiation with no initiation, the 10-year ITT risk differences (95% CI) were -0.1% (-2.4%, 1.7%) for dementia and 0.3% (-2.7%, 3.4%) for dementia or death. Since few individuals remained on statins after 5 years, we report 5-year PP risk differences. Comparing sustained statin use versus no use, the 5-year risk differences were -2.2% (-2.9%, -0.9%) for dementia and -5.8% (-8.3%, -3.0%) for dementia or death. ITT and PP estimates of HD risk were greater for statin use compared with no use. Conclusions: Our findings suggest that sustained statin use, but perhaps not statin initiation alone, may reduce the short-term risk of dementia and dementia or death. Residual confounding could have led to an underestimation of the beneficial effect of statin use.

S/P indicates work done while a student/postdoc
USING PROBABILISTIC BIAS ANALYSIS TO RE-EXAMINE THE OBESITY PARADOX IN CHRONIC KIDNEY DISEASE MORTALITY

Melissa Soohoo* Melissa Soohoo, Elani Streja, Onyebuchi A. Arah, (University of California, Los Angeles)

Background: In late-stage chronic kidney disease (CKD), obese patients have better outcomes compared to normal weight or non-obese patients, a phenomenon known as the obesity paradox. Its been suggested that these observed associations might be partially due to uncontrolled confounding by inflammation, as inflammation increases with advancing CKD. We examined the association of body mass index (BMI) with mortality across CKD stages, bias-adjusted for plausible uncontrolled confounding due to inflammation. Methods: Cox proportional hazards models were used to examine the association of BMI with mortality (ref. BMI 25-<30 kg/m2), by CKD stage, adjusted for demographics and comorbid conditions, among 2,337,607 US veterans with a median follow-up of 9 years. We performed bias analysis using a series of weighted probabilistic models of inflammation given observed record-level data in order to adjust for unmeasured inflammation. Results: The cohort was an average 64 ±14 years old, with 5% females, 14% African-Americans, 45% smokers. In adjusted analyses and across all CKD stages, the association of BMI with mortality showed a reverse J-shape, where both lower BMI and higher BMI were associated with higher mortality risks. Conversely, modestly higher BMI (30-<35 kg/m2) was associated with lower mortality risk across all stages, demonstrating an obesity paradox (Fig A). The probabilistic bias analysis for uncontrolled confounding by inflammation strengthened the paradoxical inverse obesity-mortality association for those with BMI 30-<40 kg/m2 and late stage CKD (Fig B). Conclusion: The lowest mortality risk in late-stage CKD was observed for moderately high BMI. Moreover, our bias analysis using plausible information on the conditional associations of unmeasured inflammation with both BMI and mortality, suggest that after adjusting for measured confounders, inflammation might not fully explain the obesity-mortality paradox in CKD patients.
FLAVONOIDS, AND FLAVONOID SUBCLASSES INTAKES AND BREAST CANCER RISK: A CASE-CONTROL STUDY IN CHINA  

Cai-Xia Zhang*, Cai-Xia Zhang, Xiao-Li Feng, (Sun Yat-Sen University)

Background Anti-tumor effect of dietary flavonoids has been sustained by laboratory experiments, but epidemiological studies with breast cancer risk remained inconsistent and insufficient. Different dietary flavonoid subclasses may exert different influences on breast cancer. Our study investigated the associations between flavonoid and flavonoid subclasses and breast cancer risk among Chinese population. Methods This hospital-based case-control study included 1522 eligible newly diagnosed and histologically confirmed breast cancer cases and 1547 frequency-matched controls recruited from June 2007 to July 2018 in Guangdong, China. Dietary information was obtained by face-to-face interview using a validated food frequency questionnaire. Subclasses of flavonoid (anthocyanidins, flavanols, flavanones, flavones and flavonols) intake from total foods and beverage were calculated according to the updated flavonoids food composition database published by the US Department of Agriculture. Isoflavones intake was calculated according to the 2002 Chinese Food Composition Table. Results After adjusting potential confounders, significant inverse association were observed between total flavonoids, most flavonoid subclasses consumptions and overall breast cancer risk. Compared with the lowest quartile, the adjusted OR (95%CI) for the highest quartile were 0.66 (0.53, 0.81) for total flavonoids, 0.60 (0.48, 0.75) for anthocyanidins, 0.66 (0.53, 0.83) for proanthocyanidins, 0.70 (0.57, 0.87) for flavanones, 0.48 (0.39, 0.60) for flavones, 0.51 (0.41-0.63) for flavonols, 0.67 (0.54-0.83) for isoflavones, respectively. No significant association was found between flavanols, flavan-3-ol monomers, theaflavins and breast cancer risk. The associations of flavonoid with breast cancer were not modified by ER/PR status. Conclusions This study indicates that total flavonoids, anthocyanidins, proanthocyanidins, flavanones, flavones, flavonols and isoflavones intake were inversely associated with breast cancer risk.

S/P indicates work done while a student/postdoc
Background: The Centers for Disease Control and Prevention recommends intake of foods rich in iron, calcium, and vitamin C for managing elevated childhood blood lead levels (BLLs). However, there is limited empirical evidence on food intake patterns that are associated with low BLLs. Methods: Data from 992 12-36-month old children from the 2009-2014 National Health and Nutrition Examination Survey were used assess the association between intake of foods rich in iron, calcium, and vitamin C and BLLs. Intake was based on a 24-hour dietary recall; individual foods were grouped into 10 energy-adjusted food groups. Consumption was categorized as none (reference) and tertiles. BLLs were log-transformed. Linear regression was used to test the association between energy-adjusted food groups and BLLs adjusting for age, race, poverty to income ratio, receiving Women, Infants, and Children program benefits the prior year, and enrollment cycle. Results: The median (range) BLLs of the 992 children were 1.1 (0.08, 34.11) µg/dL. Compared to no intake, any intake of breakfast cereal [tertiles 1, 2, 3: β (95% CI) = -0.17 (-0.26, -0.08), -0.16 (-0.32, -0.01), -0.22 (-0.34, -0.10) respectively] and high intake of any vegetables [tertile 3: -0.15 (-0.27, -0.02)] were associated with lower BLLs. Intake of starchy vegetables [tertile 3: 0.15 (0.01, 0.29)], meats [tertile 2: 0.21 (0.07, 0.35)], and fruit drinks [tertiles 1, 2, 3: 0.16 (0.03, 0.30), 0.20 (0.09, 0.31), 0.23 (0.09, 0.31) respectively] were associated with higher BLLs, with no evidence of a dose-response relationship. Intake of other foods (milk, sweets, grains, starchy vegetables, fruits, and legumes) was not associated with BLLs. Conclusion: In a representative sample of US children with low lead exposure, consumption of foods rich in iron, calcium or vitamin C is not a good predictor of BLL variability.
FOOD INTAKE AND BLOOD LEVELS OF MERCURY, LEAD, AND CADMIUM AMONG HEALTHY REPRODUCTIVE AGED WOMEN Keewan Kim* Keewan Kim, Carrie Nobles, Alexandra Purdue-Smithe, Jean Wactawski-Wende, Anna Pollack, Joshua Freeman, Zeina Alkhalaf, Victoria Andriessen, Jeannie Radoc, Sunni Mumford, (NICHD)

Objectives: Though toxic metals adversely affect reproductive health, common food sources among reproductive aged women are less understood. We addressed this gap among healthy premenopausal women, residing in western New York, 2005-2007. Methods: Women enrolled in the BioCycle Study (n=249, mean age 27.4 years and BMI 24.1 kg/m2) completed a baseline food frequency questionnaire and provided blood samples to measure levels of mercury (Hg), lead (Pb), and cadmium (Cd). We used linear regression to examine associations between food intake and log-transformed toxic metals, adjusted for age, BMI, race, smoking, physical activity, and intakes of energy, protein, fat, and fiber. Models were adjusted for false discovery rate.

Results: Total fish intake ≥1 serving per day was associated with 54.7% (95% CI 36.1, 75.9) higher Hg levels, compared to <1 serving, as well as specific fish intakes (i.e., canned tuna, fried fish, shellfish, white fish, and dark fish). Though total meat intakes were not associated with Hg, intakes of lunch meat (28.1%), beef/pork/lamb (21.0%), and chicken/turkey (43.5%) were associated with higher Hg levels, compared to no intake. Intakes of specific vegetables, including red pepper (17.4%), green beans (20.1%), summer (24.7%) and winter squash (19.3%), and garlic (18.5%) were associated with higher Hg levels. Total fruit intake ≥1 serving per day was also positively associated with Hg (18.7%, 95% CI 4.8, 34.5), compared to 0 versus no intake. Compared to no intake, green pepper (11.8%) and cauliflower (9.9%) were associated with higher Pb levels, whereas apples were associated with lower Pb levels (-14.6%). No associations were found between food intakes and Cd. Conclusions: We found that intakes of certain foods are related to a higher blood level of toxic metals among reproductive aged women. Further research on food preparations (e.g., washing, packing) to reduce toxic metals exposure is needed.
MEAL TIMING, DISTRIBUTION OF MACRONUTRIENTS, AND INFLAMMATION AMONG AFRICAN-AMERICAN WOMEN Michael Wirth, Samantha Truman, Swann Arp Adams, Gabrielle Turner-McGrievy, Kelly Reiss, James Hebert, (University of South Carolina)

Background: Chronic low-grade inflammation is an underlying risk factor for several metabolic diseases and cancer. Eating at earlier times in the day has been associated with a reduction in inflammatory activity. This study aims to explore the effect of various meal time-related factors of macronutrient consumption in relation to chronic inflammation and Breast Imaging Reporting and Data System (BI-RADS) readings. Methods: This cross-sectional analysis consisted of 249 African-American women who were either overweight or obese (>25 kg/m2). A single 24-hour dietary recall was administered, blood samples were assayed for c-reactive protein (CRP) and interleukin-6 (IL-6), and BI-RADs ratings from digital mammograms were assessed. Meal-timing was operationalized as the percentage of calories consumed after 5PM. This was analyzed continuously and categorized at ≥30% vs. <30% energy. Additionally, meal-timing was characterized by the meal (i.e., breakfast, lunch, or dinner) that contained the largest quantity of fat, protein, or carbohydrate. Multiple linear and logistic regression models were used to assess these relationships. Results: The majority of women (73%) consumed more than 30% of their calories after 5PM. Higher carbohydrate consumption at breakfast was associated with a significantly lower CRP vs. higher carbohydrate consumption at dinner (7.08, vs. 9.58 mg/L, respectively, p = 0.03). In addition, every 1-unit increase in percent energy consumed after 5PM resulted in a BI-RAD reading indicating a possibly suspicious abnormality (OR: 1.053, 95% CI: 1.003-1.105), suggesting an increase in breast cancer risk. Conclusions: Eating later in the day may contribute to mechanisms that increase risk of breast cancer. Both timing of energy and macronutrient consumption may modulate chronic inflammation, with important implications for reducing the risk of developing breast cancer and other chronic diseases.
ABNORMAL METABOLIC COMPONENTS CLUSTERING AND ASSOCIATED INDIVIDUAL HABITUAL BEHAVIORS – A NATIONWIDE ADOLESCENT STUDY IN TAIWAN

Wei-Ting Lin*
Wei-Ting Lin, Chun-Ying Lee, Pei-Wen Wu, Yu-Ting Chin, David W. Seal, Chien-Hung Lee, (Tulane University)

The clustering of metabolic risk factors in childhood predicting adult metabolic syndrome (MetS), type 2 diabetes, and cardiovascular diseases were proposed in prior studies. Early identification and management for pediatric metabolic dysfunctions has been considered be a vital focus in child healthcare. This study aims to investigate the clustering of abnormal metabolic risk factors and associated unhealthy lifestyle patterns among Taiwan adolescents. We evaluated 1920 representative adolescents aged 12-18 years with complete questionnaire, body measurement and clinical examination who were selected from 2010-2011 Nutrition and Health Survey in Taiwan. The MetS diagnostic criteria defined by the Taiwan Pediatric Association (TPA) and International Diabetes Federation (IDF) for adolescents, and the criteria defined by the Joint Interim Statement for adults (JIS-Adult) were used to evaluate abnormal components. Survey data modules were used to adjust for sampling weights in all analyses. Multivariable logistic regression models were used to assess the effect of lifestyle factors on the clustering of metabolic risk factors. The prevalence of TPA-, IDF-, and JIS-Adult-defined MetS was 4.1%, 3.0%, and 4.0%, respectively, with 22.1%, 19.3%, and 17.7-18.1% of adolescents having high fasting glucose, low high-density lipoprotein cholesterol and central obesity. A 0.4-to-0.5-fold decreased risk of having ≥2 MetS abnormal components was detected among adolescents who consumed ≥1 servings/week of dairy product and fresh fruit. Boys who consumed ≥7 drinks/week of soda drinks and girls who consumed ≥7 drinks/week of tea beverages had a 4.6-and 6.8-fold risk of MetS, respectively. In conclusion, this study reveals significant dimensions of MetS in adolescents, including detecting population-specific prevalent patterns for MetS risk components and their clustering, and lend support to the emphasis placed on health promotion activities for reducing sugary drinks intake.
AN ECOLOGICAL STUDY OF THE ASSOCIATION AND SPATIALLY VARYING RELATIONSHIP BETWEEN EXTREME OBESITY AND MORTALITY RATES AMONG ADULTS IN THE UNITED STATES Carrie W. Mills* Carrie W. Mills, Glen Johnson, Deborah Balk, Terry Huang, Katarzyna Wyka, (CUNY Graduate School of Public Health and Health Policy)

Mortality rates in the US have slowed their long-running decline in recent years. One hypothesis addressing this change is that mortality trends are displaying a delayed effect of the obesity epidemic. This study utilizes a spatial approach to measure the county-level association of extreme obesity and mortality rates. Additionally, the presence of spatial heterogeneity in the association between extreme obesity and mortality across the US is assessed. County-level prevalence estimates of extreme and moderate obesity created from the 2012 Behavioral Risk Factor Surveillance System and Census Bureau were used for this analysis. Age-adjusted county-level mortality rates (per 100,000) were obtained from the 2010-2014 National Vital Statistics System. Covariate data on health care access, health behavior, economics, and physical environment were obtained from 2015 County Health Rankings National Data. Using a spatial error model, the association between county-level prevalence of extreme obesity and mortality was assessed while controlling for spatial autocorrelation. Geographically weighted regression was used to explore whether the association varied spatially by area of residence. The association between moderate obesity and mortality was examined for comparison. Both extreme and moderate obesity were associated with mortality rates and the association was stronger for extreme obesity. One unit rise in prevalence of extreme obesity was associated with increased 8.4 mortality rate (SE= 1.07, p <.0001) while one unit rise in moderate obesity was associated with an increase of 6.1 (SE= 0.45, p <.0001). There was significant spatial heterogeneity in the association between extreme obesity and mortality (IQR 1.60-14.35, p <.001).

Extreme obesity was more strongly associated with mortality than was moderate obesity and the association displayed significant spatial heterogeneity. Additional research to identify the cultural, policy, or other contextual factors is warranted.

Figure 1. GWR Correlation Coefficients of Effect of Extreme Obesity on Age-Adjusted Mortality Rates
THE EFFECTS OF HEAT ILLNESS EVENTS ON MEDICAL NON-READINESS IN THE U.S. ARMY
Alexis Maule* Alexis Maule, , (ORISE - APHC)

Using reportable medical event surveillance data, rates of heat illness (heat exhaustion and heat stroke) have increased among U.S. Army Soldiers since 2014. Heat illnesses exist along a continuum of symptoms and illness severity, and a clinical diagnosis of heat exhaustion is less severe than heat stroke. However, both conditions can result in hospitalization and lost duty days. Temporary medical profiles are issued to Soldiers which limit their duties to allow for recovery from illness and injury. If profiles exceed 14 days, Soldiers are temporarily considered not medically ready to deploy. This project examined predictors of medical non-readiness following heat illness events. Analysis for this project utilized 647 heat exhaustion and 172 heat stroke cases reported to the Disease Reporting System internet from January through December 2017. Length of a profile (in days) was pulled from the Military Operational Data System eProfile application and dichotomized into profile groups (profile >14 days versus ≤14 days (reference)). Type of reported heat illness, hospitalization, race, age, duty status (i.e., Active Duty, Reserve/National Guard, Recruit), gender, and body mass index (BMI) were entered as predictors of medical non-readiness (profile >14 days) in a stepwise logistic regression model using p<0.20 as the cut-off for entry and removal. Standardized beta estimates determined the strength of predictors and odds ratios (OR) were calculated by exponentiating beta estimates. Hospitalization (OR=5.7, 95% CI: 3.9, 8.5) was the strongest predictor of medical non-readiness, followed by heat illness type. Heat stroke cases had increased odds of non-readiness compared to heat exhaustion (OR=3.2, 95% CI: 2.0, 4.9). Gender, BMI, and duty status remained in the model. These results indicate heat illness events requiring hospitalization and heat stroke case status are associated with individual medical non-readiness which has consequences for unit operational readiness.
Between 2001 and 2009, roughly 320,000 (19.5%) soldiers sustained a traumatic brain injury (TBI), with an estimated 75% of those classified as mild (mTBI). mTBIs may have long term consequences that impact soldiers’ readiness and resilience. This study evaluated if having a mTBI affected separation from Army service between 2002 and 2011. Using data from the Total Army Injury and Health Outcomes Database, a data repository for all active duty Army personnel, a risk set matched cohort analysis was conducted examining three groups of injured soldiers (mTBI injured, traumatic non-head injured, and combined traumatic head and non-head injured (polytrauma)). Each injured soldier was matched on date of injury to four uninjured soldiers who had served the same duration of time in the military as the injured soldier. Conditional logistic regression models evaluated differences in the odds of separation by injury type and were computed annually post-injury to calculate annual odds of military separation by injury category. Cox proportional hazards models estimated hazards ratios of time to separation from service based on injury type. All models were adjusted by age, sex, race, education, marital status, military rank, deployment history, and history of a PTSD, anxiety, or depression. Injured Soldiers from all three groups experienced increased odds of military separation (mTBI OR (95%CI): 1.055 (1.003, 1.109); trauma OR (95%CI): 1.168 (1.158, 1.179); and polytrauma OR (95%CI): 1.181 (1.103, 1.264)). However, only the polytrauma group separated at a faster rate than uninjured soldiers on average (HR (95%CI): 1.065 (1.005, 1.129)). In the first year post-injury, injured soldiers were less likely to separate from service than their uninjured comrades, but this finding did not remain consistent after the first year post-injury. Our findings suggest injury type does impact Army separation. Future analyses will focus on evaluating factors that modify separation by injury group.

Objective: The drug overdose mortality rate has rapidly increased in the past two decades. The major causes of these deaths involved prescription (Rx) opioids. Workers in industries with high injury rates may be more likely to be exposed to opioids. Studies of the extent of analgesics (opioids, non-opioids) Rx medication use among US workers are limited. Our aim was to estimate the prevalence of Rx opioids and Rx non-opioid analgesics among US adults and working adults, overall and by industry groups. Methods: Self-reported Rx drug use in the past 30 days was collected from adults (aged ≥18 years) in the National Health and Nutrition Examination Survey (2005-2012). Working adults were defined as adults aged ≥18 years and employed in the week prior to the survey. Prevalence of Rx opioids and Rx non-opioid analgesics use were estimated by demographics and industry group using SUDAAN v11.0. Results: Overall, the prevalence of Rx opioids and Rx non-opioids analgesic use were higher among all adults (6.6% and 9.3%, respectively) than among working adults (4.4 and 6.5, respectively). Workers in Mining had the highest prevalence of Rx opioids use (8.1), followed by Accommodation and Food Services (6.5) and Health Care and Social Assistance (6.1). The highest prevalence of Rx non-opioid analgesics use was observed among workers in Accommodation and Food Services (9.7), followed by Health Care and Social Assistance (7.0) and Transportation and Warehousing (7.7). Conclusions: Workers in Mining reported the highest prevalence of Rx opioids use. Workers in Accommodation and Food Services had the highest prevalence of Rx non-opioid analgesics use and the second highest prevalence of Rx opioids use. Prevalence of Rx opioids and Rx non-opioid analgesics use varies across industry groups.
VALIDITY OF RETROSPECTIVE OCCUPATIONAL EXPOSURE ESTIMATES OF LEAD AND MANGANESE IN A CASE-CONTROL STUDY


Background: The validity of surrogate measures of retrospective occupational exposure in population-based epidemiological studies has rarely been evaluated. Using toenail samples as an objective exposure measure, we assessed whether work tasks and expert assessments of occupational metal exposure obtained from personal interviews were associated with lead and manganese concentrations. Methods: We selected 609 controls from a case-control study of bladder cancer in New England who had held a job for at least 1 year in the 8-24 months prior to toenail collection. We evaluated associations between toenail metal concentrations and five tasks extracted from occupational questionnaires (grinding, painting, soldering, welding, and working near engines) using linear regression models. For 139 subjects, we also evaluated associations between the toenail concentrations and exposure estimates from three experts. Results: We observed a 1.9-fold increase (95% confidence interval (CI) 1.4-2.5) in toenail lead concentrations with painting and 1.4-fold increase (95% CI 1.1-1.7) in manganese concentrations with working around engines and handling fuel. We observed significant trends with increasing frequency of both activities. For lead, significant trends were observed with the ratings from all three experts. Their average ratings showed the strongest association, with subjects rated as possibly or probably exposed to lead having lead concentrations that were 2.0 and 2.5 times higher, respectively, than in unexposed subjects (Ptrend<0.001). Expert estimates were only weakly associated with manganese toenail concentrations. Conclusions: Our findings support the validity of surrogate measures to assess occupational exposure in epidemiologic studies. The stronger associations with task frequency and expert assessments support using refined exposure characterization whenever possible.

S/P indicates work done while a student/postdoc
THE EFFECT OF SUPERVISOR TRAINING PROGRAM ON WORK RELATED MUSCULOSKELETAL DISABILITY COSTS AND WORKERS’ SELF-REPORTED OUTCOMES.
Neha Dewan* Neha Dewan, Dr. Vicki Kristman, Joshua Armstrong, (Postdoctoral Fellow)

Objectives: In this proposed project, we will investigate the effect of the supervisor training program (STP) on reducing total indemnity costs of the workers working on crews involved in the STP study. Secondarily, we will explore whether the STP has any impact on workers’ self-reported outcomes. Methods: The proposed study expands on a CIHR funded cluster RCT by focusing on self-reported outcomes of the workers. We will recruit workers directly from participating transportation/mining worksites in Canada. Worksites will be randomized at the department level to either supervisor training or no training. Workers will be blinded to the intervention. All consenting workers will be surveyed prior to supervisor training with follow up assessment at 3-months. Intervention: The training focuses on improving supervisor understanding of musculoskeletal (MSK) disorders & the recovery process, job modifications/ergonomic advice, fatigue management, effective team communication & problem-solving strategies to promote supportive worker relations. The primary outcome will be MSK related worker compensation indemnity costs for the lost work time. The worker reported outcomes will include assessment of supervisor-employee relationship; fatigue, quality of life; workers’ perception of organization/supervisor expectation & supervisor attitude regarding problem-solving to improve their MSK health & work functioning. Analysis: Indemnity costs will be summed across departments & mean comparisons will be made using t-tests. Impact of STP on worker-reported outcomes will be analyzed using t-tests and multivariate multilevel modeling will be used to account for confounders & clustered nature of the data: workers nested within supervisors, who will be nested within randomized departments. Potential Impact: This project will provide evidence for reductions in work disability costs associated with supervisor training and will help us understand how supervisor training impacts individual workers.
THE IMPACT OF MIDLIFE JOB LOSS ON SELF-INJURY MORTALITY IN A COHORT OF AUTOWORKERS; APPLICATION OF A NOVEL CAUSAL APPROACH Suzanne Dufault*, Suzanne Dufault, Sally Picciotto, Andreas Neophytou, Ellen Eisen, (Graduate Group in Biostatistics, University of California, Berkeley)

In 2018, the U.S. Centers for Disease Control and Prevention reported a 30% increase in the suicide rate over the last two decades. Further, unintentional poisonings, commonly due to opioid overdoses, nearly tripled. The phrase “deaths of despair” has been used to link these increasing death rates to the deterioration of economic and social stability in middle aged men and women. In a nationally representative sample of the US population over age 52, more than half of full-time workers with a long-term employer experienced involuntary employment separation. We examined the impact of precariousness of employment at older ages on risk of self-injury mortality (suicide combined with unintentional poisonings) in the General Motors – United Autoworkers cohort. For 22,000 autoworkers ever employed between ages 35 and 64, we estimated the causal effects of hypothetical interventions to reduce the annual odds of leaving work, under assumptions. We applied incremental propensity score interventions to examine how shifting the odds by a series of multiplicative factors (δ between 0.1 and 5) would have affected the cumulative incidence of self-injury mortality. In order to develop a comprehensive picture of the relationship we estimate a curve for the incremental effect on self-injury over a range of possible intervention sizes. The cumulative incidence of self-injury mortality was 0.74% (167 cases) at the observed odds of leaving work (δ = 1). Cumulative incidence rose monotonically to 1.1% as we incrementally increased the odds of leaving work to 5. It fell when the odds were decreased: the estimated cumulative incidence of self-injury mortality dropped by 24%, to 0.56% (95% CI: [0.29%, 0.82%]) when the odds of leaving work were halved (δ = 0.5). These results suggest that staying at work until retirement age reduces the midlife risk of death due to suicide or drug overdose after work termination.
COMMUNITY AND IN-HOSPITAL ACQUIRED ACUTE KIDNEY INJURY IN THE CLINICAL EMERGENCY DEPARTMENT AT AN UNIVERSITY TERTIARY HOSPITAL: COMPARISON OF FREQUENCY AND OUTCOMES BY DIFFERENT DIAGNOSIS CRITERIA

Dirce Maria Trevisan Zanetta*, Dirce Maria Trevisan Zanetta, Flávia Barros de Azevedo, Lia Junqueira Marçal, Verônica Torres da Costa e Silva, Leila Antonangelo, Luiz Yu, Emmanuel de Almeida Burdmann, Dirce Maria Trevisan Zanetta, (University of Sao Paulo School of Public Health)

Prospective studies comparing community and in-hospital acquired acute kidney injury (AKI) are scarce. This study compared frequency, and outcomes of community AKI (CAKI) and in-hospital acquired AKI diagnosed by RIFLE or KDIGO (serum creatinine criteria - SCr) in patients (pts) admitted to the Emergency Department (ED) through a reference emergency room of a tertiary university hospital. All pts aged ≥ 18 years, with ED hospitalization > 48hs were included and assessed prospectively until day 7 of hospitalization or discharge. Exclusion criteria: chronic kidney disease stage 5, pts on palliative care and renal transplant. Pts were divided in five groups: no-AKI, CAKI, AKI by RIFLE (AKI RIFLE), AKI by KDIGO (AKI KDIGO) and AKI KDIGO positive and AKI RIFLE negative (AKI K+R-). Data are presented as median (minimum-maximum values) or percentage (%). Among 788 pts evaluated, 231 (29.3%) developed in-hospital AKI according to KDIGO, mostly KDIGO I (69.7%), and 167 pts (21.1%) presented community-acquired AKI, resulting in 398 AKI patients (50.5%). RIFLE criteria identified 148 pts (18.8%) and 83 pts (10.5%) were AKI K+R-. Main causes of hospitalization were pulmonary (36.2%), cardiovascular (11.3%) and gastric (16.3%). Compared with non-AKI pts, those with AKI were older, and had longer length of in-hospital stay (Non-AKI: 57(18-95) years and 5(2-132) days, respectively vs CAKI (64 (18-98) years and 9 (1-132) days), AKI RIFLE (64 ( 18-98) years and 10 ( 2 - 95) days), AKI KDIGO(65 (18-98)years and 9 ( 2-95)days) and AKI K+R-(66 ( 20-95) years and 8( 2-78)days). In-hospital mortality differed significantly in all groups: Non- AKI: 9.5%, CAKI: 17.4%; AKI RIFLE: 31.1%, AKI KDIGO: 28.5% and AKI K+R-: 24.1%. KDIGO criterion diagnosed more patients than RIFLE in hospitalized patients. Frequency of CAKI and in-hospital AKI in the first 7 days of hospitalization was remarkably high in ED, with higher in-hospital mortality than non-AKI patients in all groups evaluated.
ATTEMPT TO MODERNIZE EPIDEMIOLOGICAL CONCEPT OF HEALTH STATUS IN HEALTH PROMOTION PRACTICE  Hideo Yamazaki* Hideo Yamazaki, Soichi Sakabe, Xiao Qing, Minako Danbara, Hikaru Yamazaki, (Tokoha University)

Introduction: Non-communicable diseases (NCDs) are responsible for 60% of the causes of death in Japan. Also, in many developed countries, they remain one of leading causes of death. NCDs will be to have cumulative exposure to some disorder or behavioral disadvantage. The present study proposed a modernized concept of health status which indicated people’s poor health condition in a transitional stage from health condition to disease. A fundamental scheme of the concept was based on theoretical relation between the natural history of disease and preventive medicine. Methods: The authors adopted the secondary survey. We surveyed time-series on main disease from the past to present in order to extract a fundamental scheme of the present concept. The survey should be covered diseases transition which has attacked human beings from the beginning of the 1900s to the present. Then we examined the relationship between the natural history of disease and preventive medicine. Results: The outline of time-series on main diseases which have attacked human beings over about one thousand years should have four stages. The first stage was shown as an epidemic of acute and infectious digestive diseases such as the plague. The second was shown as an epidemic of respiratory diseases such as tuberculosis and the third was shown as an epidemic of chronic and non-infectious diseases such as life-style related diseases and diseases resulting from the structure of complicated society. Next, we analyzed the relationship between the natural history of diseases and preventive medicine. Then tree patterns were extracted based on each the corresponding phase. The phases were the correspondence of the susceptibility with primary prevention, of the preclinical with secondary prevention, and of the clinical with tertiary prevention. Conclusions: It was suggested that the first phase was necessary for dividing into two sub-phases from a light of health promotion activities.

S/P indicates work done while a student/postdoc
Pyrethroids and organophosphate pesticides are used to protect crops and reduce the transmission of insect-borne diseases. Previous studies have found an inverse association between exposure to these pesticides and the birth outcomes. We aimed to investigate the effect of five urinary metabolites (3-PBA, PNP, CPM, OPM, and 24-D) of pyrethroid and organophosphates among healthy pregnant women aged 16-35 living in New York City on the weight at birth, length at birth and head circumference of their children. Urinary biomarkers of 153 women who participated in the Thyroid Disruption and Infant Development Study were measured. We imputed the <LOD values of the metabolites using log probit regression method. We imputed the missing values of the outcomes and the potential confounding variables using multiple imputation methods. All participants with live-birth pregnancies were included in our analysis. Linear regression models were used to evaluate the association between the log of pesticide's concentration and birth length, birthweight and head circumference. The association was assessed in multivariable linear regression models adjusting for season of birth, mode of delivery, ethnicity, home ownership, marital status, education, income, employment, maternal age, gestational age, and maternal pre-pregnancy BMI. Among boys, for each log unit increase in CPM (urinary metabolite of chlorpyrifos) in maternal urine, there was a 1.30 cm decrease in head circumference (95% CI: -2.41, -0.19). There was a positive association between urinary concentration of 2,4-dichlorophenoxyacetic acid and birthweight (b=99.7, 95% CI: 5.83, 193.57). Among girls, for each log unit increase in urinary level of OPM (urinary metabolite of permethrin), there was a 0.70 cm increase in head circumference (95% CI: 0.13, 1.27). Our results support the previous findings of the effect of prenatal exposure to organophosphate and pyrethroid pesticides on head circumference in this urban cohort.
FACTORS IN THE HOSPITAL EXPERIENCE ASSOCIATED WITH POSTPARTUM BREASTFEEDING SUCCESS
Karen Schliep* Karen Schliep, Daniel Denhalter, Lisa Gren, Katherine Panushka, Tejinder Pal Singh, Michael Varner, (University of Utah)

Introduction: Hospitals are in a unique position to promote, protect, and support breastfeeding. However, how effective their measures are within population-based samples has not been well studied. Materials and Methods: A stratified (by education and birth weight) systematic sample of 5,770 mothers taking part in the Utah Pregnancy Risk Assessment Monitoring System, 2012–2015, were included. Mothers, 2–4 months postpartum, completed the 82-item questionnaire including if they had ever breastfed their new baby, and if so, current breastfeeding status. Relationships between in-hospital experiences and breastfeeding termination and duration were evaluated via Poisson and Cox proportional hazard regression models, adjusting for other in-hospital experiences, maternal age, race/ethnicity, maternal education, marital status, smoking, physical activity, delivery method, pregnancy complications, and length of hospital stay. Results: 94.4% of mothers self-reported breastfeeding initiation, of whom 18.8% had breastfed < 2 months, having breastfed on average 3.2 weeks (SE: 0.07). Mothers who reported receiving a pacifier, receiving formula, or had staff help them learn how to breastfeed had a higher prevalence of terminating breastfeeding prior to 2 months (adjusted prevalence ratio [aPR]=1.13, 95% CI: 0.97, 1.32; aPR=1.20, 95% CI: 1.07, 1.36; and aPR=1.25, 95% CI: 1.08, 1.34). Conversely, mothers who reported starting and feeding only breastmilk in the hospital and receiving a phone number to call for help with breastfeeding had a lower prevalence of breastfeeding termination prior to 2 months (aPR=0.72, 95% CI: 0.61, 0.86; aPR=0.57, 95% CI: 0.51, 0.64; and aPR=0.91, 95% CI: 0.80, 1.03). Adjusted Cox models showed similar direction of associations (Figure 1). Conclusions: Encouraging mothers to exclusively breastfeed in the hospital, and reducing gift packs containing pacifiers and formula, may be key areas U.S. hospitals can focus on to increase breastfeeding success.

Figure 1: Adjusted Hazard Ratios (HR) for Breastfeeding Discontinuation by In-Hospital Newborn Care Enhancement Measures (UT-PRAMS 2012-2015)

 Adjusted for other HHNCEM measures, maternal age race/ethnicity, maternal education, marital status, smoking, exercise in last trimester, vaginal delivery, multiples, preterm birth, hypertensive disorder of pregnancy, gestational diabetes, birth defect, and length of hospital stay.

S/P indicates work done while a student/postdoc
LUNG FUNCTION AND BIRTH WEIGHT: TWO-SAMPLE MENDELIAN RANDOMIZATION STUDY Baoting He* Baoting He, Maggie Kowk, C Mary Schooling, (The University of Hong Kong)

Background: Evolutionary theory and the developmental origins of health and diseases suggest early-life growth may affect adult health. Observationally poorer intrauterine experiences, proxied by low birth weight, are associated with poorer lung function, but this relation may be confounded by social-economic position and maternal health status. Here we assessed the role of genetically predicted birth weight in lung function, and genetically predicted maternal lung function in offspring birth weight using Mendelian randomization. Methods: Genetic instruments were obtained from the largest published genome-wide association studies of birth weight (44 single nucleotide polymorphism (SNPs)) and of maternal lung function (11 and 8 SNPs for FEV1 and FVC). Summary genetic associations with lung function (n=272,338) and birth weight of the first child for women (n=155,202) were obtained from the UK Biobank. Mendelian randomization estimates were obtained using inverse variance weighting (IVW) with multiplicative random effects. Sensitivity analysis included use of the weighted median, MR-Egger and the Mendelian randomization pleiotropy residual sum and outlier (MR-PRESSO) test, as well as exclusion of potentially pleiotropic SNPs. Results: Birth weight was positively associated with lung function (FEV1 0.16 per standard deviation (SD), 95% confidence interval (CI) 0.08 to 0.25, FVC 0.21, 95% CI 0.11 to 0.30). Weighted median, MR-Egger and MR-PRESSO estimates were in same direction. After exclusion of potential pleiotropic SNPs related to height, the IVW estimates were attenuated but still significant. Maternal lung function was not associated with offspring birth weight (FEV1 -0.01 per SD, 95% CI -0.10 to 0.08, FVC -0.05, 95% CI -0.16 to 0.06). Conclusions: Our study suggests a positive association of birth weight and lung function, which is not confounded by maternal lung function.
LOW CIGARETTE CONSUMPTION BEFORE AND DURING PREGNANCY IN RELATION TO RISK OF PRETERM BIRTH: A LARGE POPULATION-BASED STUDY WITH 22 MILLION MOTHER-INFANT PAIRS Buyun Liu* Buyun Liu, Guifeng Xu, Yangbo Sun, Yongfu Yu, Linda G. Snetselaar, Wei Bao, (University of Iowa)

Background: Health effects of low-level cigarette consumption during pregnancy are unclear. This study aimed to examine the trimester specific association of maternal cigarette consumption with risk of preterm birth in a large-scale population-based study. Methods: We used the US nationwide birth certificate data from singleton mother-infant pairs in the National Vital Statistics System (NVSS) 2011-2017. Preterm birth was defined as gestational age less than 37 weeks. Participants were divided into 8 groups according to their smoking status (yes or no) before and during pregnancy (1st and 2nd trimester). We used logistic regression to estimate the odds ratio (OR) of preterm birth for smoking vs non-smoking before pregnancy and at each trimester. In addition, the OR of preterm birth with various amounts of cigarette consumption was estimated. Maternal age, race/ethnicity, parity, education, smoking during pregnancy, previous history of preterm birth, marital status, infant sex, and initiation of prenatal care were adjusted. Results: This study included 22,163,580 mother-infant pairs, containing 2,004,139 preterm births. Compared with women who never smoked, women who smoked, even during only one period, had a higher risk of having a preterm birth. The OR (95% confidence interval [CI]) of preterm birth was 1.00 (0.99-1.02), 0.99 (0.98-1.00), 0.96 (0.94-0.97), 1.01 (0.99-1.02), and 1.01 (1.00-1.02) for those who smoked 1-2, 3-5, 6-9, 10-19, and ≥20 cigarettes per day before pregnancy, respectively. The corresponding ORs for those who smoked during the first trimester were 1.14 (1.12-1.16), 1.12 (1.10-1.14), 1.13 (1.10-1.15), 1.21 (1.19-1.23), and 1.29 (1.27-1.31), while for those who smoked during the second trimester, the OR was 1.18 (1.15-1.20), 1.17 (1.16-1.19), 1.17 (1.15-1.20), 1.27 (1.25-1.29), and 1.37 (1.35-1.40), respectively. Conclusion: Low-level cigarette consumption during pregnancy, even if only 1-2 cigarette per day, may rise the risk of preterm birth.
Phototherapy (PT) is a common treatment for jaundice in newborns and may negatively affect breastfeeding (BF). Previous studies of its effect on BF have not controlled for bilirubin levels, which may be higher if BF is not going well. This study evaluated whether PT affected any BF or exclusive BF at two months of age. We obtained electronic medical records on 42,426 infants born in 2010-2014 at ≥35 weeks’ gestation in 16 Kaiser Permanente Northern California Hospitals with a qualifying bilirubin level (bilirubin within -3 to +4.9 mg/dL of PT threshold for age). Exposures of interest were PT during the birth hospitalization, home PT, and readmission for PT. Outcomes were exclusive BF and any BF reported by caregivers at 2-month well-child visits. We estimated logistic regression models, adjusting for qualifying bilirubin level and other confounding variables. Coefficients from these models were used to estimate marginal risk differences (RDs). Of the eligible sample, 28,886 (68%) had 2-month BF data available, of whom 28,746 (99.5%) had complete covariate data. Of these, 25% received PT during the birth hospitalization, 16% received home PT, and 11% were readmitted for PT; 6% had more than one exposure to PT. At two months, 39% were breastfed exclusively and 76% were breastfed at all. While PT during birth hospitalization was associated with lower reported exclusive BF (OR: 0.80, 95% CI: 0.76, 0.85), the association was nearly fully attenuated after adjusting for confounders (adjusted OR: 0.94, adjusted RD: -1.53%, 95% CI: -3.06%, 0.00%). PT during birth hospitalization did not affect any BF at two months after adjusting for confounders (crude OR: 0.92, 95% CI: 0.87, 0.98; adjusted OR: 1.04, adjusted RD: 0.66%, 95% CI: -0.65%, 1.98%). Similarly, neither home PT nor readmission for PT affected any BF outcomes after adjusting for confounding variables. In a large sample of infants from a hospital system that supports BF, PT does not appear to affect BF at 2 months.
Objectives: Fewer studies have examined the role of leisure-time physical activity (LTPA) during pregnancy on preterm births after controlling for physical activity levels before pregnancy. Data and Methods: Data came from the 2009-2015 South Carolina (SC) Pregnancy Risk Assessment Monitoring System, restricting to singleton pregnancies after excluding births
AN EVALUATION OF ZIKA BIRTH DEFECTS SURVEILLANCE: A MODEL FOR RAPID SURVEILLANCE OF BIRTH DEFECTS DURING AN EMERGENCY RESPONSE — UNITED STATES, 2018

Kathleen H. Krause* Kathleen H. Krause, Elizabeth Ailes, Suzanne Gilboa, Van Tong, Janet Cragan, Augustina Delaney, Abbey Jones, John Nahabedian, Samantha Olson, Nicole Roth, Ashley Smoots, Tineka Yowe-Conley, Dana Meaney-Delman, Margaret Honein, (CDC)

Background: Congenital Zika virus (ZIKV) infection can cause serious birth defects of the brain and eyes. During the ZIKV response, CDC funded 50 jurisdictions to conduct Zika Birth Defects Surveillance (ZBDS) to rapidly identify infants with birth defects potentially related to congenital ZIKV infection. Our evaluation assessed the attributes of the ZBDS system and whether ZBDS accomplished its purpose of documenting the prevalence of birth defects potentially related to congenital ZIKV infection. Methods: We evaluated the ZBDS system’s attributes of timeliness, predictive value positive (PVP), data quality, and representativeness by interviewing six CDC and three jurisdictional stakeholders and performing descriptive analyses on key variables. Results: ZBDS was timely; case ascertainment, medical record abstraction, and clinical review occurred within six months of birth compared to two years for traditional birth defects surveillance. PVP was 78.4% and among ten key variables, missingness ranged from 0% to 5.3%. Staff maintained high data quality through clinical review of verbatim text abstracted from medical records, and pre- and postnatal imaging findings (when available), to determine whether every reported case met the surveillance definition. A 2018 Morbidity and Mortality Weekly Report used ZBDS data from 15 jurisdictions to estimate the prevalence of birth defects potentially related to congenital ZIKV infection, which was representative of areas with local transmission and high and low levels of confirmed, symptomatic travel-associated infection. Conclusions: ZBDS obtained timely, high-quality data during an emergency response, which provided representative prevalence estimates of the birth defects potentially related to congenital ZIKV infection. Successful implementation of ZBDS was predicated upon staff effort, which will be required for future emergency response in the absence of a national, standardized birth defects surveillance system.

S/P indicates work done while a student/postdoc
FACTORS ASSOCIATED WITH THE TRAJECTORY OF GESTATIONAL WEIGHT GAIN: A MULTILEVEL ANALYSIS Kohta Suzuki* Kohta Suzuki, Satoshi Shinohara, Shuji Hirata, (Aichi Medical University)

Inappropriate birthweight might be a risk factor of inappropriate childhood growth and development based on “Developmental Origins of Health and Disease” concept. It has been suggested that gestational weight gain (GWG) was a major factor which was associated with birthweight. Moreover, GWG is an intermediate of the association between other prenatal factors, such as hypertensive disorders of pregnancy (HDP) and gestational diabetes mellitus (GDM) and birthweight. However, there was no study to describe the trajectory of GWG and to explore the factors associated with GWG. This study explored the factors associated with GWG by using multilevel analysis. This study included women who received prenatal checkup and delivered a singleton at the University of Yamanashi Hospital between July 1, 2012 and September 30, 2017. Outcomes were GWG at each prenatal check-up and explanatory variables included maternal age, maternal pregestational weight status (PWS), maternal smoking during pregnancy, HDP, GDM and infertility treatment. Multilevel analyses were conducted by using these outcomes and variables stratified by the sex of children. In total, 37239 prenatal examination results were obtained from 2377 pregnant women. In both sex of children, maternal age, maternal PWS, GDM were significantly associated with trajectory of GWG. Furthermore, interaction terms of maternal age, maternal PWS and GDM with gestational duration were also significantly related with GWG. In boys, HDP and maternal smoking during pregnancy were significantly associated with GWG. On the other hand, in girls, there were significant associations between birth order and interaction terms of birth order and maternal smoking during pregnancy with gestational duration and GWG. In conclusion, it was suggested that GWG might intervene the association between some prenatal factors, such as HDP and GDM, and birthweight.
HISTORY OF EARLY-LIFE CANCER AND RISK OF ADVERSE PREGNANCY AND NEONATAL OUTCOMES Leslie V. Farland* Leslie V. Farland, Judy E. Stern, Sunah Hwang, Chia -Ling Liu, Howard Cabral, Richard Knowlton, Susan Gershman, Hafsatou Diop, Stacey A Missmer, (Department of Epidemiology and Biostatistics, University of Arizona)

Background: As early-life cancer survivorship improves, there is increasing interest in the reproductive health of survivors. The goal of this study was to investigate the association between history of cancer, subsequent infertility, and perinatal outcomes. Methods: Deliveries from Massachusetts (MA) vital records for women >18 years old between 2004-2013 were linked to the Society for Assisted Reproductive Technology Clinic Outcome Reporting System, MA hospital stays and Cancer Registry. The relative risks (RR) and 95% confidence intervals of adverse outcomes (gestational diabetes (GDM), pregnancy-induced hypertension (PIH), cesarean section (CS), small for gestational age (SGA), preterm birth (PTB), neonatal mortality, and prolonged neonatal hospital stay) were modeled with a log-link and a Poisson distribution. Generalized estimating equations accounted for women with >1 pregnancy. Models adjusted for maternal age, race/ethnicity, education, and delivery year. Effect modification by infertility history was examined. Results: Among 670,601 deliveries, 2,983 were to women with a history of cancer. The most common cancers were thyroid (21.2%), melanoma (17.8%), breast (10.7%), and cancers of the reproductive organs (23.1%). Deliveries to women with a history of cancer were not at greater risk of GDM, PIH, or CS. However, they were at greater risk of PTB (RR: 1.25 [1.12-1.41]), prolonged neonatal hospital stay (RR: 1.16 [1.01-1.33]), and neonatal mortality (RR: 1.64 [1.00-2.68]). There was heterogeneity in the relationship between history of cancer and SGA by infertility (p-value, test for heterogeneity: 0.02). Among deliveries with a history of infertility, those with a history of cancer had a greater risk of SGA (RR: 1.33 [1.00-1.78]). Conclusions: Deliveries to women with a history of cancer had a greater risk of some adverse pregnancy and neonatal outcomes. The relation with SGA varied by infertility history, which warrants further investigation.
ASSOCIATION OF DEMOGRAPHIC AND CLINICAL FACTORS WITH THE PRE-ZIKA TIME TREND OF MICROCEPHALY IN TEXAS, 1999-2014

Peter H Langlois* Peter H Langlois, Adrienne T Hoyt, Mark A Canfield, (Birth Defects Epidemiology and Surveillance Branch, Texas Department of State Health Services)

Background In Texas, the birth prevalence of the birth defect microcephaly increased from 6.4 cases per 10,000 live births in 1999 to 16.7 cases in 2014. This preceded the Zika virus outbreak in the Americas. We tried using an objective statistical approach to identify which combination of factors might best explain this time trend.

Methods We used data from the Texas Birth Defects Registry and Texas birth certificates for deliveries to Texas residents in 1999 through 2014. Cases were included if they had a definite diagnosis of microcephaly or small head. Poisson regression was used to estimate the slope or annual percent change (APC) for year alone in crude models and together with covariates in two separate adjusted models. Covariates were entered into models both as main effects and interaction effects (year*covariate), and the most parsimonious model was sought beginning with a full model and using a change-in-estimate backwards selection approach for the year term. 'Explanatory' covariates were operationally defined those that most decreased the APC. Results There were 7247 definite cases of microcephaly. The crude APC (with year as the only independent variable) was an average increase of 7.9% per year (95% CI 6.8, 9.0). The most explanatory combination of demographic factors was maternal race/ethnicity, maternal education, infant sex, and Texas health service region; this adjustment reduced the APC to 4.3% (1.9, 6.7). The most explanatory combination of clinical factors was severity of microcephaly, co-occurring exposures, and whether there were co-occurring birth defects, which combined brought the APC to 5.3% (0.8, 10.0). Discussion This objective approach identified factors that might help explain some but not all of the time trend in microcephaly.
GESTATIONAL WEIGHT GAIN AND PREGNANCY OUTCOMES IN WOMEN WITH CHRONIC HYPERTENSION


Background: Gestational weight gain (GWG) is a potentially modifiable risk factor for pregnancy complications and fetal growth. The Institute of Medicine (IOM) has published GWG guidelines but relationships may be different in women with chronic hypertension, a group at high risk for pregnancy complications. We assessed associations of GWG with adverse pregnancy outcomes in women with chronic hypertension. Methods: This retrospective cohort study used routine clinical data for women with chronic hypertension in three integrated health care delivery systems from 2005-2014. We categorized total GWG for outcomes occurring at delivery and rate of GWG for preeclampsia according to the IOM GWG recommendations. We identified outcomes using electronic health records (preeclampsia, cesarean delivery, birthweight, and neonatal intensive care unit (NICU) admission) and birthweight-for-gestational age curves (small-for-gestational age (SGA)). We used log-binomial models to calculate RRs and 95% CIs, adjusted for sociodemographic and medical characteristics. Results: In our cohort of 10,813 women with chronic hypertension, 29% of women gained less than, 24% gained within, and 48% gained more than the IOM recommendations. Rates of preeclampsia were 18%, 17%, and 25% and rates of SGA were 16%, 12%, and 8% in each GWG category, respectively. GWG below the IOM recommendations was associated with 42% greater risk of SGA (RR=1.42; 95% CI: 1.24, 1.62). GWG above the IOM recommendations was associated with 52% greater risk of preeclampsia (RR=1.52; 95% CI: 1.34, 1.71) and 23% lower risk of SGA (RR=0.77; 95% CI: 0.67, 0.89). GWG was not associated with risk of Cesarean delivery or NICU admission. Conclusion: In women with chronic hypertension, lower GWG was associated with greater risk of SGA, while higher GWG was associated with preeclampsia. Our findings support counseling women with chronic hypertension to gain weight according to the IOM recommendations.

S/P indicates work done while a student/postdoc
MATERNAL DIABETES DURING PREGNANCY AND ARTERIAL CARDIOVASCULAR DISEASE IN OFFSPRING Yongfu Yu* Yongfu Yu, Onyebuchi A. Arah, Zeyan Liew, Sven Cnattingius, Jørn Olsen, Guoyou Qin, Henrik Toft Sørensen, Jiong Li, (Department of Epidemiology, UCLA Fielding School of Public Health)

BACKGROUND Accumulating evidence shows that prenatal exposure to maternal diabetes is associated with increased risk of the metabolic syndrome in offspring. However, less is known about the potential effects of maternal diabetes during pregnancy on the development of cardiovascular disease (CVD) in offspring.

METHODS We developed a population-based cohort study and included all live-born children in Denmark during 1977-2016 (n=2 475 209). We examined the associations between maternal diabetes and risks of CVD in offspring, and effect modification by maternal history of CVD or maternal diabetic complications. We used Poisson regression to estimate incidence rate ratios (IRRs). RESULTS Offspring of diabetic mothers had a 40% increased risk of CVD (IRR: 1.40, 95% confidence interval [CI]: 1.32-1.47; rate difference: 0.48, 95% CI: 0.36-0.59 per 1000 person-years) during 40 years of follow-up. Exposure to maternal pregestational diabetes conferred slightly higher CVD risks in offspring (IRR: 1.44, 95% CI: 1.35 to 1.54) than exposure to gestational diabetes (IRR: 1.31, 95% CI: 1.19-1.44). Increased CVD risks were seen from childhood to early adulthood (<40 years of age), regarding both overall risks and risks by different types of maternal diabetes. Higher IRRs were found among offspring of diabetic mothers with comorbid CVD (IRR: 1.80, 95% CI: 1.43-2.25) and with diabetic complications (IRR: 1.81, 95% CI: 1.46-2.25). CONCLUSIONS Maternal diabetes during pregnancy is associated with increased CVD risks in offspring throughout early decades of life, especially for offspring of diabetic mothers with a history of CVD or with diabetic complications. These findings highlight the clinical importance of effective strategies for screening and preventing diabetes in women of childbearing age.
Purpose: Morphine is a preferred agent for continuous infusion of pain management in non-critically ill patients. In response to the nation-wide morphine drug shortage in 2017, hospitals were forced to look for alternative medications to fulfill therapeutic needs. The aim of this project is to compare the safety and clinical efficacy of fentanyl, as an alternative medication to morphine, for pain control in non-critically ill adults. Methods: A systematic search for relevant literature comparing safety and efficacy of fentanyl and morphine was conducted using electronic databases Medline (via PubMed), Cumulative Index for Nursing and Allied Health Literature, Embase, and Google. The quality of included studies was assessed using standardized tools and evaluated on adequate validity and reliability of methods, potential bias and confounding, as well as appropriate interpretation of results. Results: Search methods identified 7 studies comparing safety and clinical efficacy of fentanyl with morphine. Results from 3 studies indicated post-operative pain scores were lower for fentanyl compared to morphine, and 1 found no significant difference in pain levels or patient satisfaction. Five studies reported minimal to no difference in adverse drug effects such as nausea or vomiting events, respiratory depression, or headache to name a few. Overall, studies ranged from moderate to low quality with common issues such as small sample sizes, relatively short observation periods, and unclear randomization or blinding. Conclusions: Although some results are inconsistent regarding use of additional analgesia and total opioid consumption, more studies of higher quality indicated equal or better postoperative pain control with fentanyl compared to morphine in non-critically ill medical or surgical patients, and little to no difference in most safety outcomes.
DOSE-RESPONSE EFFECT FOR INCIDENCE OF SEPSIS WITH THE USE OF HYDROCHLOROTHIAZIDE IN TAIWAN

CHEN CHENG-LI* CHEN CHENG-LI, Yu-Cheng Kuo, Yu-Ching Chou, Chien-An Sun, (National Defense Medical Center)

Background: Treatment with hydrochlorothiazide (HCTZ) may be beneficial for patients with hypertension. However, the debate over the clinical importance of HCTZ use has associated with sepsis remains unresolved. Additionally, the data on patients who have yet to progress to sepsis is lacking. The aim of this study is to investigate the potential association between the use of HCTZ and the risk of sepsis development in Taiwanese population. Methods: By using the Taiwan National Health Insurance Research Database (NHIRD), we conducted a population-based cohort study from 2000 to 2013. A total of 9,946 patients merely used HCTZ was included as the study cohort. Each patient was matched to 4 control patients from the NHIRD by age and sex. A Cox proportional hazards regression model was performed to evaluate the association between HCTZ use and sepsis risk. Results: A total of 8,852 patients had used HCTZ, and 35,408 control patients were enrolled in the study. The mean (SD) age of HCTZ cohort was 52.6 (17.8) years, and 57.6% (n=5096) were women. The total group incidence rate was 46.2 cases of sepsis per 10,000 person-years (adjusted hazard ratio, 2.14; 95% CI, 1.87-2.44) for HCTZ users. Furthermore, the association was more obvious in the male cohort (adjusted hazard ratio, 2.43, 95% CI 2.02–2.93). There was a significant dose-response relationship between HCTZ use and sepsis risk (p for trend <0.001). The adjusted hazard ratios were 1.80 (95% CI, 1.58 to 2.05), and 2.28 (95% CI, 1.85 to 2.81) for HCTZ use of 1 to 91, and more than 91 cumulative defined daily dose (CDDD), respectively, relative to nonuser (0 CDDD in 1 year). Conclusion: Hydrochlorothiazide use was associated with an increased risk of sepsis, and have a notable dose-effect relationship. Further clinical research is needed to determine the importance of this association for both therapeutic options and outcomes.
RISK OF NEONATAL ABSTINENCE SYNDROME FOLLOWING PRENATAL EXPOSURE TO METHADONE OR BUPRENORPHINE

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Rising rates of opioid addiction mean that pregnant women are more often on opioid maintenance therapy (OMT), necessitating a clinical choice between methadone and buprenorphine. Randomized trials and observational studies have shown that maternal Methadone (M) exposure is associated with higher risk of neonatal abstinence syndrome (NAS) in infants, compared to buprenorphine (B), with effects estimated at about a 20% increased risk. However, residual confounding may explain this, as women on B have worse adherence and more often relapse in pregnancy. We linked Norwegian National Registries data collected from 2009-2015 with data from specialized addiction services. We used log-binomial regression to assess the relative risk of NAS in M vs B exposed pregnancies after adjusting for confounders using inverse probability of treatment weights in the main sample and using the addiction services internal validation sample to further adjust for additional addiction severity confounders. In the main registry data, 77% of the 41 infants exposed to M at the beginning of pregnancy had a diagnosis of NAS compared to 68% of the 72 exposed to B, with similar rates in the xx women with data from the specialized addiction services. Women on M vs those on B more often reported use of heroin in the past 6 months (52 vs 44%), including during pregnancy (18 vs 9%); depression or anxiety (93 vs 80%); and switching OMT within the last 5 years (41 vs 12%). The relative risk of NAS for M vs B 1st trimester-exposed infants was unchanged from a crude of 1.13 to 1.14 (95% CI 0.91, 1.43) after full confounder adjustment; estimates for exposure in the 30 days before delivery were 0.96 and 1.04 (95% CI 0.86 to 1.24), respectively. We found a slightly higher NAS risk for M than for B treatment in early pregnancy but not near delivery, suggesting residual confounding. However, the association was not explained by measured confounding by severity of addiction.

S/P indicates work done while a student/postdoc
LIPOSOMAL BUPIVACAINE FOR TOTAL KNEE ARTHROPLASTY Audrey A. Herring* Rebecca M. Guth, Audrey A. Herring, Liana R. Merz, (BJC HealthCare, St. Louis, MO)

Background: Liposomal bupivacaine (LB) is an extended-release local anesthetic for pain management after total knee arthroplasty (TKA) but is more costly than periarticular injection with other anesthetics. This systematic review evaluated patient outcomes associated with periarticular injection with LB versus other anesthetics in TKA. Methods: Medline, Embase, Cochrane, and CINAHL were systematically searched for randomized controlled trials (RCTs). Relevant outcomes included pain, narcotic use, length of stay, nausea/vomiting, and adverse events. Risk of bias was assessed using standardized criteria. Data were pooled with random effects meta-analysis. Results: Of 545 reviewed records, 16 RCTs were included. Risk of bias was moderate to high. Pooled analysis showed no difference between periarticular injection with LB versus other anesthetics for 10-point pain scores at 24 hours post-TKA [mean difference (MD) -0.13; 95% CI -0.45, 0.19; 12 RCTs], 48 hours (MD -0.10; 95% CI -0.38, 0.19; 11 RCTs), 72 hours (MD -0.17; 95% CI -0.49, 0.15; 6 RCTs), or any other time point. There was also no difference in narcotic use (morphine milligram equivalents) at 24 hours post-TKA (MD -1.21; 95% CI -10.12, 7.70; 7 RCTs), 48 hours (MD -1.51; 95% CI -8.42, 5.40; 6 RCTs), or 72 hours (MD 8.05; 95% CI -1.47, 17.57; 2 RCTs), and no difference in total narcotic consumption (MD -14.40; 95% CI -52.94, 24.14; 6 RCTs). Hospital length of stay (MD 0.03 days; 95% CI -0.04, 0.10; 8 RCTs), nausea (RR 0.80; 95% CI 0.56, 1.13; 6 RCTs), vomiting (RR 0.89; 95% CI 0.63, 1.24; 4 RCTs), and adverse events (RR 0.91; 95% CI 0.63, 1.33; 7 RCTs) were also not different between groups. Subgroup/sensitivity analyses did not change outcomes, but study heterogeneity may have impacted findings. Conclusions: Pooled data from 16 RCTs demonstrated no significant improvement in patient outcomes associated with periarticular injection of LB versus other anesthetics in TKA.
Objective: Prior research collectively shows that endometriosis is inversely related to women’s adiposity. The aim of this study was to assess whether this inverse relationship holds true by disease severity and typology.

Design: Secondary data analysis of a prospective cohort study. Setting: Fourteen clinical centers in Salt Lake City, Utah and San Francisco, California. Patients: 190 menstruating women, 18–44 years with no prior history of endometriosis, scheduled to undergo a gynecologic laparoscopy/laparotomy, regardless of clinical indication, and who received an incident endometriosis diagnosis. Participants underwent anthropometric assessments, body composition, and body fat distribution ratios before surgery. Surgeons completed a standardized operative report immediately after surgery to capture revised ASRM staging (I to IV) and typology of disease (superficial [SE], ovarian endometrioma [OE], and deep infiltrating endometriosis [DIE]).

Main Outcome Measures: Least squares regression was used to generate adiposity measures by endometriosis stage (I–IV) and typology (SE, DIE, OE, OE + DIE) adjusting for age, race/ethnicity, and parity. Results: While no statistically significant associations were found for stage and typology, two general impressions emerged: 1) women with stage I or IV had lower anthropometric/body composition indicators compared to women with stage II or III; and 2) women with OE and/or DIE tended to have the lowest anthropometric/body composition indicators, while women with SE had the highest indicators (Figure 1). Conclusion: Our research highlights that the relationship between a woman’s adiposity and endometriosis severity and typology may be more complicated than prior research indicates.
We describe the prevalence and patterns of first-trimester nausea and vomiting of pregnancy (NVP) and selected treatment use among 10,883 controls in the case-control National Birth Defects Prevention Study (1997-2011). We used self-reported post-delivery interview data about NVP and use of most-frequently reported treatments for NVP (ondansetron, promethazine, pyridoxine, metoclopramide, doxylamine succinate, ginger, emetrol, and prochlorperazine) from mothers of non-malformed singleton liveborn controls to estimate prevalence of NVP and first trimester use of treatments. We examined secular and demographic trends for use of specific selected treatments among women with NVP, adjusting for 9 US study sites. Demographic factors included education, race/ethnicity, and age. 7,393 women (70%) reported first trimester NVP, and 907 of those (12%) used >1 treatment of interest. After adjustment for study site, these were ondansetron: 3.4%; promethazine: 4.2%; pyridoxine: 3.2%; metoclopramide: 0.7%; doxylamine succinate: 1.7%; ginger: 1.0%; emetrol: 0.41%; prochlorperazine: 0.31%. Use tended to increase over the study period (Figure). 72% of women with ≥16 years of education and 67% of women with <12 years reported NVP; women with more education were more likely to use treatments. White (72%), Hispanic (70%) and other race (71%) women reported more NVP than black (67%) women; white women tended to use NVP medications most frequently, and black women tended to use them more than Hispanic women. Though women aged 25-34 reported more NVP (72%) than younger (69%) or older (67%) women, the frequency of medication use was similar among women aged 25-34 and ≥35, and lower among women age <25. NBDPS controls reported NVP at frequencies similar to those reported in prospective cohort studies. We observed an increase in use of selected treatments over time, and variations in NVP and treatments by study site and demographic factors.
Studies of pain-relieving medications and fecundability have not examined specific windows of exposure during the menstrual cycle. We analyzed data from a prospective time-to-pregnancy cohort of women aged 30-44 with no history of infertility. Participants recorded their medication use in daily diaries. Analgesic medications were classified as acetaminophen, opioids, aspirin, or non-aspirin NSAID and their use during four time periods was quantified: pre-ovulation, peri-ovulation, implantation, and all non-bleeding days of the cycle. Vaginal bleeding and sexual intercourse information from the daily diary were combined with baseline information on contraception use and attempts to conceive to quantify menstrual cycles at risk until conception or study end. Discrete time fecundability models were used to estimate the fecundability ratio (FR) and 95% CI in each of the four time windows of interest and for each pain reliever, compared with women who reported not using any medications in that time window. Models were estimated with minimal adjustment (age, race, and education) and full adjustment (adding BMI, frequency of sexual intercourse, alcohol, caffeine, history of migraines, and history of fibroids) but results did not materially differ. The fully adjusted analyses included approximately 590 women and 1180 cycles (depending on the time window). Non-aspirin NSAIDs and acetaminophen, were not associated with fecundability (all FRs around 1.0). Aspirin use was rare (N=31 exposed cycles), but its use in all time windows was associated with higher fecundability (non-bleeding FR(CI): 1.3 (0.8, 2.1)) and the association was strongest for aspirin use during the implantation window: FR (CI): 2.2 (1.3, 3.8). Results were unchanged in sensitivity analyses for confounding by indication. Aspirin use may improve fecundability; further, the implantation window of the menstrual cycle should be targeted for future investigations of aspirin’s potential efficacy.
ATOVAQUONE-PROGUANIL EXPOSURE IN PREGNANCY AND RISK FOR ADVERSE FETAL AND INFANT OUTCOMES Clinton Hall* Clinton Hall, Julie R. Gutman, Kathrine R. Tan, Zeina G. Khodr, Anna T. Bukowinski, Gia R. Gumbs, Ava Marie S. Conlin, Natalie Y. Wells, (Naval Health Research Center, Deployment Health Research Department, San Diego, CA; Leidos, Inc., San Diego, CA)

Malaria infection in pregnancy can lead to maternal and fetal complications. Only chloroquine (CQ) and mefloquine (MQ) are recommended for chemoprophylaxis in pregnancy, but parasite resistance and contraindications may leave some women with no recommended options. Limited data suggest atovaquone-proguanil (AP), a highly effective antimalarial, might be suitable for malaria prevention in pregnancy, but more evidence is needed. Data for pregnancies and live births among active duty women, 2003-2014, from the Department of Defense Birth and Infant Health Research program were linked with pharmacy data to determine antimalarial exposure, defined as a drug dispensation date in pregnancy. Multivariable Cox and logistic regression models were used to assess the relationship between antimalarial exposure and fetal and infant outcomes, respectively. Among 199,017 pregnancies, 51 were exposed to AP, 159 to MQ, and 133 to CQ. Overall, 15.1% of unexposed pregnancies and 27.5%, 13.8%, and 4.5% of pregnancies exposed to AP, MQ, and CQ, respectively, ended in miscarriage (adjusted hazard ratios [aHR]=1.72, 95% confidence interval [CI]=1.02-2.90; aHR=1.03, 95% CI=0.68-1.57; and aHR=0.38, 95% CI=0.17-0.85, respectively). Among 160,944 live births, 36 were exposed to AP, 130 to MQ, and 122 to CQ. Compared with unexposed infants, there was a statistically insignificant increased risk for a composite poor live birth outcome (preterm birth, low birthweight, or small for gestational age) among AP exposed infants (adjusted odds ratio=2.02, 95% CI=0.88-4.60), but not MQ or CQ exposed infants. Birth defects were seen in 3.0% of unexposed and 5.6%, 0.8%, and 0.8% of infants exposed to AP, MQ, and CQ, respectively. The small number of AP exposed pregnancies highlights the difficulty in assessing safety. While definitive conclusions are not possible, these data suggest further research of AP exposure in pregnancy and fetal loss is warranted.

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DIETARY FOLATE INTAKE AND FECUNDABILITY IN TWO PRECONCEPTION COHORT STUDIES

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Folate, an antioxidant micronutrient found primarily in liver, green leafy vegetables, and beans, is essential for cell growth. Supplemental folic acid has been associated with improved fecundability, but little is known about the effects of dietary folate. We evaluated the association between dietary folate intake and fecundability. We conducted parallel and pooled analyses, using data from two similar prospective cohort studies of pregnancy planners from Denmark and North America. Women completed baseline questionnaires to ascertain information on demographic, lifestyle, and reproductive history, and bi-monthly follow-up questionnaires to update pregnancy status over time. We assessed dietary folate intake via validated food frequency questionnaires completed 10 days after baseline. We restricted our analysis to 6,277 women (2,636 Danes and 3,641 North Americans) attempting pregnancy for ≤6 months at study entry during 2013-2018. Women contributed follow-up data until they reported pregnancy or experienced a censoring event. We used proportional probabilities regression models to estimate fecundability ratios (FR) and 95% confidence intervals (CI), adjusting for potential confounders. Overall, 7%, 58%, and 35% of women had energy-adjusted dietary folate intakes of <250, 250-399, and ≥400 µg/day. Relative to dietary folate intake of ≥400 µg/day, adjusted FRs for <250 µg/day was 0.79 (CI: 0.70-0.90) and 0.94 (CI: 0.89-1.00) for 250-399 µg/day. Results were similar across cohorts. Compared with dietary intakes of ≥400 µg/day, FRs for <250 µg/day and no supplementation were 0.68 (CI: 0.54-0.85) and 0.83 (CI: 0.72-0.97) with supplementation. These data indicate that female dietary folate intakes <400 µg/day are associated with decreased fecundability in countries with (i.e., North America) and without (i.e., Denmark) fortification of foods with folic acid.

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Dietary Fat Intake, Erythrocyte Fatty Acids, and Risk of Uterine Leiomyoma

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Background: Dietary fats have been hypothesized to play a role in uterine leiomyoma (UL) etiology due to their potential to modify endogenous hormones as well as their inflammatory effects; however, few studies have examined dietary fat intake and UL risk, and to our knowledge, no studies have examined erythrocyte membrane fatty acid (FA) levels and UL risk. Methods: We investigated whether intake of dietary fats or erythrocyte membrane FA levels were associated with incident UL confirmed by ultrasound or hysterectomy in a prospective cohort of 81,589 premenopausal women. Dietary fat intake was assessed using food frequency questionnaires (FFQs) at 7-time points over an 18-year follow-up period. Cox proportional hazards regression models were used to calculate HR and 95% CI for the dietary fat analysis. In a subset of participants (n=554; 56 UL cases), a total of 34 individual erythrocyte membrane FAs were analyzed and expressed as a percentage of total FAs. OR and 95% CI of UL in relation to FAs were estimated using logistic regression models. Results: From 1991-2009, 8,142 incident cases of UL were reported. No associations were observed between intake of any dietary fats and UL in the multivariable models. However, when erythrocyte FAs were examined an inverse association was observed between total N-3 polyunsaturated FAs and UL risk (OR for 4th quartile=0.41; 95% CI=0.18-0.94; ptrend=0.03). In addition, total trans FAs were associated with increased UL risk (OR for 4th quartile=2.71; 95% CI=1.18-6.21; ptrend=0.004). Conclusions: Our findings suggest N-3 polyunsaturated FAs and trans FAs may play a role in UL etiology. The FA composition of the erythrocyte membrane is thought to represent an integrated measure of the interactions between dietary fatty acid intake, other dietary factors and patterns of fatty acid metabolism which may explain the association observed with the erythrocyte FAs and not with the dietary fat intake assessed with FFQs.
Bisphenol S (BPS) was introduced in the market as a potentially safer alternative to bisphenol A (BPA). However, there are limited data on health effects of BPS and no epidemiologic studies on its relationship with semen quality. We investigated predictors of urinary BPS and its association with semen parameters among men attending a fertility center. This cross-sectional analysis included 158 men of couples seeking infertility treatment (2011-2017) contributing 338 semen and urine samples. At the time of sample collection, men completed a questionnaire on self-reported use of household products and food intake within the previous 24 hours. Semen samples were analyzed following WHO guidelines. Generalized linear mixed models with random intercepts to account for repeated samples were used while adjusting for abstinence time, specific gravity, age, body mass index (BMI), year of sample collection and BPA concentrations. Analyses were also stratified by BMI (≥25 vs <25 kg/m²). Median (IQR) urinary BPS concentration was 0.30 (0.20, 0.90) μg/L, and 77% samples had detectable concentrations. Self-reported fabric softener and paint/solvent use as well as intake of specific food items (lamb, pork, hot dog) within 24 hours before urine collection were positively associated with urinary BPS. Men with higher BPS concentrations also had significantly higher BMI. Decreased semen parameters were found among men with detectable BPS concentrations, compared to men with non-detectable BPS [2.66 vs. 2.91 ml for volume (p=0.03), 30.7 vs. 38.3 mil/ml for concentration (p=0.03), 76.8 vs. 90.0 mil for total count (p=0.17), 43.7 vs. 47.0% for motility (p=0.06), and 5.42 vs. 6.77% for morphologically normal sperm (p=0.24)]. Associations of BPS with decreased semen parameters were stronger among men with a BMI≥25 kg/m². These results identified some predictors of BPS exposure, and showed some negative associations between BPS and semen parameters, especially among overweight and obese men.
THE ROLE OF MATERNAL AGE AND PREGNANCY HISTORY IN RISK OF MISCARRIAGE
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Objectives: To estimate the burden of miscarriage in the Norwegian population and to evaluate associations with
maternal age and pregnancy history. Design: Prospective cohort study. Setting: All registered pregnancies in
Norway. Participants: All Norwegian women who were pregnant between 2009 and 2013, as identified through
the Medical Birth Registry of Norway, the Norwegian Patient Registry and the abortion registry. Main outcome
measures: Risk of miscarriage according to the woman's age and pregnancy history using logistic regression.
Results: There were 421,201 pregnancies during the study period. Miscarriage risk was lowest among women
age 25-29 years (10%), and rose rapidly after age thirty, reaching 53% among women 45 years and older. There
was a strong recurrence risk of miscarriage, with age-adjusted odds ratios (aORs) of 1.5 (95% CI: 1.5 to 1.6)
after one miscarriage, 2.2 (95% CI: 2.0 to 2.4) after two, and 4.0 (95% CI: 3.3 to 4.8) after three consecutive
miscarriages. Risk was modestly increased if the previous birth ended in a preterm delivery (1.22; 95% CI: 1.12
to 1.29), stillbirth (1.30; 1.11 to 1.54), caesarean section (1.16 95% CI: 1.12 to 1.21), or if woman had
gestational diabetes in the previous pregnancy (1.19; 95% CI: 1.05 to 1.36). Risk of miscarriage was slightly
higher among women who themselves had been small-for-gestational age (1.08; 95% CI: 1.04 to 1.13).
Conclusions: The risk of miscarriage varies greatly by maternal age, shows a strong pattern of recurrence, and is
increased after other adverse pregnancy outcomes.
Objective: Marijuana is the most widely used and fastest growing drug in the US, with legislation currently broadening legalization for both medical and recreational use. A few studies evaluating self-reported use suggest marijuana may not be harmful for pregnancy, yet there is concern for underreporting due to stigma as marijuana is not universally legalized. Our aim was to examine associations between preconception marijuana use, using both self-reported and urinary levels of tetrahydrocannabinol (THC), and fecundability, live birth, and pregnancy loss. Methods: Women aged 18-40 years old (n=1212) enrolled in the EAGeR trial were screened for urinary THC up to 2 time points during preconception using a homogenous enzyme immunoassay (Randox Laboratories), and reported marijuana use during the past year at baseline. Women were followed for up to 6 months while attempting pregnancy. Cox proportional hazard regression was used to calculate fecundability odds ratios (FOR), and log-binomial regression to estimate risk ratios (RR) for live birth and pregnancy loss adjusting for age, race, BMI, education, smoking, alcohol, and detectable levels of opioids. Results: 33 (2.7%) women screened positive for THC, of which 14 self-reported use. 62 women (5.1%) screened positive or self-reported use. Women who screened positive for THC had reduced fecundability (FOR 0.50; 95% CI 0.25, 1.00), as well as women with self-report (FOR 0.54; 95% CI 0.31, 0.94), or using either urinary or self-report (FOR 0.53, 95% CI 0.33, 0.86). No associations were observed with live birth (RR 0.71; 95% CI 0.41, 1.22) or pregnancy loss (RR 0.78; 95% CI 0.28, 2.18). Conclusions: Women who screened positive for THC during preconception, or self-reported use during the past year had reduced fecundability, though no associations were observed with live birth or pregnancy loss. Further investigations are needed to determine what duration and dose of marijuana may negatively impact fecundability.
SOCIOECONOMIC STATUS AND COLORECTAL CANCER SCREENING BEHAVIORS IN A VULNERABLE MULTIETHNIC POPULATION Eduardo J. Santiago-Rodriguez* Eduardo J. Santiago-Rodriguez, Natalie A. Rivadeneira, Mekhala Hoskote, Gem M. Le, Urmimala Sarkar, Jacqueline M. Torres, Robert A. Hiatt, (Department of Epidemiology and Biostatistics, University of California San Francisco)

Colorectal cancer (CRC) screening adherence among disadvantaged racial/ethnic minorities in the United States has been suboptimal. Many factors could explain screening non-adherence (SNA), including those associated with low socioeconomic status (SES). In this cross-sectional study, we assessed the association of SES and self-reported CRC screening behaviors in a sample of non-Hispanic Blacks (NHB), Hispanics (H) and Asian/Pacific Islanders (API) in San Francisco (SF). A total of 376 of participants in the SF version of the Health Information National Trends Survey (HINTS), who were 50-75-year-old at time of interview were included. SNA was defined as not having fecal occult blood test within the past year or sigmoidoscopy/colonoscopy within the past 10 years. We used Poisson regression models with robust variance estimators to evaluate the effect of education, employment status and household income on SNA, adjusting for possible confounders. Prevalence ratios (PR) and 95% confidence intervals (95% CI) are reported. The sample was comprised of 37% API, 32% H and 31% NHB. Median (IQR) age was 60 (55-66) and 60% were women. Overall SNA was 40%. In multivariable models, lower educational attainment and lower household income were associated with higher prevalence of SNA, but results did not reach statistical significance. Regarding employment status, those unemployed (PR=1.23, 95% CI=0.90, 1.69) and disabled (PR=1.29, 95% CI=0.93, 1.78) had higher SNA prevalence in comparison to employed participants, but the contrary was observed for those retired (PR=0.42, 95% CI=0.24, 0.73). In this sample, SNA was higher than the reported in SF (33%) and targets of the National CRC Roundtable (20%: “80% by 2018”) and Healthy People 2020 (30%). Lower SES indicators were associated with higher SNA and job retirement with lower SNA. Life circumstances of retired people could provide insights for improving CRC screening uptake in these priority groups and requires further evaluation.
CONTROLLED DIRECT EFFECTS OF OCCUPATIONAL CLASS ON DEPRESSION RISK AFTER ACCOUNTING FOR WAGES: AN APPLICATION OF THE LONGITUDINAL PARAMETRIC G-FORMULA Holly Elser* Holly Elser, Andreas M. Neophytou, David H. Rehkopf, Sadie Costello, Ashley I. Naimi, Mark R. Cullen, Ellen A. Eisen, (UC Berkeley School of Public Health, Division of Epidemiology)

Introduction: Increased risk of psychiatric distress is consistently observed among workers of lower occupational strata, and past research finds increased risk for depression among industrial blue-collar workers as compared with white-collar workers. Differences in wages between blue- and white-collar workers may mediate this relationship. Methods: We estimated the controlled direct effect of occupational class on depression risk independent of wages among 18,407 blue-collar and 4,966 white-collar workers employed by a single U.S. aluminum manufacturer between 2003 and 2013. Wage and salary information were available through form W-2 from the Internal Revenue Service. We applied the longitudinal parametric g-formula to account for time-varying risk score – an actuarial estimate of underlying health – that confounds the mediator-outcome association and is also affected by occupational class. We estimated the total effect of occupational status on depression as well as the controlled direct effects under hypothetical interventions in which wages were held constant at $40,000, $55,000, and $70,000 thousand dollars. These values correspond to the 25th, 50th, and 75th percentile, respectively, for all workers for every year of follow-up. Results: For the total effect, we estimated an additional 29.5 cases of depression per 1,000 workers associated with blue-collar status (95% CI = 24.1 – 35.0). The excess risk associated with blue-collar status was attenuated when wages were fixed at $40,000 (RD = 13.8, 95% CI 8.5 – 19.1), $50,000 (RD = 11.7, 95% CI 6.2 – 17.2), and $70,000 (RD = 10.0, 95% CI 4.7 – 15.3). Conclusion: Although attenuated, a direct association between occupational class and depression remains even when workers’ wages were fixed at a constant value. This finding implies that differences in wages by occupational class may contribute to – but cannot fully explain – the observed disparity in depression risk.
RELATIONSHIP BETWEEN MATERNAL EDUCATION AND MAJOR BIRTH DEFECTS, TEXAS, 2005-2015

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BACKGROUND: Maternal educational attainment is a frequently used variable in epidemiologic studies of birth defects. Unfortunately, little work has sought to understand how maternal educational attainment influences risk of birth defects. In this study we sought to answer the questions: What is the role of maternal educational attainment in birth defect risk, and is this consistent across maternal race/ethnic groups? METHODS: Multivariable Poisson regression was used to estimate prevalence ratios (aPR) by maternal educational level for 30 types of birth defects among deliveries during 2005–2015 to non-Hispanic (NH) White, NH Black, and Hispanic mothers in Texas adjusting for delivery payor; maternal pre-pregnancy body mass index, diabetes, age; gestational age; and sex of infant. Stratified analyses were carried out across maternal race/ethnicity groups and maternal education, adjusting for delivery payor; maternal pre-pregnancy body mass index, diabetes, age; gestational age; and infant sex. RESULTS: We found a modest (aPR < 1.50) increased risk of birth defects among the lowest educated mothers for ventricular septal defect, atrial septal defect, pulmonary valve atresia/stenosis, cleft lip with or without cleft palate, and trisomy 21, and a moderate (aPR ≥1.50) increased risk for cleft palate alone (without cleft lip), microcephaly, gastroschisis, and pyloric stenosis. Upon stratification, we found a moderate increased risk among the lowest educated NH white mothers for microcephaly and gastroschisis, and a moderate increased risk among the lowest educated NH black mothers for microcephaly. CONCLUSIONS: Maternal education is an important dimension of socio-economic status. The results demonstrate significant variation in risk across maternal race/ethnicity. These data may be used to guide the selection of covariates i.e., maternal education for the nine defects we identified, and to develop enhanced interventions and outreach activities for lower educated women.
CHILDHOOD ADVERSITY AND INDICATORS OF IMMUNE AND EPIGENETIC AGING IN ADULTHOOD Rae Anne Martinez*, Rae Anne Martinez, Chantel Martin, Grace Noopert, Cavin Ward-Caviness, Monica Uddin, Sandro Galea, Karesten, Derek, Allison, (Department of Epidemiology, Gillings School of Global Public Health)

S/P indicates work done while a student/postdoc
RACIAL/ETHNIC DIFFERENCES IN THE ASSOCIATION BETWEEN NEIGHBORHOOD CONTEXT AND EARLY CHILDHOOD GROWTH PATTERNS IN A US SAFETY-NET POPULATION  
Sarah B. Andrea, Janne Boone-Heinonen, Jean P O'Malley, Carrie J Tillotson, Miguel Marino, Andrew Brickman, Jennifer DeVoe, Jon Puro, (OHSU-PSU School of Public Health)

Background: Neighborhood characteristics are well known to relate to birth outcomes and obesity throughout the lifespan; however, their relationship with infant growth is understudied. Our objective was to investigate racial/ethnic differences in the association between neighborhood-level sociodemographic characteristics and infant growth trajectories within a safety-net population. Methods: Using longitudinal clinical weight and height measurements on a cohort of 64,897 low-income infants in the ADVANCE Clinical Data Research Network, we identified early childhood (0-24 months) patterns in Body Mass Index (BMI) using group-based trajectory modeling (747,052 BMI z-score observations). In subsequent sex- and race/ethnicity-stratified multinomial regression analyses, trajectory group was modeled as a function of census tract-level characteristics (income inequality [Gini coefficient], social deprivation [SDI], racial composition) and individual-level covariates (income to poverty ratio, payer type). Results: Six BMI trajectory groups were identified; 33.4% of infants were classified as normal birthweight, stable (reference outcome). While greater Gini was associated with greater odds of each adverse growth trajectory irrespective of race/ethnicity and sex, heterogeneous associations were observed for SDI and racial composition. For example, black female infants in neighborhoods with the highest SDI quartile had greater odds of membership in the catch-up growth group (OR=1.37; 95%CI: 1.00,1.89). In contrast, Hispanic female infants in such neighborhoods had lower odds of membership in the catch-up growth group (OR=0.70; 95% CI: 0.57,0.87), yet greater odds of membership in the born larger and increasing group (OR=1.13; 95%CI: 1.00,1.28). Conclusion: Further research is necessary to understand contextual or behavioral factors that contribute to the observed racial/ethnic differences in the association between neighborhood sociodemographic characteristics and infant growth.
IMPACT OF ALCOHOL AND SUBSTANCE USE ON SYSTOLIC BLOOD PRESSURE AMONG PEOPLE LIVING WITH HIV


Background: Alcohol and substance use may affect blood pressure (BP) and subsequent cardiovascular disease risk. We estimated the impact of different patterns of alcohol use on systolic BP (SBP) among people living with HIV (PLWH)

Methods: PLWH in care from 7 CNICS sites across the United States completed tablet-based assessments including alcohol use (AUDIT-C) and substance use (methamphetamine, cocaine, marijuana, and opioids) as part of routine clinical care. Alcohol severity was defined by AUDIT-C score (0-12 points), binge drinking frequency was defined as number of days binge drinking per month (≥5 drinks at a time for men, ≥4 for women), and substance use was defined as days of substance use per month. Linear mixed models with exchangeable covariance matrix and robust standard errors were used to model the longitudinal associations between time-updated alcohol/substance use and future SBP adjusted for age, sex, race/ethnicity, and antihypertensive medications.

Results: Among 14,158 PLWH (mean of 18 SBP measures), increased alcohol severity was associated with higher SBP (0.2 mmHg, 95%CI 0.1 to 0.3 per AUDIT-C point). More binge drinking days per month were associated with higher SBP but this plateaued (e.g. 1.2 mmHg 95%CI 0.6 to 1.9 per 10 vs. 0 binge days per month; 1.2 mmHg 95%CI 0.1 to 2.2 per 20 vs. 0 binge days per month). Relative to no use, daily use of opioids (-0.1 mmHg 95%CI -2.2 to 2.1) and cocaine (-1.7 mmHg 95%CI -3.5 to 0.2) were not associated with SBP. Daily use of methamphetamine (1.4 mmHg 95%CI 0.5 to 2.3) was associated with increased SBP and daily use of marijuana (-0.7 mmHg 95%CI -1.3 to -0.2) was associated with decreased SBP.

Conclusions: Alcohol, methamphetamine, and marijuana use have a small impact on SBP levels among PLWH.

Figure. Generalized additive model of association between AUDIT-C alcohol severity score and SBP in adjusted analyses of PLWH.
Adolescent combustible cigarette use has declined in the US since the late 1990s. New cigarette delivery systems (vaping) threaten progress, given that adolescents may still develop nicotine dependence, and that vaping may have respiratory consequences. Adolescents who vape are more likely to use combustible cigarettes, thus the contribution of vaping alone (without combustible cigarette use) is important to establish. We estimated the extent to which vaped products affect trends in adolescent smoking in: National Youth Tobacco Survey (NYTS, available to 2017), a national sample of adolescents in 6th-12th grade, and Monitoring the Future (MTF, available to 2018), a national sample of adolescents in 8th, 10th, 12th grade. The NYTS has questions on “electronic cigarettes” or “e-cigarettes” since 2011. Monitoring the Future has questions on “electronic vaporizers” since 2015. In NYTS, the proportion of students reporting ever use of vaped products increased from 3.3% in 2011 to 21.5% in 2017; simultaneously, among those who vaped, the proportion who reported no history of combustible cigarette use increased from 8.6% to 45.4%. In MTF, the proportion of students reporting ever use of vaped products increased from 29.9% in 2015 to 33.8% in 2018; simultaneously, among those who used vape, the proportion who reported no history of combustible cigarette use increased. Figure 1 shows two trends in smoking: a) any history of combustible cigarette use; and b) any history of combustible or vaped products. In NYTS, cigarette use has declined 43.0%, but when vaped products are considered, smoking (vaping or combustible use) declined is 9.73%. In MTF, cigarette use has declined 23.3%, but when vaped products are considered, the decline is 10.2%. In summary, when considering vaped products together with combustible cigarette use, there has been little progress reducing adolescent smoking since the introduction of electronic delivery systems.
ASSOCIATION OF OVERDOSE AND INJECTION PRACTICES WITH DRUG USE TYPOLOGIES: A LATENT CLASS ANALYSIS AMONG PEOPLE WHO INJECT DRUGS IN BALTIMORE, 2017
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Overdose and bloodborne virus infection risks differ for people who use illicitly obtained prescription opioids vs. other drugs (e.g. heroin). We used latent class analysis to characterize drug use typologies among a community-based sample of 671 current and former people who inject drugs (PWID) in Baltimore’s AIDS Linked to the Intravenous Experience (ALIVE) study during 2017 who used 1 drug in the past 6 months. We described differences by these typologies in demographic characteristics, syringe sharing, syringe access (via pharmacies or syringe services programs [SSPs]), and overdose in the past six months. We identified 3 classes: low intensity use (76.3% of participants; median: 2 drugs used), prescription drug use (11.9%, median: 6 drugs), and heroin and cocaine injection (11.8%, median: 5 drugs). Participants in the prescription drug use and low intensity use classes were more commonly female. Participants in the heroin and cocaine injection and prescription drug use classes were younger and more commonly white. Relative to low intensity use, participants characterized by heroin and cocaine injection and prescription drug use had higher odds of overdose after adjusting for age, race, sex, homelessness, HIV status, depression, and alcohol use (heroin and cocaine injection adjusted odds ratio [aOR]: 2.8, 95% confidence interval [CI]: 1.5-5.4, prescription drug use aOR: 4.3, 95% CI: 2.4-8.0) and, among current PWID, had higher odds of sharing syringes (heroin and cocaine injection: aOR: 2.4, 95% CI: 1.3-4.2, prescription drug use: aOR: 1.9, 95% CI: 1.0-3.4). However, current PWID characterized by prescription drug use were less likely to obtain sterile syringes through SSPs or pharmacies relative to heroin and cocaine injection (aOR: 0.36, 95% CI: 0.18-0.75). To mitigate risk, harm reduction programs may need expand outreach efforts and consider differentiated models to reach all people who use drugs, particularly those who obtain prescription drugs illicitly.
SOCIODEMOGRAPHIC DISPARITIES IN POLYTOBACCO USE AMONG U.S. ADULTS, TOBACCO USE SUPPLEMENT, 2014-2015

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Introduction: Despite reductions in U.S. prevalence of tobacco use, a leading cause of non-communicable disease, considerable sociodemographic disparities remain. As more tobacco products enter the marketplace, it is increasingly important to measure the use of multiple tobacco products. This study examined sociodemographic disparities in polytobacco use among a nationally representative sample of U.S. adults.

Methods: We analyzed data from 146,025 adults (18 and older) participating in the 2014-15 Tobacco Use Supplement to the Current Population Survey. Current tobacco use status was measured as every day or some days monotobacco (one product only: cigarette, cigar, regular pipe, hookah, smokeless tobacco, e-cigarette, or dissolvable tobacco) and polytobacco use (at least two products). We conducted weighted multinomial logistic regression analysis to examine associations between sociodemographic characteristics and current tobacco use status. Results: 14.4% of adults reported current monotobacco use, while 3.1% reported polytobacco use. Men had higher odds of mono (AOR: 1.83, 95% CI: 1.76-1.90) and polytobacco use (AOR: 2.49, 95% CI: 2.30-2.70) than women. Non-Hispanic (NH) Whites (reference group) had higher odds of mono and polytobacco use than NH Blacks and Hispanics. 25-44 year-olds had the highest odds of mono (AOR: 1.85, 95% CI: 1.71-2.00) and polytobacco use (AOR: 1.23, 95% CI: 1.07-1.41). Higher education and income were negatively associated with the odds of mono and polytobacco use. Foreign born participants had lower odds of mono (AOR: 0.46, 95% CI: 0.42-0.50) and polytobacco use (AOR: 0.27, 95% CI: 0.22-0.34) than U.S. born participants. Unemployed adults (AOR: 1.60, 95% CI: 1.36-1.88) and those who were not in labor force due to disability (AOR: 1.72, 95% CI: 1.51-1.97) had higher odds of polytobacco use than employed adults.

S/P indicates work done while a student/postdoc
ALCOHOL LAW ENFORCEMENT ACTIVITIES BY COMMUNITY TYPE  Collin Calvert* Collin Calvert, Traci Toomey, Kathleen Lenk, Spruha Joshi, Toben Nelson, Darin Erickson, (University of Minnesota School of Public Health)

Purpose: How well alcohol policies are enforced can affect the occurrence of alcohol-related health problems. Different types of communities (i.e., urban, suburban, small town, and rural) may vary in the alcohol enforcement activities they conduct. Methods: We conducted a national survey of local law enforcement agencies in 2010 to assess alcohol policy enforcement activities. We assessed whether the use of specific types of enforcement strategies varied by community type. Results: The proportion of agencies conducting different types of enforcement activities ranged from 82% (underage compliance checks) to 24% (enforcement aimed at illegal sales to intoxicated patrons). Agencies in urban areas conducted more enforcement activities than other community types. Urban agencies were more likely than rural agencies to conduct underage compliance checks, saturation patrols, and enforcement aimed at illegal sales to intoxicated patrons. Urban agencies were also more likely than small town and suburban agencies to do compliance checks and more likely than suburban agencies to do enforcement actions around the sale of alcohol to intoxicated patrons or provision of alcohol to minors. Conclusions: Enforcement of alcohol laws differs by community type. Differences in resources to conduct alcohol enforcement activities may contribute to these differences. Continued effort is needed to increase certain types of enforcement, such as targeting sales to intoxicated patrons, and particularly among non-urban agencies. Future research is needed to identify mechanisms to increase enforcement by agencies in different types of communities.
MARIJUANA SMOKING AND OUTCOMES OF INFERTILITY TREATMENT WITH ASSISTED REPRODUCTIVE TECHNOLOGIES Feiby Nassan*, Feiby Nassan, Mariel Arvizu, Lidia Mínguez-Alarcón, Audrey J. Gaskins, Paige L. Williams, John C. Petrozza, Russ Hauser, Jorge E. Chavarro, (Harvard T. H. Chan School of Public Health)

Background: Data on the relation of marijuana use with outcomes of infertility treatment is scarce despite increased use and legalization worldwide. Objective(s): To examine the association of female and male partner marijuana smoking with infertility treatment outcomes with assisted reproductive technologies (ART). Study Design: We followed 421 women (730 cycles) while participating in a prospective cohort. Among them, 200 women (368 cycles) were part of a couple in which their male partner also enrolled in the study. Participants self-reported marijuana smoking at baseline. Clinical endpoints were abstracted from medical records. We used generalized mixed models with empirical standard errors to evaluate the association of baseline marijuana smoking with ART outcomes adjusting for participants’ age, race, body mass index, tobacco smoking, coffee and alcohol consumption, and cocaine use. We estimated the adjusted probability of implantation, clinical pregnancy, and live birth per ART cycle, as well as the probability of pregnancy loss. Results: 44% of women and 61% of men had ever smoked marijuana; 3% and 12% were current marijuana smokers at baseline, respectively. Among 317 women (395 cycles) with a positive β-hCG, current marijuana smokers had more than double the predicted probability of pregnancy loss than women who were past/never marijuana smokers (54% vs. 26%; p=0.0003). This estimate was based on sparse data, however. Couples in which the male partner was a current marijuana smoker had a significantly higher predicted probability of live birth than couples in which the male partner was a never or past marijuana smoker (48% vs. 29%; p=0.04), independently of women’s marijuana smoking status. Treatment outcomes of past marijuana smokers, male and female, did not differ from those of never marijuana smokers. Conclusion(s): Current female partner marijuana smoking was associated with higher predicted probability of pregnancy loss during infertility treatment with ART.
E-CIGARETTE USE AND SLEEP-RELATED COMPLAINTS AMONG U.S. YOUTH  Kira E. Riehm*
Kira E. Riehm, Darlynn M. Rojo-Wissar, Kenneth A. Feder, Ramin Mojtabai, Adam P. Spira, Johannes Thrul, Rosa M. Crum, (Department of Mental Health, Johns Hopkins University)

Background: E-cigarette use is highly prevalent among adolescents. E-cigarettes frequently contain nicotine, which may disturb sleep; however, little research has examined the relationship between e-cigarette use and sleep-related complaints among adolescents. The objective of this study was to determine whether exclusive e-cigarette, exclusive combusted cigarette, and dual product use are associated with sleep-related complaints among adolescents. Methods: Participants were 9,611 U.S. adolescents aged 12-17 years from the Population Assessment of Tobacco and Health Study, a nationally representative cohort, followed from 2013 through 2015. Using logistic regression, we examined the cross-sectional association between past-year e-cigarette, combusted cigarette, or dual product use and past-year sleep-related complaints (bad dreams, sleeping restlessly, or falling asleep during the day), both measured at Wave 2. We controlled for Wave 1 demographic characteristics and prior history of depressive symptoms, anxiety symptoms, marijuana use, alcohol use, e-cigarette use, combusted cigarette use, and sleep-related complaints. Results: In unadjusted analyses, e-cigarette, combusted cigarette, and dual product use were significantly associated with increased odds of sleep-related complaints, compared to use of neither product (e-cigarettes: OR=1.61, 95% CI=1.34-1.94; combusted cigarettes: OR=1.62, 95% CI=1.26-2.09; dual product use: OR=2.00, 95% CI=1.63-2.46). Associations between e-cigarette and dual product use, but not combusted cigarette use, and sleep-related complaints remained significant in adjusted analyses (e-cigarettes: aOR=1.31, 95% CI=1.06-1.61; combusted cigarettes: aOR=1.29, 95% CI=0.98-1.70; dual product use: aOR=1.58, 95% CI=1.25-1.99). Conclusions: E-cigarette and dual product use are significantly associated with a higher odds of sleep-related complaints among adolescents. Disrupted sleep may be an adverse health outcome associated with e-cigarette use.
Marijuana (MJ) use is common in pregnancy and as laws are liberalized it may increase. This study explored pregnant women's beliefs, attitudes, and experiences regarding MJ. Focus groups were conducted within the Lifestyle and Early Achievement in Families study, an historical cohort. Children whose mothers were enrolled in pregnancy were followed at age 3.5-7 to estimate the association of in utero MJ and executive function and aggression. ~1/3 of mothers used MJ in pregnancy. 22 women participated in 4 focus groups, stratified by race and pregnancy MJ. Domains included risk perception of commonly-used substances, reasons for use in pregnancy, where pregnant women get health information, and providers' counseling about substances and behaviors. Health literacy was assessed by the eHealth Literacy Scale (mean 31.4/40 indicating good perceived skills using online health info). Women preferred to get info from (>1 choice) providers (73%), internet (55%), social networking (41%), and online forums (36%). All women knew cigarettes were risky, although many smoked. In contrast, many women said MJ was risky, but skepticism soon emerged. (“I circled risky for legality purposes. I don't think MJ's as detrimental as everybody says.”) MJ was viewed as a plant, and therefore natural (“MJ is not manmade. It's not a chemical like other drugs.”), and was equally or less risky than prescription meds. The most common reason for MJ use was to gain weight/handle nausea (“I literally lost 37# in 2 wks because I couldn’t hold anything down. The only way I could eat was to actually smoke”). Help sleeping was another reason for use. Doctors gave inconsistent information, even tacit encouragement, about MJ (“I can't tell you that you can't. Whatever you're doing, keep on doing it.” And I gained all my weight back”). Reports did not differ by race or MJ use in pregnancy. Regardless of use, participants had a benign attitude toward pregnancy MJ use, and caregivers gave mixed messages on use.
ASSESSMENT OF POLYSUBSTANCE USE DURING OPIOID USE DISORDER TREATMENT IN THE UNITED STATES: A SYSTEMATIC REVIEW Mirinda Gormley* Mirinda Gormley, Courtney Blondino, Dashaunda Taylor, Elizabeth Lowery, Whitney Graves, James Clifford, Elizabeth Prom-Wormley, Juan Lu, (Virginia Commonwealth University)

Background. Successful treatment of opioid use disorder (OUD) is often reduced in the presence of co-occurring polysubstance use. However, there is not yet a consistent recommendation regarding the consideration of comorbid polysubstance use (i.e., concurrent use of two or more substances) (PSU) during OUD treatment. This inconsistency is due in part to variation in the measurement of PSU throughout treatment of OUD. This systematic review aimed to describe the assessment of PSU during OUD treatment in the United States (U.S.).

Methods. We searched MEDLINE/PubMED, EMBASE, PsychINFO, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) to select relevant publications up to November 2018. We included observational studies and randomized control trials of adults in OUD treatment reporting baseline or in-treatment PSU. Four evaluators independently reviewed and selected eligible studies based on predetermined selection criteria. Quality assessment was performed using the ROBINS-I tool.

Results. Of the 3,219 titles screened, 614 abstracts and 231 full-text candidates were assessed, which resulted in 112 eligible articles: 67 randomized control trials and 45 observational studies. These studies included a total of 48,654 patients. PSU was most often evaluated by studies that implemented combined pharmacological and behavioral treatments (47.5%), followed by pharmacological (36%), and behavioral (15.8%). The substances most frequently evaluated included cocaine (89%), alcohol (52%), marijuana (38%), benzodiazepines (33%), and amphetamines (21%), very few studies assessed nicotine/tobacco use (8%).

Conclusion. This systematic review describes how PSU is assessed in OUD treatment studies within the U.S. Understanding the current assessment of PSU in OUD population is crucial for identifying knowledge gaps and developing effective treatment strategies.
TRENDS IN PAST-MONTH CANNABIS USE AMONG ADULTS WITH CHILDREN IN THE UNITED STATES, 2006-2017 Natasha Sokol* Natasha Sokol, Laura Stroud, (Brown University School of Public Health Center for Alcohol and Addiction Studies)

Background Parent cannabis use is a risk factor for early offspring initiation. The extent to which parents use cannabis, whether they differ from adults without children, and whether this has changed over time have not yet been reported. Methods We used cross-sectional data from adults (18-64) from the National Survey on Drug Use and Health (N=55,525) to assess the prevalence of past-month cannabis use among those with and without children between 2006 and 2017. We used logistic regression to test for time trends in past-month CB use, and to identify differences in demographic characteristics and substance dependence between parents and non-parents. Results The proportion of parents who used cannabis in the past month increased from 2.8% (95% CI=0.03, 0.03) in 2006 to 3.7% (95% CI=0.03, 0.04) in 2017. At all time points, past-month cannabis use prevalence was more than twice as high among non-parents compared to parents. There was a significant linear time trend in past-month cannabis use among both parents (OR=1.05; 95% CI=1.05, 1.06) and non-parents (OR=1.05; 95% CI=1.04, 1.06). Among past-month cannabis users, compared to non-parents, parents were less likely to report past-year alcohol abuse or dependence, be white, or have more than a high school education. They were more likely to be female, report nicotine dependence, and earn greater than $50,000/year. The minority of cannabis-using parents (10.9%) and non-parents (11.2%) reported cannabis dependence. Parents were no more likely to report cannabis dependence than non-parents. Conclusions Consistent with trends observed in other populations, the prevalence of cannabis use among parents has increased. Parents who use cannabis are less likely to report other drug dependence compared to non-parents. Shifting norms in cannabis use may be contributing to this increased prevalence. Future work may investigate interventions to minimize the impact of parent cannabis use on parent and offspring health and health behaviors.
EXCESS MORTALITY AMONG FIRST-TIME OFFENDERS OF KETAMINE USE IN TAIWAN: A 3-YEAR STANDARDIZED MORTALITY RATIO STUDY AMONG THE NATIONAL COHORT FROM 2009 TO 2013 Wei J. Chen* Wei J. Chen, Chi-Ya Chen, Shang-Chi Wu, Chien-Chang Wu, Susyan Jou, Tzu-Pin Lu, Yu-Chi Tung, Hsien-Ho Lin, (Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University; Department of Psychiatry, College of Medicine and National Taiwan University Hospital, National Taiwan University)

Background. The popularity of ketamine for recreational use among young people began to increase since 2000, particularly in Asia. Whether recreational use of ketamine leads to excess mortality remains rarely known. This study aims to estimate the 3-year standardized mortality ratio (SMR) among first-time offenders of ketamine use as compared to the general population in Taiwan. Methods. Following a law amendment in 2009 stipulating that persons convicted of possessing or using ketamine of less than 20 grams shall attend a narcotics hazard seminar, these offenders were enrolled in a database called “Administrative Penalty system for Schedule III/IV Illegal Drugs.” Ketamine users with previous drug offense records were excluded after linking with “Criminal Record Processing System.” The first-time ketamine offenders from year 2009 to 2013 were subjected to a 3-year mortality analysis. Individuals were excluded from the mortality analysis for the following reasons: 1) inconsistent birth year in different databases or the death year being earlier than the birth year (n = 4); 2) any person whose age was greater than 60 years (n = 2). The final sample size was 27,491. Results. During the 3-year follow-up, 328 deaths were identified. For all-cause death, the 3-year SMR was 4.8 (95% CI: 4.3-5.3) for the total sample, with the estimate for females (12.1; 95% CI: 9.4-15.4) being much higher than that for males (4.1; 95% CI: 3.6-4.7). The increased mortality could be detected even in young adults (18 to 24 years old), with the SMR being 3.8 for males and 9.1 for females. When death were divided into natural versus unnatural deaths, the increased mortality among first-time ketamine users was more prominent for unnatural deaths (9.7; 95% CI: 8.5-10.9) than for natural deaths (2.5; 95% CI: 2.0-3.2). Conclusions. Recreational use of ketamine leads to an increased mortality five times higher than that of the general population, and almost ten times higher for unnatural deaths.
Polysubstance use and misuse can increase risks for nonfatal and fatal drug overdose. To categorize drugs used in combination in nonfatal overdoses, we analyzed data from emergency department (ED) overdose-related visits in 14 states, from all four US Census regions, funded by CDC’s Enhanced State Opioid Overdose Surveillance program. In 2017, 56,312 ED visits included at least one hospital International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) discharge code indicating acute drug poisoning for opioids (including heroin), stimulants (including cocaine and amphetamines), hallucinogens, cannabis, anti-depressants, sedatives, alcohol, benzodiazepines, or other psychotropic drugs. Latent class analyses were conducted to determine the groupings of overdose visits of concurrent drug discharges. Results indicated a model of 5 classes - heroin overdose only (42.6% of visits); non-heroin opioid overdose only (26.3%); female, ≥55 years, non-opioid polydrug (13%); non-heroin opioid polydrug (10.5%); and non-opioid, younger (<25) polydrug (7.5%). The range of drug overlap was 1 (only one drug discharge indicated) to 9 drugs during the same visit (mean = 4.2). Our sample was mostly male (62%), and persons aged 25-34 years (32%) had the most visits when compared to other age groups. Findings indicate that heroin continues to be a large burden to EDs, yet EDs are also seeing overdose survivors with polydrug toxicity. Medication-assisted treatment could be initiated in the ED for those with moderate to severe opioid use disorder. Post-overdose protocols such as naloxone provision and linkage to risk reduction services have the potential to prevent future overdose for those at risk, particularly for those with multiple drugs used in combination.
Background: The current academic environment represents epidemiology as the ‘science’ of public health, with community health or policy focused investigators primarily championing the intervention or implementation of the science. Calls to action have been made over the last few decades to move epidemiology’s focus from etiology to improvement of health outcomes. Objectives: We conducted a systematic review of the literature in epidemiology to assess the proportion of papers that focused attention to the policy or interventional consequence of their work, as opposed to just etiology. Methods: Investigators sampled 100 full length original research publications published between 2013-18 from five top epidemiology journals. We used a novel tool to aid the review process and publication categorization. Risk factor (RF) publications focused on disease etiology while consequentialist (CS) publications focused on improving population health outcomes. Altmetric Attention Scores, a measure of attention and impact of publications, were also collected. Results: 21% of publications were rated as having 1+ CS themes and 79% had 1+ RF themes. There was no significant relationship between Altmetric scores and CS ratings (p=0.08). The most common themes to actionable messages for RF and CS publications included references to “mortality risks” and “women’s health”. The most popular manner of publication dissemination for both CS and RF publications was through social media channels while there was a statistically significant association between CS categorization and dissemination via affiliated lay media or news (p=0.00). Conclusion: The percentage of CS publications increased from 15% in 2012, but it still remains a small proportion of literature published in epidemiology journals offering epidemiologists the opportunity to initiate calls to action based on real-world implications of their research.
BLOOD DHEA AND DHEA-S AS POTENTIAL BIOMARKERS FOR CHRONIC PAIN IN WOMEN: FINDINGS FROM A NATIONAL SAMPLE OF US ADULTS Rui Li* Rui Li, Shannon M. Smith, Benjamin Chapman, (Department of Public Health Sciences, University of Rochester Medical Center)

Objective: The search for valid and specific biomarkers is a priority in translational chronic pain research, and the blood may be an important source with cost-benefit appeal. Dehydroepiandrosterone (DHEA) and its sulfated form DHEA-S are neurosteroids with neuroprotective properties and also reflect adrenocortical function. We hypothesized that DHEA and DHEA-S would be blood chronic pain markers that capture the key neuroendocrine mechanisms of chronic pain. Methods: Based on 1017 adults aged 34-84, we studied the associations between chronic pain and subsequent blood DHEA and DHEA-S concentrations, using data of the second wave Midlife in the United States. We used linear regression to estimate the change in blood DHEA and DHEA-S concentrations associated with chronic pain in men and women separately, adjusting for demographic, clinical conditions, medications, lifestyle and psychosocial factors. If an association was found, we further explored the dose-response relationship by the number of chronic pain locations and the degree of chronic pain interference. Results: Within a mean follow-up of 28 months, chronic pain did not predict blood DHEA or DHEA-S levels in men. In women, chronic pain was associated with \(0.07 \text{ reduced } \log_{10} \text{ DHEA} (95\% \ CI = -0.12, -0.02 \text{ ng/mL})\), and \(0.09 \text{ reduced } \log_{10} \text{ DHEA-S} (95\% \ CI = -0.15, -0.04 \text{ µg/dL})\). Dose response relationship was detected for chronic pain interference. Compared to women without chronic pain, women with low-interference pain had \(0.06 \text{ reduced } \log_{10} \text{ DHEA} \text{ ng/mL} \) and \(0.07 \text{ reduced } \log_{10} \text{ DHEA-S} \text{ µg/dL}\), while women with high-interference pain had \(0.09 \text{ reduced } \log_{10} \text{ DHEA} \text{ ng/mL} \) and \(0.15 \text{ reduced } \log_{10} \text{ DHEA-S} \text{ µg/dL} \) (p for trend, 0.029, <0.001 respectively). Conclusion: Chronic pain corresponds to lower blood DHEA and DHEA-S levels in women, which better captures chronic pain-related stress dysfunction. Given its high concentration and stability compared to DHEA, DHEA-S may be a better blood biomarker for chronic pain in women.
THE ASSOCIATION BETWEEN WOMEN'S INTER-BIRTH INTERVALS AND CANCER INCIDENCE

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Background: Reproductive characteristics are important risk factors for cancer in women. However, little is known about whether inter-birth intervals (IBI) are independently associated with cancer incidence. We aimed to assess the association between IBIs and incidence of any-cancer, as well as breast, colorectal, cervical, and ovarian cancer. Methods: Data from the population-based Jerusalem Perinatal Study cohort, that included all residents of Jerusalem who gave birth between 1964-1976, was linked with Israel's National Cancer Registry (total person-years=880,399). For women with at least two live singleton births (N=18,501), we calculated the interval between women's first and second birth in the cohort, and the minimum interval between births in the cohort. Intervals were grouped into 5 categories (<15 months, 15-<20, 20-<30, 30-45 months had higher risk of breast cancer incidence (HR 1.17; 95% CI: 1.01–1.36) compared to women with IBIs of 20-30 months.

Women with IBIs <15 months had increased risk of colorectal cancer incidence (HR 1.38; 95% CI: 1.00–1.90) compared to women with an IBI of 20-30 months. We did not find evidence of an association between IBI and cervical and ovarian cancer incidence. Results were similar when assessing minimum intervals between births and when limiting the analysis to primiparas, to assess the interval between women's first and second birth.

Discussion To the best of our knowledge, this is the first study to estimate the association of IBI with cancer incidence. Our findings are in line with known breast cancer risk factors such as age at first birth and parity, and highlight IBI as an additional important risk factor for breast cancer incidence.
Objective. To use principal component and cluster analysis to identify, for the first time, distinct hormone phenotypes of peripubertal girls. Identifying these phenotypes will aid in understanding the biological mechanisms underlying differences in age at pubertal development. Methods. We measured four hormones, DHEA, estrone, estradiol, and testosterone, at five time periods relative to onset of thelarche (time=-18,-12,-6,0, +6) in 269 girls from the greater Cincinnati area. Principal components analysis was performed to select a subset of relevant hormone variables. Cluster Analysis was then applied to identify phenotypes of girls based on the predictive hormone variables. Differences in demographic, anthropometric and age at pubertal maturation events between the phenotypes were tested with the Kruskal-Wallis statistic and Chi-Square tests. Results. Principal component analysis yielded three components accounting for 74% of the shared variability among our initial phenotypic variables. K-Means cluster analysis then identified four distinct hormone phenotypes. Phenotype 1 (n=42) was defined as girls with high DHEA, and high testosterone and estrone; Phenotype 2 (n=37) was girls with very high estradiol, and high DHEA and testosterone; Phenotype 3 (n=74), girls who generally did not have high hormone values; and Phenotype 4 (n=96) girls with very low hormones. Further differences in age of thelarche, pubarche, ethnicity and changes in the hormone levels between time periods were seen between the phenotypes. Conclusions. Principal component and cluster analysis identified four meaningful and distinct hormone profile phenotypes among peripubertal girls indicating the heterogeneity of hormone profiles around pubertal timing. These analyses help us understand the rich interplay of hormones during pubertal maturation, but also give us insight in to the developmental onset of hormone related adult diseases. Funding:U01-ES12770,u01-ES019453,U01-ES026119,R01-ES029133
ASSOCIATION BETWEEN ESTROGENS AND SELF-REPORTED HOT FLASHES AND VAGINAL DRYNESS IN POSTMENOPAUSAL WOMEN RANDOMIZED TO THE MAP.3 CHEMOPREVENTION TRIAL

Lindsey Cameron-Dermann* Lindsey Cameron-Dermann, Jim Ingle, Paul Goss, Dongsheng Tu, Harriet Richardson, (Queen's University)

Background: Although the aromatase inhibitor exemestane has been found to have small negative effects on menopause-specific quality of life (QOL) overall, women randomized to exemestane in the Mammary Prevention 3 (MAP.3) trial were at a slightly increased risk of experiencing worsened vasomotor and sexual QOL compared with placebo. This study aimed to determine the association of natural estrone (E1) and estradiol (E2) on the most prevalent vasomotor and sexual symptom prior to randomization: hot flashes and vaginal dryness. Methods: E1 and E2 were quantified in serum samples acquired from MAP.3 participants prior to randomization using CLIA-approved LC/MS/MS. The presence and severity of hot flashes and vaginal dryness were assessed using responses from the Menopause-Specific Quality of Life Questionnaire (MENQOL) administered prior to randomization. Participants were characterized as having very bothersome symptoms if responses to questions were ≥5 (of 8) points. Multiple logistical regression analyses were performed on 3038 Caucasian participants, accounting for 94% of the data. Results: The odds of reporting very bothersome hot flashes was significantly higher for women in the lowest quartile of log-transformed E1 (OR= 1.44, 95% CI: 1.06-1.96) and E2 (OR= 1.52, 95% CI: 1.14-2.02) compared with the highest quartiles. Similarly, the odds of reporting very bothersome vaginal dryness was significantly higher for women in the lowest quartile of log-transformed E1 (OR= 1.73, 95% CI: 1.25-2.37) and E2 (OR= 1.53, 95% CI: 1.10-2.13) compared with the highest quartiles. Conclusion: Caucasian postmenopausal women with low E1 and E2 have increased odds of reporting hot flashes and vaginal dryness. These results will inform pending analyses of the effect of exemestane-induced estrogen suppression on changes in menopause-specific QOL one year after randomization to the MAP.3 trial, which will be described at time of presentation.

S/P indicates work done while a student/postdoc
THE ROLE OF OCCUPATIONAL EXPOSURES IN LUNG CANCER RISK AMONG WOMEN
Mengting Xu* Mengting Xu, Jack Siemiatycki, Vikki Ho, (University of Montreal; CRCHUM)

Introduction: Lung cancer incidence has greatly increased among women. Hardly any research has been conducted on possible associations between occupational exposures and lung cancer among women. Objective: To explore whether occupational exposures increase lung cancer risk among women. Methods: A population-based case-control study on lung cancer was conducted from 1996 to 2001 in Montreal, Canada. Cases were individuals diagnosed with incident lung cancer and population controls were randomly selected from electoral lists and frequency-matched to cases. Questionnaires on lifetime occupational history, smoking and demographic characteristics were collected during in-person interview. Experts reviewed subjects’ work history and assessed exposure to 294 agents. 465 female cases and 614 female controls were included in the current analysis. We examined the associations between female lung cancer risk, and occupational exposure to each of 30 agents, selected based on their relatively high prevalence and/or because they are known lung carcinogens among men. Analyses were conducted using multivariate logistic regression models, adjusted for smoking and other selected covariates, with the reference category for each agent being the women without exposure to that agent. Results: No elevated lung cancer risk was observed among women occupationally exposed to our selected agents. Unexpectedly, for a few of the agents (cellulose, treated textile fibers, carbon monoxide, ozone), the odds ratios were significantly below the null. Discussion: Our results do not support the hypothesis that occupational exposure to prevalent agents in female jobs and to known occupational lung carcinogens in men increases women’s lung cancer risk. Inferences from these observations are limited because of relatively small numbers of exposed women, and relatively low exposure levels.
Polybrominated diphenyl and biphenyl ethers (PBDEs and PBBs), are organic pollutants commonly detected in humans. In the U.S., penta- and octa-PBDEs were removed from the market in 2004, deca-PBDE phased out in 2010, and PBB153 banned in 1976 after an agricultural contamination. Using baseline data from a prospective cohort study of Black women aged 23-34 years from Detroit, MI (2010-2012), we examined predictors of PBDEs and PBB153. Non-fasting blood samples were collected from 742 participants at enrollment. Demographic, educational, behavioral, dietary, early-life exposures, occupational, and medical history data were collected via self-administered questionnaires, telephone interviews, and in-person clinic visits. We fit linear regression models to calculate percent differences and 95% CIs for each baseline predictor with lipid-adjusted plasma BFR concentrations. In models adjusted for all other predictors, predictor profiles differed for PBDEs and PBB-153. Plasma penta- and octa- PBDE concentrations were positively associated with occupational exposure to dust (range: 29-45% higher) and were inversely associated with a 5-year increase in age (range: 6-20% lower). No associations with deca- PBDE were observed. Plasma PBB-153 concentrations were 48% higher with a 5-year increase in age (95% CI=30-69), and 71% higher when comparing participants breastfed for ≥3 months as an infant with participants who were not breastfed (95% CI=47-99). A 5 kg/m² increase in BMI was associated with 17% lower PBB-153 and generally not associated with PBDE concentrations. Diet was not an important predictor of plasma concentrations. Occupational exposure to dust was associated with higher plasma concentrations of penta- and octa- PBDEs, and early-life exposure to breastfeeding was associated with elevated plasma concentrations of PBB-153.
THYMIC FUNCTION AND VULVODYNIA: A NOVEL APPROACH TO ASSESS IMMUNE DYSFUNCTION Sydney I Willis* Sydney K Willis, Bernard L Harlow, Julie A Nelson, Allison E Aiello, (Boston University School of Public Health)

Vulvodynia is chronic idiopathic unexplained vulvar pain that has been estimated to affect 8% of American women by the age of 40. Although the cause of vulvodynia is largely unknown, risk factors that alter immune function appear to be more prevalent in women with vulvodynia. To better understand this immune hypothesis, we used DNA extracted from whole blood to measure T-cell Receptor Excision Circles (sjTREC), an indicator of thymic function, responsible for the production of T-Cells in response to immunological assaults. High sjTREC indicates higher thymic output. Among 234 women with and 234 without clinically-confirmed vulvodynia 18-40 years of age, thymic function appreciably decreased with increasing age as expected (3% of 18-24yo women compared to 42% of 35-40yo women were in lowest thymic function quartiles). However, when stratified by age, women 30 with vulvodynia had 0.5 times the likelihood (95%CI 0.2-1.6) of being in the highest quartile of thymic function. Furthermore, in women with lower median diversity vaginal microbiomes, those with vulvodynia were nearly 2 times more likely to be in the highest quartile of thymic function (95%CI 0.6-5.2) whereas in women with more diverse vaginal microbiomes, those with vulvodynia had 0.5 times the odds (95%CI 0.2-1.5) of being in the highest thymic function quartile. Although confidence intervals were wide, this degree of heterogeneity was significant and these findings suggest that in younger women with less microbiome diversity, those with vulvodynia may put more stress on their immune system, and have a more precipitous decline in thymic function as they age, relative to women without vulvodynia. This is the first study to use thymic function as a direct marker of immune status in relation to vulvodynia.
A QUANTILE-BASED G-COMPUTATION APPROACH TO ADDRESSING THE EFFECTS OF EXPOSURE MIXTURES Jessie P. Buckley* Alexander P. Keil, Jessie P. Buckley, Katie M. O’Brien, Kelly K. Ferguson, Shanshan Zhao, Alexandra J. White, (Department of Epidemiology, University of North Carolina, Chapel Hill, North Carolina; Epidemiology Branch, National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH), Department of Health and Human Services (DHHS), Research Triangle Park, North Carolina, USA.)

Exposure mixtures frequently occur in epidemiologic data, particularly in the fields of environmental and nutritional epidemiology. Various strategies have arisen to answer questions about exposure mixtures, including methods such as weighted quantile sum regression that estimate a joint effect of the mixture components. Few other methods have been used to estimate such joint effects, even though they are of great interest for informing interventions that may act on multiple exposures. We demonstrate a new approach to estimating the joint effects of a mixture: quantile g-computation. This approach combines the inferential simplicity of weighted quantile sum regression and the immense flexibility of g-computation, a method of causal effect estimation. We demonstrate, using simulations and large sample formulae, that weighted quantile sum regression can be considered a special case of quantile g-computation, and that quantile g-computation often provides improved inference at sample sizes typically encountered in epidemiologic studies, and when the assumptions of weighted quantile sum regression are not met. We examine, in particular, the impacts of large numbers of non-causal exposures, exposure correlation, unmeasured confounding, and non-linearity of exposure effects. We show that, counter to intuition, quantile g-computation estimates can become more precise as exposure correlation increases (Figure). Quantile g-computation appears robust to many problems routinely encountered in analyses of exposure mixtures. Methods, such as quantile g-computation, that can yield unbiased estimates of the effect of the mixture are essential for understanding the effects of potential interventions that may act on many components of the mixture, and our approach may serve as an excellent tool for quantifying such effects as a way to bridge gaps between epidemiologic analysis and public health action.
CENSORING FOR LOSS TO FOLLOW-UP IN TIME-TO-EVENT ANALYSES OF COMPOSITE OUTCOMES OR IN THE PRESENCE OF COMPETING RISKS Catherine Lesko*, Catherine Lesko, Jessie K Edwards, Richard D Moore, Bryan Lau, (Johns Hopkins Bloomberg School of Public Health)

Background. Loss to follow-up (LTFU) is ubiquitous in time-to-event analyses. Censoring time for persons who are LTFU should depend on the event under study: for outcomes only observable in a study encounter (“measured”), censoring should be at the last study visit (“last-encounter censoring”); and for outcomes observable outside a study encounter, e.g., in a registry (“captured”), censoring should be when the definition of LTFU is met (“LTFU-definition censoring”). We investigate the optimal censoring scheme when the outcome is a mix of measured and captured events. Methods. We studied: 1) risk of a composite event made up of measured and captured events; and risk of a 2) measured or 3) captured event in the presence of a competing event of the other type. We simulated data assuming several different values for risk of the estimand of interest and of LTFU. We estimated truth from the full simulated data, then simulated LTFU and attempted to recapture the truth under: 1) last-encounter censoring; 2) LTFU-definition censoring; and 3) a new, hybrid censoring strategy. Results. For risk of the composite event, our hybrid approach for censoring was least biased; of the other two strategies, last-encounter censoring was least biased when the proportion of events in the composite outcome that were measured was <60%. Last-encounter censoring was approximately unbiased for estimating risk of a measured event, and LTFU-definition censoring was approximately unbiased for estimating risk of a captured event, even in the presence of a competing event, until majority of the sample had an event or was LTFU. Conclusions. Time-to-event analysis of composite outcomes composed of both measured and captured events should employ the new hybrid censoring strategy, or choose a censoring strategy based on the relative frequency of event types. Analyses of measured or captured events should employ last-encounter and LTFU-definition censoring, even in the presence of a competing event.
Pre-exposure prophylaxis (PrEP) for HIV prevention may not only benefit the individual treated, but also their sexual risk contacts. We developed an agent-based model using a novel trial emulation approach to quantify disseminated effects of PrEP among men who have sex with men in Atlanta, GA. To apply existing causal methods, static sexual network components of size 2 to 100 were defined based on existing literature. Following a two-stage randomized design schema for network-randomized trials, components were first randomized to intervention or control (no PrEP), then within intervention components, agents were randomized to PrEP according to coverage level for the scenarios: PrEP coverage level of 10% to 100% in 10% increments. The direct effect was defined as HIV prevalence among agents on PrEP beyond being in an intervention component; the disseminated effect is that among agents not on PrEP but sharing sexual risk with those on PrEP. We estimated direct and disseminated effects using randomization-based estimators and report corresponding 95% simulation intervals (SI). There were 11,245 agents followed from 2015 to 2019 with an average of 1,628 components identified. On average, among intervention components with 50% coverage, the point prevalence of HIV at 60 months was 13% (95% SI = 11%, 16%) among PrEP agents, compared to 69% (95% SI = 66%, 72%) among non-PrEP agents. Among components with 70% coverage, there was a 76% direct rate reduction in HIV incidence among agents on PrEP compared to agents not on PrEP (95% SI = 0.19, 0.30). Comparing agents not on PrEP in 70% coverage components to agents in control components, there was a 17% disseminated rate reduction in HIV incidence (95% SI = 0.67, 1.02). Individuals not on PrEP may benefit by being in a sexual network with higher PrEP coverage levels. Agent-based models are useful to evaluate potential direct and disseminated effects of HIV prevention modalities in sexual networks.
IMPROVING INSTRUMENTAL VARIABLE STUDIES OF SOCIAL DETERMINANTS OF HEALTH: EVALUATING THE BIAS-VARIANCE TRADEOFF WHEN ADJUSTING FOR POTENTIAL INSTRUMENT-OUTCOME CONFOUNDERS
Audrey Murchland, Elizabeth Rose Mayeda, David Rehkopf, Justin White, Jennifer J. Manly, Anusha Vable, Rita Hamad, Willa Brenowitz, M. Maria Glymour, (University of California, San Francisco)

Figure 1. Causal DAG Showing Confounded IV-Outcome Relationship
GUIDELINES FOR CAUSAL INFEERENCE FROM PRAGMATIC RANDOMIZED TRIALS REQUIRE ANALYTIC METHODS FROM OBSERVATIONAL STUDIES

Eleanor Murray*, Eleanor Murray, Miguel Hernan, (Harvard TH Chan School of Public Health)

Pragmatic randomized trials are key tools for research on the comparative effectiveness of medical interventions. Unlike other randomized trials, pragmatic trials are specifically designed to address real-world questions about options for care and therefore to guide decisions by patients, clinicians and other stakeholders. Therefore, characteristics of a pragmatic trial include typical patients and care settings, clinically relevant comparators, unconcealed assignment to treatment, and follow-up time long enough to study long-term clinical outcomes without having to rely on surrogates. While pragmatic trials are useful to guide decision making, they are also especially vulnerable to post-randomization confounding from incomplete adherence and post-randomization selection bias from loss to follow-up. These sources of bias are common in observational epidemiology, and the use of analytic approaches pioneered for observational studies can improve inference from pragmatic trials. Here we propose causal inference guidelines tailored for the analysis of pragmatic randomized trials using methods from observational research. Importantly, conventional methods to adjust for confounding and selection bias do not generally work for post-randomization variables. In fact, conventional methods such as multivariate outcome regression, stratified analyses, propensity score regression and matching, and others may themselves introduce bias. Therefore, our guidelines are based on so-called g-methods, developed by Robins and collaborators since 1986, which can appropriately adjust for post-randomization biases. Because g-methods require data on post-randomization (that is, time-varying) treatments and covariates, embracing these guidelines will require a revised framework for both the design and conduct of both pragmatic trials and other trials with substantial loss to follow-up or non-adherence.
VALID CAUSAL EFFECT ESTIMATES WITH MACHINE LEARNING ALGORITHMS
Ashley Naimi* Ashley Naimi, Edward Kennedy, (University of Pittsburgh)

Machine learning is increasingly in popularity because such methods do not require precise knowledge of the true underlying models that generated the data under study. As such, numerous authors have advocated for their use with standard methods (e.g., regression, inverse probability weighting). Unfortunately, it is not generally recognized that machine learning algorithms can lead yield estimators that are considerably biased, inefficient, with no method to obtain valid confidence intervals. Doubly robust estimators can be used to overcome these problems. Using extensive Monte Carlo simulations, we show how doubly robust methods offer improvements over singly robust approaches when implemented using machine learning methods. We use 10,000 simulated samples and 50, 200, and 1200 observations to investigate the bias, mean squared error, efficiency, and confidence interval coverage and width of singly robust (g Computation, inverse probability weighting) and doubly robust (augmented inverse probability weighting, targeted maximum likelihood estimation) estimators under four scenarios: correct and incorrect model specification; and parametric and nonparametric estimation. Figure 1 shows that for $N=1200$ with correctly specified confounders and machine learning algorithms, IP-weighting and g computation is 14 times and 10 times as biased as TMLE, respectively. Similarly, for $N=1200$ with misspecified confounders and machine learning algorithms, the respective bias of IP-weighting and g computation is 5 times and 4 times as high as TMLE. A similar pattern was observed for standard error estimation, as well as confidence interval coverage and width. Our results suggest that nonparametric methods should be used with doubly instead of singly robust estimation techniques.

Figure 1: Estimated bias of inverse probability weighted, g-computation, and doubly robust estimators for sample sizes of $N = 50$, $N = 200$, and $N = 1,200$ observations when models for each estimator are specified parametrically (correct, mis-specified) using linear regression, and nonparametrically using random forests.

S/P indicates work done while a student/postdoc
FIVE COMPLICATIONS OF TERM PREGNANCIES THAT PREDICT FUTURE PRETERM DELIVERY Liv Grimstvedt Kvalvik, Allen Wilcox, Rolv Skjaerven, Quaker Harmon, Truls Ostbye, (University of Bergen)

Background. Women with a complication of pregnancy are at increased risk of recurrence of the specific complication in subsequent pregnancies. We explored whether poor outcomes in term pregnancies might also predict preterm delivery in the next pregnancy. Methods. Using the population-based Medical Birth Registry of Norway (MBRN), including 785 540 women giving births between 1967-2015, we linked outcomes of women’s first pregnancies with outcomes in their second. Results. Preeclampsia, placental abruption, stillbirth, neonatal death, and small-for-gestational-age babies in term pregnancies were each strongly associated with an increased risk of preterm delivery in the subsequent pregnancy. Relative risks ranged from 1.68 to 2.83, with p-values all less than 0.001. An elevated preterm risk persisted even after excluding recurrence of the specific complication. These associations were also seen in the reverse direction: preterm birth without recorded pathology predicted the occurrence of pathological conditions in the next pregnancy at term. Discussion. Complications of pregnancy at term apparently share underlying causes with preterm delivery. These presumably reflect persistent conditions in the mother or her environment, possibly acting through placental pathology. Conclusion. Complications of pregnancy are not entirely distinct entities, but expressions of some set of underlying pathological processes to which some women are more susceptible.
The association between short interpregnancy interval and increased risk of adverse birth outcomes is well-documented. Possible mechanisms include maternal nutritional depletion and diminished vascularization from incomplete uterine tissue remodeling. Little is known about the optimal time between giving birth and attempting to conceive again (postpartum interval). We evaluated the association between the postpartum interval and fecundability in Pregnancy Study Online (PRESTO), a prospective preconception cohort of pregnancy planners. Eligible women were aged 21-45, residents of the U.S or Canada, attempting pregnancy, and not using fertility treatment. Women completed a baseline questionnaire to ascertain information on demographic, lifestyle, and reproductive history, including the gestational length of all previous pregnancies. They completed bi-monthly follow-up questionnaires to update pregnancy status over time. We restricted our analysis to 1,238 women whose previous pregnancy resulted in a singleton live birth and who were attempting pregnancy for ≤6 months at study entry. We used proportional probabilities regression models to estimate fecundability ratios (FR) and 95% confidence intervals (CI), adjusted for age, partner’s age, race/ethnicity, education, income, smoking history, breastfeeding, and weight gain during prior pregnancy. We defined the postpartum interval based on the time between the date of the prior live birth and the initiation of the current pregnancy attempt. Postpartum intervals ranged from 1-220 months. Relative to a 12-23 month postpartum interval, FRs for an interval of <12, 24-27, and ≥48 months were 0.95 (CI: 0.79-1.13), 1.11 (CI: 0.94-1.31) and 0.85 (CI: 0.69-1.05), respectively. Results were similar after excluding time spent breastfeeding from the postpartum interval and when restricted to those without a history of infertility. These data indicate that postpartum intervals ≥48 months may be associated with reduced fecundability.
HOW IS GESTATIONAL WEIGHT GAIN BETWEEN CLINICAL VISITS BEST ESTIMATED IN TWIN AND SINGLETON PREGNANCIES? Michelle Dimitris* Michelle Dimitris, Jay Kaufman, Jennifer Hutcheon, Robert Platt, Katherine Himes, Lisa Bodnar, (McGill University)

Studies of maternal weight gain and perinatal outcomes typically use a single cumulative total measure of weight gain. While there is growing interest in examining serial weights, analyses (i.e. time-to-event) often require estimation of information collected between measurements. We evaluated the accuracy and precision of models for estimating maternal weight between prenatal visits in both twin and singleton pregnancies. We leveraged serial prenatal weights abstracted for a large cohort of dichorionic twin and case-cohort of singleton pregnancies delivered from 1998-2014 at Magee-Women's Hospital in Pittsburgh, Pennsylvania. We retained pre-pregnancy and delivery weights, as well as those collected at first and glucose screening visits, to mimic a typical data collection schedule. Next, we fit interpolation models, estimated weights among those not retained, and calculated the difference between estimated and observed weights in kilograms. Finally, we compared median, interquartile range (IQR), and mean squared error (MSE) of differences by model. We evaluated 16 models: 4 individual (last value carried forward, linear using proximal weights, linear/quadratic terms) and 12 pooled (mixed effects with random intercept/slope with linear, quadratic, log transformed, fractional polynomial and/or spline terms). Among both twins (n=2033, n weights estimated=16127) and singletons (n=8721, n weights estimated=70742), pooled models with random effects for pregnancy and gestational age and cubic splines with knots demarcating trimesters performed best (MSE=2.29, median=0.02, IQR=-0.88:0.86 in twins; MSE=2.04, median=0.02, IQR=-0.83:0.80 in singletons). Comparable models included individual linear interpolation using proximal weights (MSE=2.61 and 2.12 in twins and singletons, respectively) and pooled quadratic interpolation with random intercept and slope (MSE=2.86 and MSE=2.42). Generally, approaches benefitted from incorporating both flexibility and individual variation.
Firearm violence is a major source of premature death in the United States, and may indirectly affect health among pregnant women living in neighborhoods where it is endemic. We used linked birth, death, emergency department, and hospitalization data from California from 2007-2011 to estimate the association between high firearm violence exposure and preterm birth (PTB), and assessed whether the association was mediated by pregnancy complications and health behaviors recorded during pregnancy. We used an ensemble machine learning algorithm to predict the propensity for neighborhoods to be classified as high firearm violence, which we defined as having firearm violence rates greater than 50 per 100,000 persons (6.5% of neighborhoods). Risk differences (RD) for the total effect and stochastic direct (SDE) and indirect (SIE) effects were estimated using targeted maximum likelihood. We assessed whether the relationship between firearm violence and PTB was mediated by infection, preeclampsia, gestational diabetes, asthma, and substance use. We included pre-existing hypertension, diabetes, and pre-pregnancy BMI as exposure induced mediator-outcome confounders. After restricting our analyses to neighborhoods within the area of common support, we found living in high violence neighborhoods was associated with higher prevalence of PTB [RD = 0.49% (0.27%, 0.71%)], infections [RD = 1.33% (0.97%, 1.69%)], asthma [RD = 0.69% (0.54%, 0.85%)], and substance use [RD=0.70% (0.58%, 0.81%)]. The largest indirect effects between violence and PTB were observed for infection [SIE = 0.04% (0.03%, 0.04%)], preeclampsia [SIE = 0.03% (0.03%, 0.03%), and substance use [SIE = 0.06% (0.04%, 0.07%)]. Results were strongest for spontaneous PTB. Interventions that provide support for pregnant women living in high firearm violence neighborhoods may improve both maternal and infant health, especially if they reduce complications or maladaptive coping behaviors during pregnancy.
OUTBURSTS OF ANGER IMMEDIATELY PRIOR TO PLACENTAL ABRUPTION: A CASE-CROSSOVER STUDY Harpreet Chahal*, Harpreet Chahal, Bizu Gelaye, Elizabeth Mostofsky, Manuel S Salazar, Sixto E Sanchez, Cande V Ananth, Michelle A Williams, (Harvard TH Chan School of Public Health)

Background: Roughly a fourth of all placental abruption cases have an acute etiologic underpinning, but the causes of acute abruption are poorly understood. Studies indicate that symptoms of stress, depression, and anxiety during pregnancy are associated with a higher risk of abruption. Objective: We examined the rate of abruption in the two hours immediately following outbursts of anger. Methods: In a multicenter case-crossover study, we interviewed 663 women with placental abruption admitted to one of seven Peruvian hospitals between January 2013 and August 2015. We asked women about outbursts of anger before symptom onset and compared this to their usual frequency of anger during the week before placental abruption. Results: The rate of placental abruption was 2.83 (95% confidence interval (CI) 1.85, 4.33) times higher in the 2 hours following an outburst of anger compared to other times. The rate ratio (RR) was lower for women who completed technical school or university (RR 1.38, 95% CI 0.52, 3.69) compared to women with secondary school education or less (RR 3.73, 95% CI 2.32, 5.99, P-homogeneity = 0.07). There was no evidence that the association between anger episodes and placental abruption varied by hypertensive disorders of pregnancy (i.e., preeclampsia/eclampsia) or antepartum depressive symptoms. Conclusion: There was a higher rate of placental abruptions in the 2 hours following outbursts of anger compared to other times, providing potential clues to the aetiologic mechanisms of abruption of acute onset.
INCREASE IN PRETERM BIRTHS AMONG US LATINA WOMEN AFTER THE 2016 PRESIDENTIAL ELECTION Jacqueline M. Torres* Alison Gemmill, Ralph Catalano, Deborah Karasek, Hector E. Alcala, Joan Casey, Holly Elser, Jacqueline M. Torres, (Stony Brook University)

The 2016 presidential election may have had adverse impacts on population health, particularly among U.S. Latinos given anti-immigrant rhetoric and policies that characterized the Trump campaign. Our analysis extends previous research demonstrating increased rates of preterm birth (< 37 weeks gestation) among Latina women living in New York City following the 2016 presidential election by using national-level data and rigorous time-series methods that allow us to account for cycles, seasonality, and trends in preterm birth. We obtain counts of singleton term and preterm births by month and ethnicity between September 2012 and July 2017 (n=20,524,179 live births) from the CDC Wonder online database. We use an interrupted time series design to test the hypothesis that preterm birth rose above otherwise expected levels among Latina women in the United States following the election of Donald Trump. We generate our expected counts of Latina preterm births from the 50 months prior to November 2016, as well as by controlling for the monthly number of Latina term births in months t, t +1, and t + 2, and the number of non-Latina preterm births in month t. Over the study period, rates of preterm birth for non-Latina and Latina women were 9.6% and 10.1%, respectively. We find evidence of an additional 1,098 Latino preterm births in the nine months following the election (95% Confidence Interval (CI): 235, 1961) above the 66,000 expected under the counterfactual scenario in which no election occurred. Excess preterm births peaked in February 2017. Sex-specific analyses revealed greater increases in preterm births among male infants (i.e. 837, 95% CI: 308, 1366 above the expected 36,800). We extend prior research suggesting that the 2016 U.S. presidential election contributed to increased preterm births among Latina women living in the U.S. Future research should continue to evaluate the impact of the 2016 election and subsequent policy changes on population health.

S/P indicates work done while a student/postdoc
THE WORLD TRADE CENTER DISASTER AND LONG-TERM CVD RISK AMONG
FIREFIGHTERS

Hillel Cohen* Molly Skerker, Hillel Cohen, Rachel Zeig-Owens, Cynthia Joe, Charles Hall, Mayris Webber, Nadia Jaber, Michael Weiden, Krystal Cleven, Molly Skerker, David Prezant, (Montefiore Medical Center, Fire Department of the City of New York)

Background. Intensity of exposure to the dust cloud from the collapses of the World Trade Center (WTC) on Sept. 11, 2001 (9/11) was directly associated with subsequent risk of pulmonary diseases and other health conditions in firefighters from the Fire Department of the City of New York (FDNY). This study examines long-term cardiovascular disease (CVD) risk associated with WTC exposure intensity in the FDNY cohort. Methods. Acute exposure intensity was defined by one of the following: Arrival Group 1: firefighters first arrived the morning of the 9/11 collapse; Arrival Group 2: first arrived that afternoon; Reference Group: first arrived within 3-14 days of 9/11. Post-acute exposure, called “Duration,” was based on number of months (1-10) participants worked at the WTC site through July 2002, dichotomized as ≥6 months for higher exposure and <6 as reference. Primary CVD outcome included physician documented diagnoses of myocardial infarction, stroke, unstable angina, coronary artery surgery or angioplasty. Age-adjusted incident rates by exposure were calculated. Cox proportional hazard models estimated hazard ratios (HR) and (95%CI) for exposures using age as the time scale and adjusting for hypertension, diabetes, hypercholesterolemia, smoking and probable Post Traumatic Stress Disorder (PTSD) along with race and body mass index among 9,792 male, exposed firefighters giving informed consent and without prior CVD. Results. The Figure shows age adjusted incidence rates by 3 acute exposure groups. Fully adjusted HR (95%CI) were 1.4 (1.1, 1.9; p=0.02) for Arrival Group 1 compared to reference. P for trend for 3 arrival group categories was p=0.01. HR for Duration ≥6 months vs. <6 was 1.3 (1.1, 1.6, p = 0.01). Conclusion. We found statistically significant associations between acute and post-acute work exposure at the WTC site and long-term CVD risk. The findings reinforce the importance of long-term monitoring of the health of survivors of such disasters.

![Figure 1. Age-adjusted incidence rates by Arrival Group for Primary CVD Outcome](image)

S/P indicates work done while a student/postdoc
THE IMPORTANCE OF NON-TRADITIONAL RISK FACTORS FOR PREDICTION OF CARDIOVASCULAR DISEASE IN WOMEN OF REPRODUCTIVE AGE  Sonia M Grandi* Sonia M Grandi, Kristian B. Filion, Jennifer A. Hutcheon, Graeme N Smith, Robert W. Platt, (McGill University)

Introduction: Currently available risk prediction scores for cardiovascular disease (CVD) were developed in older populations which limits their ability to provide accurate estimates of risk in younger women. Moreover, these models do not incorporate pregnancy-related risk factors that have been shown to be associated with long-term risk of CVD.

Methods: A cohort of 111,204 women aged 15-45 years with a first recorded delivery (stillbirth or livebirth) from April 1999 to March 2018 in the United Kingdom's Clinical Practice Research Datalink database was created for this study. Women with a history of CVD, prior pregnancy, and <1 year of medical history prior to cohort entry were excluded. The primary outcome was CVD defined as myocardial infarction, cerebrovascular disease, coronary artery disease, peripheral vascular disease, coronary revascularization, unstable angina, or cardiovascular-related death. Candidate predictors were selected based on clinical and substantive knowledge and defined within 5 years prior to the start of the pregnancy. Missing predictor values were imputed using the multiple imputation by chained equations method. An accelerated failure time model using the Adaptive Elastic Net method was used to determine the inclusion of predictors and to estimate the final model.

Results: A total of 302 women experienced a CVD event over a median follow-up of 4.06 (IQR: 1.64-8.05). Predictors included in the final model were age, ethnicity, social deprivation, body mass index, systolic blood pressure, diabetes, hypertension, polycystic ovary syndrome, renal disease, oral contraceptive use, history of depression, gestational diabetes, hypertensive disorders in pregnancy, placental abruption, preterm birth, history of infertility or use of infertility treatments, venous thromboembolism, and rheumatoid arthritis.

Conclusions: The findings highlight the importance of non-traditional risk factors for the prediction of CVD risk in women of reproductive age.
EFFECT OF LONGITUDINALLY MEASURED PHYSICAL ACTIVITY ON THE 10-YEAR RISK OF HEART FAILURE AMONG POSTMENOPAUSAL WOMEN: A WOMEN'S HEALTH INITIATIVE STUDY

Sina Noshad* Sina Noshad, Chanelle J. Howe, Michael J. LaMonte, Simin Liu, Mary B. Roberts, Matthew Allison, Aladdin H. Shadyab, Yangbo Sun, Kelly Evenson, Lisa Warsinger Martin, Kerryn Reding, Gurusher Panjrath, Tina E. Brinkley, JoAnn E. Manson, Charles B. Eaton, (Department of Epidemiology, Brown School of Public Health)

Background: Previous studies investigating the relationship between physical activity (PA) and heart failure (HF) have often relied on a single PA measurement at baseline. We aimed to re-evaluate this association using time-updated PA. Methods: We used data from the observational cohort of the Women’s Health Initiative restricted to women with no missing values on analysis variables (n= 68,046). PA was carried forward if it was missing at only one occasion. HF was defined as the first hospitalization episode. Using minutes of moderate/vigorous activity per week, PA categories of inactive (0 minutes), insufficiently active (1-149 minutes) and active (≥150 minutes) were defined. PA was also defined using metabolic equivalent-hours per week (MET-h/w), taking into account the duration and intensity of all leisure-time PA. Time-fixed (i.e. sociodemographics, personal habits, and medical history) and time-updated (e.g. cardiometabolic conditions) covariates were considered while death was treated as a competing risk. Given that time-updated covariates could be affected by prior exposure, we used the parametric g-formula to disentangle the confounding from the mediating effect of such in the PA-HF association. Results: Over a median follow-up of 8.2 years, 1565 cases of HF occurred. Compared with the observed distribution of PA, setting everyone to be active and insufficiently active reduced the risk of HF by 29.5% [risk difference (95% CL): -0.69 (-0.80, -0.50)] and 19.7% [-0.46 (-0.60, -0.31)], respectively. A dose-response relationship was observed per 5-MET-h/w increments of PA (Figure), with the largest decrease (29.3%) occurring over the first 5 MET-h/w increment, equal to, for instance, walking briskly, 12-minutes a day, 5-days a week. Conclusion: Higher levels of PA markedly lowered the 10-year risk of HF in postmenopausal women. Interventions focusing on increasing PA levels even modestly, if sustained over time, may lead to significant HF prevention.

Hypothetical interventions of increments in physical activity and 10-year risk of incident hospitalized heart failure

S/P indicates work done while a student/postdoc
PREVENTION OF HEART FAILURE IN HYPERTENSION – DISENTANGLING THE ROLE OF EVOLVING LEFT VENTRICULAR HYPERTROPHY AND BLOOD PRESSURE LOWERING: THE ALLHAT STUDY

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Background: Hypertension (HTN) is a known risk factor for heart failure (HF), possibly via the mechanism of cardiac remodeling and left ventricular hypertrophy (LVH). We studied how much blood pressure (BP) change and evolving LVH contribute to the effect that lisinopril, doxazosin, amlodipine have on HF compared to chlorthalidone. Methods: We conducted a causal mediation analysis of Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) data. ALLHAT participants with available serial ECGs and BP measurements were included (n=29,892; mean age 67±4 y; 32% black; 56% men): 11,008 were randomized to chlorthalidone, 5,967 – to doxazosin, 6,593 – to amlodipine, and 6,324 – to lisinopril. Evolving ECG-LVH and BP-lowering served as mediators. Incident symptomatic HF was the primary outcome. Linear regression (for mediator) and logistic regression (for outcome) models were adjusted for mediator-outcome confounders (demographic and clinical characteristics known to be associated both with both LVH/HTN and HF). Results: A large majority of participants (96%) had ECG-LVH status unchanged; 4% developed evolving ECG-LVH. On average, BP decreased by 11/7 mmHg. In adjusted Cox regression analyses, progressing ECG-LVH [HR 1.78(1.43-2.22)], resolving ECG-LVH [HR 1.33(1.03-1.70)], and baseline ECG-LVH [1.17(1.04-1.31)] carried risk of incident HF. After full adjustment, evolving ECG-LVH mediated 4% of the effect of doxazosin on HF. Systolic BP-lowering mediated 12% of the effect of doxazosin, and diastolic BP-lowering mediated 10% effect of doxazosin, 7% effect of amlodipine, and borderline 9% effect of lisinopril on HF. Conclusion: Evolving ECG-LVH and BP change account for 4-13% of the mechanism by which antihypertensive medications prevent HF.
THE IMPACT OF GENETICALLY PREDICTED HGB ON ISCHEMIC HEART DISEASE, MYOCARDIAL INFARCTION, HEART FAILURE AND VENOUS THROMBOEMBOLISM USING THE UK BIOBANK

Shan Luo*, Shan Luo, Shiu Lun Au Yeung, Catherine Mary Schooling, (Miss)

Background: Red blood cell transfusion and erythropoiesis-stimulating agent administration, which increase haemoglobin concentration (Hgb) to alleviate anaemia and ischemia, are cornerstones of clinical practice. However, the association of Hgb with thrombotic events is inconclusive given conflicting evidence from randomized controlled trials mainly in patients and observational studies. Objective: To determine whether genetically predicted Hgb has a causal role in ischemic heart disease (IHD), myocardial infarction (MI), heart failure (HF) and venous thromboembolism (VTE). Methods: A Mendelian randomization study was performed using genetic predictors of Hgb obtained from a genome-wide association study (173,480 participants of European ancestry), applied to individual participant records, from the UK Biobank (391,984 white British participants). Inverse variance weighting was used for the main analysis; weighted median and MR-Egger were used for sensitivity analysis. Results: Among 391,984 genetically verified white British participants in the UK Biobank (mean age 56.9 years) were 33,449 cases of IHD (22,610 men, 10,839 women), 14,408 of MI (11,153 men, 3,255 women), 5,527 of HF (3,929 men, 1,598 women) and 14,542 of VTE (6,584 men, 7,958 women). In men, genetically predicted Hgb (predicted by 26 genetic variants) was positively associated with IHD (odds ratio (OR) 1.38, 95% confidence interval (CI) 1.07 to 1.77), MI (OR 1.27, 95% CI 1.0 to 1.61), HF (OR 1.82, 95% CI 1.14 to 2.88) and VTE (OR 1.75, 95% CI 1.17 to 2.62); associations were less obvious in women. Associations were similar in sensitivity analysis. Conclusions: Endogenous Hgb was positively associated with IHD, MI, HF and VTE, particularly in men. Hgb may represent a modifiable risk factor for these conditions in the general population, and the benefits of therapies or factors that raise Hgb need to be weighed against their risks.
THE APPARENT PROTECTIVE EFFECT OF SURGERY VERSUS MEDICAL TREATMENT ON MORTALITY IN PATIENTS WITH INFECTIVE ENDOCARDITIS: POSSIBLE SELECTION BIAS AND TIME-DEPENDENT CONFOUNDING IN COHORT STUDIES Olivia Moir* Olivia Moir, Yingwei Peng, Susan B Brogley, (MSc Epidemiology Student, Department of Public Health Sciences, Queen's University)

Rationale: Infective endocarditis (IE) is a serious infection of the heart with high mortality. Evidence of the risk of death in patients treated surgically (ST) vs. medically (MT) is conflicting. In two recent studies ST was associated with higher short-term and decreased longer-term mortality compared with MT. Neither selection bias, inherent in the hazard ratio, nor the role of time-dependent confounding (TDC) have been studied as an explanation for these results. Objectives: To estimate the causal effect of ST vs. MT on mortality and to assess whether selection bias and/or TDC account for the apparent long-term protective effect of ST on death. Methods: This population-based study used universal coverage healthcare data from Ontario Canada. 17 331 patients 18 years and older hospitalized with IE from Jan 1996 – Feb 2018 were included. Cox proportional hazards with IE treatment modelled as a time-dependent variable was used. In the ST group, Johns Hopkins Aggregated Diagnosis Groups (ADG) comorbidity scores were compared at baseline and on the date of surgery to assess if confounders changed over time. Discrete time hazards model using inverse probability of treatment weighting will be used to assess the role of selection bias and to adjust for TDC. Findings: In our cohort, 3010 patients received ST and 14 321 MT. The mean age of ST and MT patients was 59 and 70 years respectively. Among those who had surgery delayed for four weeks or more, mean total ADG score considerably increased by 2.6 points from admission. ST patients had higher 30-day mortality (aHR 1.31, 95% CI:1.10-1.55) and lower mortality at 1-year (aHR 0.75, 95%CI: 0.68-0.81), and 5-years (aHR 0.72, 95%CI:0.68-0.77). Our results suggest that TDC is present. Our findings support recent studies suggesting a long-term protective effect of ST vs. MT on death. A discrete time hazards model (analyses underway) will provide insight on whether selection bias accounts for this protective effect.
Reducing maternal mortality is a priority in the US and worldwide, with most clinical and public health focus on pregnancy-related deaths due to circulatory disease and infection. Yet, a very small but emerging literature suggests that unintentional poisoning (e.g., overdose) and suicide may account for a substantial and growing portion of maternal deaths. For example, 30% of maternal deaths in Colorado from 2004-2012 were due to accidental overdose or suicide (Metz et al., 2017). To expand this limited evidence base, we used statewide, all-payer, longitudinally linked hospital and death data from California to examine incidence of death in the 12 months after delivery among women with an index delivery in 2010-2012. Parturient women were identified using diagnosis-related group codes. Causes of death were identified using ICD-10 codes. Of 1,059,714 women included in the study, 301 died during follow-up, a rate of 28.42 deaths per 100,000 person-years (p-y). The leading cause of death was obstetric-related problems (n=69; 6.51 per 100,000 p-y), followed by circulatory system disease (n=37; 3.49 per 100,000 p-y) and unintentional (UI) poisonings (n=36; 3.40 per 100,000 p-y). Suicides constituted the 7th leading cause of death (n=15; 1.42 per 100,000 p-y). Together, UI poisonings and suicide comprised 17.0% of all maternal deaths. These results indicate that deaths due to UI and suicide are a major contributor to maternal death and warrant increased attention. Importantly, 66.5% of women who died, including 83.0% of those who died by UI poisoning, made ≥1 emergency department (ED) or hospital visit between their delivery and death, suggesting that ED and hospital visits may serve as a point of identification of—and eventually, intervention on—women at risk for maternal death. We will next examine predictors of death due to UI or suicide that can be measured prior to or during delivery or at subsequent ED/hospital visits.
A 15-YEAR POPULATION-BASED INVESTIGATION OF SEXUAL ASSAULT CASES IN ONTARIO, CANADA

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Background: Sexual and gender-based violence (SGBV) is disturbingly common, yet consistently underdocumented. This study was designed to examine routinely collected health administrative databases and investigate the annual and cumulative frequencies and age-sex standardized population rates of sexual assault cases in the province of Ontario, Canada. Methods: A 15-year retrospective population-based study (2002-2016) was designed by linking five Canadian health administrative databases (National Ambulatory Care Reporting System, Discharge Abstract Database, Registered Persons Database, Ontario Health Insurance Plan and Canadian Census Data). Sexual assault was defined by a combination of ICD-10 codes and physician billing codes. An algorithm for suspected codes of childhood sexual abuse was developed to include any documentation of sexually transmit infections or genital injury in children under 10 years. Age-sex standardized rates per 10,000 population were calculated using the 2011 Canadian Census estimates. Results: Between 2002-2016, there were a total of 49,660 incident cases of sexual assault, ranging from 3,114 to 3,785 per year. The largest number of cases were captured through emergency department visits. The majority of sexual assault cases were among female patients (87.1%), however 6,423 (12.9%) cases of male sexual assault were identified. The total rate per 10,000 population was 38.64, with 65.62 among females, 10.26 among males. The highest disaggregated rates were found among females between ages 15-19 (264 per 10,000), 20-24 (186 per 10,000), 25-29 (107 per 10,000) and 0-4 (106 per 10,000). Among males, the highest rates were observed among children between the ages of 0-4 (60 per 10,000), 5-9 (41 per 10,000). Conclusion: This study has identified an increasing number of sexual assault cases each year, with disturbingly high rates in children and adolescent females. The cases are predominantly hospital-based, severely underestimating cases that never seek care.

S/P indicates work done while a student/postdoc
GEONRAPHIC VARIATIONS IN TEMPORAL TRENDS IN MORTALITY FROM PRESCRIPTION OPIOIDS Sarah Palumbo*, Sarah Palumbo, Charles H. Hennekens, Robert S. Levine, Janet Robishaw, (Charles E. Schmidt College of Medicine, Florida Atlantic University)

Background: Mortality from drug overdose is a major contributor to the current highest overall death rates in the United States in over 100 years. Since 1999, US mortality from drug overdoses has more than tripled. Mortality from prescription opioids is a major contributor, beginning when pain was introduced as the fifth vital sign and opioids were increasingly prescribed. Objective: We explored geographic variations in temporal trends in mortality from prescription opioids during the initiation and expansion of the epidemic from 1999-2004, 2005-2010, and 2011-2016. Methods: We utilized the United States Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research Multiple Cause of Death Files. We calculated age-adjusted mortality rates and generated maps of spatial clusters of hot spots using the Getis-Ord Gi* statistic. Results: From 1999-2004 the highest rate was 24.87 per 100,000 (95% C.I. = 17.84, 33.73), from 2005-2010 was 60.72 (47.33, 76.71), and from 2011-2016 was 90.24 (73.11, 107.36), a 3.6-fold increase. Initially, the highest rates were in Appalachia specifically western North Carolina and surrounding states, as well as the Southwest, primarily Utah. The rates then increased further in these regions and rose at even higher rates in Florida (FL) and Oklahoma (OK). Most recently, rates continued to increase in Appalachia and the Southwest but declined in FL and OK. Conclusions: These descriptive data suggest marked geographic variations in temporal trends in mortality from prescription opioids. They generate hypotheses concerning the apparently favorable experiences in FL and OK, relative to those in Appalachia and the Southwest. These may reflect overall improvements and/or temporal trends from overutilization of prescriptions to illicit opioids. These and other hypotheses require testing in analytic epidemiological studies and basic research in genomics and precision medicine to characterize individuals at most risk.
DECOMPOSITION OF THE US BLACK-WHITE INEQUALITY IN LIFE EXPECTANCY: QUANTIFYING THE IMPACT OF THE OPIOID EPIDEMIC

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In this cross-sectional study, we examine whether the disproportionate impact of the US opioid epidemic on middle-age whites partially accounts for the closing of the black/white inequality in life expectancy. Opioid overdoses have increased substantially in the US with recent acceleration of the mortality rate in both the black and white populations; however, since 2000, the opioid-related mortality rate has been higher in whites than blacks. During this time, life expectancy in the black population increased more rapidly than in the white population, followed by declines in both populations three years in a row. We analyzed the 1980–2016 multiple cause of death data by race, age, and census division using life table and demographic decomposition methods. These methods decompose the black/white inequality in life expectancy by both age and type of death (i.e., opioid vs non-opioid). Our preliminary results indicate that, in general, differences in non-opioid, under-5 deaths remain the largest contributor to the inequality. For example, in 2016 the black-white life expectancy inequality was 3.2 years; however, differences in under-5 deaths account for about 14% (0.46 years) of the inequality. Conversely, differences in opioid deaths in 15-to-55-year-old categories reduced the life-expectancy gap by -6% (-0.18 years). Differences in non-opioid deaths in these same age categories contribute 40% (1.3 years) to the black/white inequality in life expectancy. In addition, we find substantial variation across census division. For example, in New England in 2016, the black/white inequality in life expectancy was 0.28 years. Differences in under-5 mortality accounted for 0.30 years, which was offset by differences in opioid deaths in the 15-to-55-year-old categories (.52 years). Decomposing the black/white inequality in life expectancy due to non-opioid and opioid-related deaths provides a nuanced understanding of the impact of the rapidly evolving opioid epidemic.

Through their reporting on intimate partner violence (IPV) incidents, the media play a critical role in shaping how society perceives the dynamics of IPV and in sparking discourse around public responsibility and solutions to IPV. However, anecdotal evidence suggests that media coverage of IPV incidents is often inadequate or problematic in its framing. With the aim of producing an evidence-based foundation upon which to develop best practices and educational strategies for IPV media coverage, the NYC Mayor's Office to End Domestic and Gender-Based Violence conducted a systematic review of news coverage of all New York City intimate partner homicides from 2013-16. Two reviewers independently analyzed 442 articles written about 126 homicides. We found that only 15% of articles used terms such as “domestic violence” or “intimate partner violence”, only 2.3% of articles included an IPV advocate or expert as a source, and only 1.6% of articles listed IPV resources for readers. Furthermore, there were statistically significant differences in the quality of coverage based on the age, race, and gender of the homicide victim and perpetrator as well as the homicide weapon. For example, articles about gun homicides were over three times more likely to use victim blaming language than articles about other types of homicide (RR=3.39, 95% CI:1.48, 7.78). This systematic review elucidated important aspects of coverage quality that require improvement given the critical role the media play in shaping public conversation around IPV. These findings led to the development of a free, web-based media guide for journalists reporting on IPV.
IS MARIJUANA USE ASSOCIATED WITH DECREASED USE OF PRESCRIPTION OPIOIDS?
FINDINGS FROM TOXICOLOGICAL TESTING RESULTS FOR FATALLY INJURED DRIVERS
Guohua Li* Guohua Li, Stanford Chihuri, (Columbia University)

There is an ongoing debate regarding the impact of state marijuana laws on opioids-related harms. While some studies indicate that state medical marijuana laws, particularly those with marijuana dispensary provisions, are associated with decreased prescriptions of opioid analgesics and related adverse health consequences, others suggest that marijuana use is a strong predictor of subsequent incident use of prescription opioids. Despite inadequate evidence, state governments are increasingly viewing marijuana laws as a policy option for controlling the opioid epidemic under the premise that marijuana is a less harmful substitute substance for opioids. In the present study, we assessed the substitution hypothesis using toxicological testing data for drivers who died from motor vehicle crashes at the scene on US public roads during 2011 through 2016. Of the 47,723 drivers studied, 15.7% tested positive for marijuana, 6.9% positive for prescription opioids, and 41.9% positive for alcohol. Alcohol use was associated with increased risk of marijuana use [estimated odds ratio (OR) 1.85, 95% confidence interval (CI) 1.76-1.94] and decreased risk of prescription opioid use (estimated OR 0.69, 95% CI 0.64-0.74). Compared with drivers testing negative for marijuana, those testing positive for marijuana were 28% more likely to test positive for prescription opioids (adjusted OR 1.28, 95% CI 1.15-1.42). Results of this study do not support the substitution hypothesis. To the contrary, there might be a weak supplementary relationship between marijuana and prescription opioids.
UNDERSTANDING THE ROLE OF SOCIAL SUPPORT IN THE RELATIONSHIP BETWEEN PERCEIVED DISCRIMINATION AND TELOMERE LENGTH: THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS (MESA) Elleni Hailu* Elleni Hailu, Belinda Needham, Tené Lewis, Jue Lin, Teresa Seeman, Ana Diez Roux, Mahasin Mujahid, (Division of Epidemiology, School of Public Health, University of California Berkeley)

Perceived discrimination is a chronic stressor that affects a myriad of adverse health outcomes. Its biological embodiment can be studied using subclinical disease indicators, such as Leukocyte Telomere Length (LTL). Having social support and utilizing active coping strategies might buffer the relationship between discrimination and LTL. Results of prior studies examining discrimination in relation to LTL have been inconsistent, and none have investigated coping and social support as moderators of this link. Using data from participants in the Multi-Ethnic Study of Atherosclerosis Stress Ancillary Study I (n=1145), this study assessed the association of reports of discrimination with LTL, and effect measure modification by active/passive coping and availability of social support. Perceived discrimination was measured using the Everyday Discrimination Scale (none, low, moderate, high) and the Major Experiences of Discrimination Scale (none, 1 domain, 2 or more domains). LTL was defined as the ratio of telomeric DNA to single copy control gene (T/S; mean length=0.92, SD=0.21). In Linear Regression models, there was no association between either measure of discrimination and LTL, but there was evidence of effect modification by social support (P(?2) = 0.002) for everyday discrimination only. Among those with low social support, reporting moderate and high everyday discrimination was associated with a 0.35 (95% CI: -0.54 to -0.15) and a 0.17 (95% CI: -0.34 to -0.01) decrease in telomere length respectively, compared to reporting no discrimination, after adjusting for demographic factors, health behaviors, and health conditions. There were no associations between discrimination and LTL among those reporting moderate or high social support and no other statistically significant interactions between either measure of discrimination and coping strategies. Chronicity of unfair treatment may have a detrimental effect on cell aging in the absence of supportive resources.
ACUTE CARE UTILIZATION AMONG CHILDREN EXPERIENCING EVICTION IN SAN FRANCISCO, CALIFORNIA Lara Cushing* Lara Cushing, Ellen Kersten, Irene Yen, (Dept. of Health Education, San Francisco State University)

Prior research shows that housing insecurity, including homelessness, foreclosure, crowding, or multiple moves are associated with adverse health outcomes such as postponed medical care, emergency department visits, depression, anxiety, and poor self-rated health. Children may be particularly vulnerable as frequent moves during childhood have been associated with subsequent lower weight, developmental delays, and behavioral problems. However, the impacts of housing insecurity on children and the effects of eviction have been relatively understudied. We present results from an exploratory retrospective matched cohort study of eviction – a highly modifiable housing insecurity-related risk factor – on childhood acute care utilization in San Francisco, CA, one of the least affordable and rapidly gentrifying cities in the country. We integrate two administrative datasets over a six-year timeframe (2007-12): 1) pediatric electronic health records (EHRs) for 30,000+ patients from the city’s safety net hospital, and 2) eviction filings from the county Rent Board. Exposure to eviction was assessed by matching residential addresses and visit dates in the EHRs with eviction records. Each evicted child was matched to four controls based on sex, age, and prior acute care utilization over the previous year. Visit frequency and diagnosis codes were used to assess the severity of acute care utilization during a one-year follow up period following the eviction notice date. We estimate the association between eviction and the frequency of largely preventable acute care visits for ambulatory care sensitive, mental health, and chronic conditions while controlling for insurance status, race/ethnicity, and neighborhood. We estimate the magnitude of possible selection bias due to differential relocation of evicted children out of the catchment area and discuss implications for leveraging administrative datasets for policy-relevant social epidemiology and health disparities research.

S/P indicates work done while a student/postdoc
Introduction Circadian rhythms have been implicated in breast cancer (BrCa) development. Individuals with a morning chronotype have been shown to have reduced BrCa risk (OR=0.88, 95% CI=0.82, 0.93 per category increase) using genetic data in Mendelian randomization (MR). However, univariable MR may yield biased estimates if the genetic variants are not specific (e.g. related to other lifestyle factors). We aimed to establish the extent to which the observed causal effect of chronotype might be explained by other lifestyle factors associated with BrCa (body mass index (BMI), alcoholic drinks per week (DPW) and age at first birth (AFB)) using bidirectional and multivariable MR. Methods We investigated whether chronotype and other lifestyle factors (BMI, DPW and AFB) are causally related by performing bidirectional MR in a two-sample framework, using genome-wide association study (GWAS) summary statistics for chronotype (UKBiobank, n=449,734), BMI (GIANT, n=339,205), DPW (GSCAN, n=226,223) and AFB (SSGAC, n=251,151). We next estimated the effect of chronotype on BrCa controlling for BMI, DPW and AFB using GWAS summary statistics for BrCa from BCAC (n=228,951) in a multivariable MR approach. Results Bidirectional MR analysis revealed a causal effect of BMI on morning chronotype (beta=0.09 category increase per SD (95% CI=0.01,0.17; p=0.025)) and of DPW on evening chronotype (beta=0.37 category increase per SD (95% CI=0.10,0.64; p=0.006)). In multivariable MR, there was robust evidence for an independent, causal effect of chronotype on BrCa, controlling for BMI, DPW and AFB, although the magnitude was reduced by 13%. Conclusion The protective effect of morning chronotype on breast cancer observed in univariable MR analysis can in part be explained by other lifestyle factors, including adiposity and alcohol. However, evidence of an independent effect of chronotype on breast cancer support hypotheses around a direct effect of circadian timing on mammary oncogenesis.
DO PRO-FAMILY EMPLOYEE BENEFITS MITIGATE THE BURDEN OF COMPETING WORKPLACE AND DOMESTIC ROLES ON WOMEN'S DEPRESSIVE SYMPTOMS? Jonathan Platt*
Jonathan Platt, Katherine Keyes, Lisa Bates, (Columbia University)

Since the 1960s, women have made progress toward gender parity in job status and prestige in the US. However, women remain more likely to provide childcare and other domestic labor. This creates competition between the fulfillment of workplace and domestic roles, which may cause role strain and increase depression symptoms. Pro-family employee benefits have become more common as a way to retain workers and potentially minimize strain among women with these competing roles. We tested the hypothesis that women with competing roles (i.e., working and raising children) have more depressive symptoms than working women without children, and that this effect will be greater among women without (vs. with) pro-family benefits. Data comprised 5 biennial waves of the National Longitudinal Survey (2006-14; n=10263). Depression symptoms were measured with the Center for Epidemiologic Studies Depression scale (range: 0-21). Using marginal structural model weights, we estimated the effect of competing roles on depressive symptoms, adjusted for time-varying confounding. We tested for additive interaction by pro-family benefits (family-leave, childcare, flexible scheduling), and also by non-family benefits (e.g., stock options), to determine whether any buffering effects on competing gender roles were specific to pro-family benefits. Overall, depressive symptoms did not differ among women with vs. without competing roles (b=1.0; 95% CI=0.2, 2.2), however, symptom levels did differ based on the availability of any pro-family benefits. In 2012, those in competing roles without pro-family benefits had 2.6 more depressive symptoms than those not in competing roles (95% CI=0.3, 5.0). For those with pro-family benefits, symptoms did not differ by competing role status. Interaction tests for non-family benefits were not significant (figure 1). These results suggest that effects are specific to pro-family benefits, which mitigate women’s depression by buffering the burden of competing roles.
THE EFFECTS OF PAID FAMILY LEAVE ON CHILD AND PARENT MENTAL HEALTH: A QUASI-EXPERIMENTAL STUDY OF U.S. STATE POLICIES Rita Hamad* Rita Hamad, Amanda Irish, Sepideh Modrek, Justin S. White, (University of California San Francisco)

Background: Paid family leave (PFL) policies that provide salary support for parents after the birth or adoption of a child have increasing public support in the U.S., but there is limited evidence of their health effects. We tested the hypothesis that PFL policies recently implemented in California, New Jersey, and Rhode Island improved the mental health of affected children and their parents. Methods: We conducted a difference-in-differences (DiD) analysis, a quasi-experimental method comparing the change in child and parental mental health outcomes in states before and after PFL policies were implemented, “differencing out” underlying temporal trends in states where no PFL policies were implemented. We examined a large diverse sample drawn from the National Health Interview Survey, a nationally representative serial cross-sectional survey. We included nearly 100,000 children born during 1997-2016 and their parents. Child outcomes included a mental health indicator based on the Child Behavior Checklist (CBCL) for younger children, and the Strengths and Difficulties Questionnaire (SDQ) score for older children. Parent outcomes included the Kessler-6 score, which captures psychological distress. Results: The passage of PFL policies reduced the rates of mental health problems among younger children (β = -0.085 in CBCL score; 95% CI: -0.14, -0.028), but there was no statistically significant change for older children (β = 0.013 in SDQ score; 95%CI: -0.020, 0.045). Parents’ mental health was also improved after the passage of PFL policies (β = -0.36 in K6 score, 95%CI: -0.26, -0.46), including both mothers and fathers. Results were robust to sensitivity analyses. Conclusions: Children's and parents’ mental health improved after implementation of state PFL policies. This is among the first studies to provide evidence of the health effects of these actively debated policies. Future studies should examine other outcomes as PFL policies are enacted in additional states.
DOES DECLINING STATE-LEVEL LABOR UNION DENSITY EXPLAIN CHANGING STATE-LEVEL RACIAL AND EDUCATIONAL MORTALITY INEQUITIES? Jerzy Eisenberg-Guyot* Jerzy Eisenberg-Guyot, Stephen J Mooney, Anjum Hajat, (Department of Epidemiology, University of Washington School of Public Health)

INTRODUCTION: Recently, life expectancy has stagnated or declined for the poor and working classes and risen for the middle and upper classes. Declining labor union density—the percent of workers belonging to labor unions—has contributed to burgeoning income inequity. We examined if declining union density has also exacerbated racial and educational mortality inequities. METHODS: From CDC, we obtained state-level all-cause and overdose/suicide (“despair”) mortality by gender, race, and education from 1986-2016. Gender-, education-, and race-specific state-level union density, as well as demographic and economic confounders, came from the Current Population Survey. State-level policy confounders came from several sources. ANALYSES: We used a marginal structural modeling approach. First, we calculated inverse probability of treatment weights (IPTW) from gamma linear models. Next, we used IPTW Poisson models with state-year fixed effects to estimate state-level union density’s effects on the following year’s state-level mortality rates. Then, for all-cause mortality, we tested for interaction between union density and gender, gender-race, and gender-education, and for despair mortality, we tested for interaction between union density and gender. Finally, we estimated how average all-cause mortality inequities from 2006-2016 would change if union density increased to 1986 levels throughout that period. In sensitivity analyses, we modeled union density with a cubic spline. RESULTS: Overall, union density had no effect on all-cause mortality but strong effects on despair mortality (Fig 1). Union density’s effects did not differ significantly by gender, race, or education (Fig 1), and modeling suggested increasing union density would have little effect on all-cause mortality inequities. Finally, sensitivity analyses revealed potential nonlinear union density effects. DISCUSSION: At the state-level, union density is unlikely to explain changing mortality inequities.
THE EFFECT OF THE 287(G) IMMIGRATION PROGRAM ON PEDIATRIC HOSPITALIZATIONS FOR AMBULATORY SENSITIVE CONDITIONS IN NORTH CAROLINA  

Lindsay Fernandez-Rhodes*  
Lindsay Fernandez-Rhodes, Michelle J. White, (Department of Biobehavioral Health, Pennsylvania State University)

Eight North Carolina (NC) counties increased immigration enforcement from 2006-2008 as part of Section 287(g). Increased immigration enforcement is a barrier to accessing care for immigrant families. Ambulatory Sensitive Conditions (ASC) hospitalizations are a proxy for access to primary care and may increase due to 287(g) implementation. We conducted a retrospective analysis of the association of 287(g) implementation and ASC hospitalizations. Using NC Hospital discharge data from 2005-2009, pediatric (<19yo) ASC hospitalizations were identified based on ICD-9 codes. At the county level, we used a difference-in-difference method to compare the odds of ASC hospitalizations in the fiscal year pre/post 287(g) in eight counties to propensity score-matched counties. To estimate discharge-level effects, we used a multi-level logistic regression with a random intercept for county and fixed effects for discharge/county-level covariates. There were 86,668 ASC hospitalizations in NC from 2005-2009. Counties with 287(g) had 3% increase in predicted ASC hospitalization risk (OR=1.14; 95% CI: 1.05, 1.23) after implementation compared to matched counties. The association between 287(g) implementation and black ASC hospitalizations was attenuated (OR=1.10), but the association was stronger for white and other race hospitalizations (OR=1.49 and 1.38). Multi-level logistic regression analyses showed that 287(g) was associated with 3% higher predicted risk of ASC hospitalization, independent of discharge/county covariates (OR=1.15; 95% CI: 1.08, 1.23). Implementation of 287(g) was consistently associated with a higher risk of ASC hospitalizations in NC. Although patient ethnicity was not recorded during this time period, analyses demonstrated a statistically significant effect among the racial subgroups most likely to include Latinos. Further investigation of the effects of immigration policies on access to care using mixed methods may reveal promising intervention targets.

S/P indicates work done while a student/postdoc
CIRCULATING IMMUNE CELL COMPOSITION AND BREAST CANCER RISK Jacob K Kresovich*
Jacob K Kresovich, Katie M O'Brien, Zongli Xu, Clarice Weinberg, Dale Sander, Jack Taylor, (NIEHS)

Subtle differences in circulating immune cell profiles may presage breast cancer diagnosis but this hypothesis has not been examined in large studies. Epidemiologic studies are increasingly assessing genome-wide DNA methylation profiles in whole blood; such profiles can be used to infer immune cell-type proportions. Post-diagnostic methylation-derived immune cell profiles have been used to show that the neutrophil to lymphocyte ratio (NLR) may be a marker of prognosis for some cancers, but these profiles have not been examined in relation to cancer diagnosis. Using HumanMethylation450 arrays, we measured blood DNA methylation in a case-subcohort analysis of 2,776 women enrolled in the Sister Study (mean follow-up: 6.0 years). 1,570 of the women had subsequently developed breast cancer, with 169 diagnosed within one year of blood draw. Using the Houseman deconvolution method, we estimated six immune cell proportions (lymphoid lineage: B-cell, natural killer, CD8+ and CD4+ T-cells; myeloid lineage: monocytes and granulocytes). For each year of follow-up, we used Cox regression models to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for circulating blood cell proportions and breast cancer risk. Within one year of blood draw, women with lower proportions of monocytes had higher risk of diagnosis (per 1-SD decrease, HR: 1.39, 95% CI: 1.14, 1.67, P= 0.001); these associations were stronger for invasive and estrogen receptor-positive tumors. A similar association was seen between one and two years after blood draw (per 1-SD decrease, HR: 1.19, 95% CI: 1.02, 1.39, P= 0.03). Although the NLR was not associated with overall breast cancer, there was a strong association for the small number of women diagnosed with late-stage (III/IV) tumors within the first year after blood draw. The results of this large prospective cohort study suggest that methylation-derived immune cell profiles may serve as a marker of clinically occult breast cancer.
EVALUATION OF THE ASSOCIATION BETWEEN UGT2B17 GENE DELETION AND ADVERSE SYMPTOMATOLOGY IN POSTMENOPAUSAL WOMEN TREATED WITH EXEMESTANE ON THE CCTG MAP.3 TRIAL
Vikki Ho* Vikki Ho, Romain Pasquet, Paul Goss, DongSheng Tu, Philip Lazarus, Harriet Richardson, (University of Montreal, Department of Social and Preventive Medicine, Montreal, Quebec, Canada)

Early detection and improved treatment have led to a significant breast cancer mortality reduction, but the most effective cancer control strategy remains primary prevention. Exemestane, an aromatase inhibitor that decreases the production of estrogen in postmenopausal women and is used as a form of endocrine therapy for breast cancer prevention. Nevertheless, its side-effects often affect patient uptake and adherence. Exemestane is extensively metabolized in the body; however, a deletion in the UGT2B17 gene has been associated with a decreased ability to metabolize exemestane metabolites. We examined associations between the UGT2B17 gene deletion and commonly reported side-effects (fatigue, hot flashes, and joint pain) in 1,719 postmenopausal women on the exemestane treatment arm of the MAP.3 trial, an international phase III randomized trial aimed at evaluating exemestane for breast cancer prevention. Symptoms were assessed using the CTCAE v4.0 at approximately 1 year intervals; a grade 3 or higher symptom was considered an event. Unconditional logistic regression was used to examine the association between UGT2B17 deletion and each side effect at 1 and 5 years after randomization, adjusting for potential cofounders. No associations were observed between the UGT2B17 gene deletion and joint pain. While, statistically significant positive associations were observed between the UGT2B17 gene deletion and grade 3 fatigue vs. < grade 3 fatigue [OR (95%CI)=2.63 (1.12-6.20)] and grade 3 fatigue vs. no fatigue [OR (95%CI)=2.80 (1.18-6.65)] at 5 years after randomization, and grade 3 hot flashes vs. no hot flashes [OR (95%CI)=2.27 (1.02-5.05)] at 1 year after randomization. The UGT2B17 deletion was associated with a higher reporting of fatigue and hot flashes. Understanding how UGT2B17 deletion affects exemestane metabolism can lead to the identification of biomarkers for predicting and monitoring the treatment efficacy, side effects and symptoms of endocrine therapy.

S/P indicates work done while a student/postdoc
Solid organ transplant recipients have an elevated risk of cancer. Quantifying deaths attributable to cancer can inform priorities to reduce cancer burden. We used linked transplant and cancer registry data to identify incident cancers and deaths among transplant recipients in the United States. The population-attributable fraction (PAF) of deaths due to cancer and cancer-attributable mortality rates were estimated using Cox models overall and by subgroup. Among 221,962 transplant recipients, 15,012 developed cancer. 13% of deaths were attributable to cancer, corresponding to a cancer-attributable mortality rate of 516 per 100,000 person-years. Lung cancer was the largest contributor to cancer-attributable mortality (PAF=3.1%), followed by non-Hodgkin lymphoma (NHL, PAF=1.9%), colorectal (PAF=0.7%), and kidney cancer (PAF=0.5%). Cancer-attributable mortality rates increased with age at transplant, reaching 1229 per 100,000 person-years among recipients 65+ years old (Figure, left panel). NHL was the largest contributor among children (PAF=4.1%) and lung cancer among 50+ year olds (PAFs=3.7-4.3%; Figure, right panel). Heart recipients had the greatest fraction of deaths due to cancer (PAF=16.4%), but lung recipients had the highest cancer-attributable mortality rate (1241 per 100,000 person-years). For the overall cohort, mortality due to cancer increased with longer time since transplant, reaching 15.7% of deaths (810 per 100,000 person-years) for 10+ years post-transplant. Comparison of cancer-attributable mortality rates with specified causes of death showed that some deaths recorded as due to infection, graft failure, or other causes may be caused by cancer or its treatment. Cancer is a substantial cause of mortality among transplant recipients, with major contributions from lung cancer and NHL. Cancer-attributable mortality increases with age and time since transplant, suggesting that cancer deaths will become an increasing burden as recipients live longer.
**A SEMI-SUPERVISED MACHINE LEARNING APPROACH TO DETECTING RECURRENT METASTATIC BREAST CANCER CASES USING LINKED CANCER REGISTRY AND ELECTRONIC MEDICAL RECORD DATA**

Albee Ling*, Albee Ling, Allison Kurian, Jennifer Caswell-Jin, George Sledge Jr., Nigam Shah, Suzanne Tamang, (Stanford University)

Most cancer data sources lack information on an important outcome: metastatic recurrence. Electronic medical records (EMRs) and population-based cancer registries contain complementary information on cancer outcomes and treatment, yet are rarely used synergistically. To enable detection of metastatic breast cancer (MBC) recurrence, we applied a semi-supervised machine learning framework to linked EMR-California Cancer Registry (CCR) data. We studied 11,459 female patients who received an incident breast cancer diagnosis from 2000-2014 and were treated at Stanford Health Care. The dataset consisted of structured data and unstructured free-text clinical notes from each patient's EMR, linked to the population-based CCR, a component of the Surveillance, Epidemiology and End Results (SEER) database. We extracted information on metastatic disease from patient notes to infer a class label and then trained a logistic regression model with regularization for metastatic recurrence classification. We evaluated model performance on an oncologist-labeled set of 146 patients. Among 11,459 patients studied, 495 (4.3%) had de novo stage IV MBC. Of the remaining 10,964 patients with Stage 0-III disease, 1,374 (12.5%) were classified as having recurrent MBC and 9,590 (87.5%) were classified as not having MBC. The median follow-up time is 96.3 months (mean 97.8, standard deviation 46.7). The best-performing model incorporated natural language processing of EMR-derived features with CCR-derived features and had an area under the receiver-operating characteristic curve = 0.925 [95% confidence interval: 0.880-0.969], sensitivity = 0.861, specificity = 0.878 and overall accuracy = 0.870. This framework for MBC case detection combining EMR and SEER registry data achieved good sensitivity, specificity and discrimination without requiring expert-labeled examples. This approach enables population-based research on how patients die from cancer and may identify novel predictors of cancer recurrence.

*S/P indicates work done while a student/postdoc*
CAUSAL MODEL-BASED REINFORCEMENT LEARNING FOR PHYSICAL ACTIVITY INTERVENTIONS AMONG PROSTATE CANCER SURVIVORS Barbra A. Dickerman* Barbra A. Dickerman, Aman Rana, Pratik Shah, Miguel A. Hernán, (Harvard TH Chan School of Public Health)

Background: Adhering to current guidelines for physical activity after prostate cancer diagnosis may improve survival. However, additional survival benefits may be gained by tailoring these strategies to evolving clinical features in a precision prevention approach. We aim to develop and apply causal model-based reinforcement learning (RL) algorithms to identify optimal physical activity strategies for 10-year survival among men with nonmetastatic prostate cancer. Methods: We will use observational data on 2,299 men in the Health Professionals Follow-up Study diagnosed with nonmetastatic prostate cancer from 1998-2010 and free of conditions that might preclude participation at baseline (first post-diagnostic questionnaire). We will use off-policy RL algorithms to identify the optimal dynamic physical activity strategy for 10-year survival, considering a broad space of potential strategies that vary in weekly duration (ranging from 0-10 hours/week for vigorous activity and from 0-30 hours/week for moderate activity, in increments of 0.5 hours) and dependence on evolving clinical features (e.g. hypertension). We will adjust for baseline and time-varying risk factors for death using the parametric g-formula. Conclusion: These findings may inform personalized, dynamic treatment strategies for clinical recommendations and trial design. Further, the novel integration of the g-formula and RL in this study may provide a framework for future research on the optimal effectiveness of any intervention strategies.
ASSOCIATION OF CHINA’S UNIVERSAL 2-CHILD POLICY WITH CHANGES IN BIRTHS AND BIRTH-RELATED HEALTH FACTORS Hongtian Li* Hongtian Li, Ming Xue, Susan Hellerstein, Yue Cai, Yan-qiu Gao, Ya-li Zhang, Jie Qiao, Jan Blustein, Jian-meng Liu, (Institute of Reproductive and Child Health, Peking University)

Background China’s government announced the Universal 2-child policy in October 2015, permitting all couples to have two children. This study aimed to measure the changes in births and birth-related health factors following the policy change, using previous trends as a baseline. Methods Descriptive study, based on two national data sources: the County-level Monthly Aggregated Data and the Individual-level Delivery Information Records. We compared two periods: the “baseline period” (up to and including nine months after the announcement, i.e. up to and including June 2016) and the “effective period” (from July 2016 through December 2017). To quantify the number of births attributable to the policy, we used a difference-in-difference approach, with the assumption that births would increase to multiparous mothers, but not to nulliparous mothers (the reference group). We also examined changes in the proportion of births to multiparous mothers, mothers aged >=35 years, preterm deliveries and cesarean deliveries. Results There were 5.40 (95% CI: 4.34-6.46) million additional births attributable to the new policy between July 2016 and December 2017. There was also an increase in the percentage of births to multiparous mothers (+9.1 percentage points; 95% CI: +6.4 to +11.7), and to mothers aged 35 and over (+5.8 percentage points; 95% CI: 5.2 to 6.4). This increase in older mothers, however, was not associated with a concurrent increase in the overall preterm birth rate. The cesarean delivery rate among multiparous mothers increased by 1.2 percentage points (95% CI: +0.8 to +1.6) from 39.7% to 40.9%, and among nulliparous mothers decreased by 3.0 percentage points (95% CI: -3.5 to -2.5) from 39.6% to 36.6%. Conclusion The Universal 2-child Policy was associated with a rise in births, and with changes in health-related birth characteristics: women giving birth were more likely to be multiparas, and more likely to be aged 35 and over.
DOES MOVING ORPHANS OUT OF INSTITUTIONAL CARE IMPROVE THEIR WELLBEING?
USING MARGINAL STRUCTURAL MODELS TO ESTIMATE POLICY-RELEVANT EFFECTS
Christine L. Gray* Christine L. Gray, Kathryn Whetten, Michael G. Hudgens, Julie L. Daniels, Audrey E. Pettifor, Brian W. Pence, (Center for Health Policy and Inequalities Research, Duke Global Health Institute, Duke University)

Background: US and global policies advocate family-based care for the world's 140 million orphaned and separated children (OSC), encouraging closure of residential care. Studies in low and middle income countries (LMICs) show average experiences in institutions are no worse than family care. It is unknown whether moving OSC out of institutions improves wellbeing. Methods: We used data from the Positive Outcomes for Orphans (POFO) study, a large, randomly sampled, longitudinal cohort of OSC in 5 LMICs, to estimate effects of moving from institution-based care to family-based care by age 16 on 3 outcomes: incident (past year) abuse (using the Life Events Checklist), change since baseline in cognitive functioning (using a cultural adaptation of the California Verbal Learning Test), and emotional difficulties (using the Strengths and Difficulties Questionnaire). We fitted marginal structural models using inverse probability of treatment and censoring weights to address potential confounding and informative loss to follow-up, and incorporated study sampling weights. We estimated the risk ratio (RR) and risk difference (RD) for abuse, and mean differences (MDs) in continuous scores for cognitive functioning (range: 0 to 15, higher is better) and emotional difficulties (range: 0 to 40, lower is better). Robust standard errors were used to construct 95% confidence intervals. Results: Among 1,194 institution-based OSC followed for 8 years, 155 (13%) were moved to family-based care by age 16. Baseline age ranged from 6–12. Compared to OSC remaining in residential care, OSC moved to family care had slightly increased risk of abuse (RR: 1.2(0.7, 2.0); RD: 0.01(-0.03, 0.05)), decreased cognitive functioning (MD: -0.33(1.31, 0.64)), and increased emotional difficulties (MD: 0.33(-0.91, 1.39)). Conclusion: We found small but negative effects in all 3 outcomes for OSC moved to family care compared to those still in residential care. Moving OSC to family care may not improve wellbeing.
EXPLOITING MINIMUM LEGAL MARIJUANA USE AGE TO ASSESS THE IMPACT OF MARIJUANA LEGALIZATION IN URUGUAY ON MARIJUANA USE PATTERNS

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A growing number of jurisdictions have legalized marijuana for recreational purposes. In 2013, Uruguay became the first country to allow citizens above 18 years old to legally produce, sell, and access cannabis for recreational use. We use a regression discontinuity design to test whether legalization is associated with changes in risky marijuana use and frequency of use among past month users. We use data from repeated cross-sectional nationally representative surveys of students (ages 12-21) in 2009-2016. First, we estimate differences in use just below and above the legal age of use of marijuana (age 18) before and after the enactment of the legalization of marijuana. Second, we compare post-legalization differences below and above 18 years old in Uruguay and Chile, which did not legalize. We measure risky marijuana use based on the Cannabis Abuse Screening Test (CAST), which comprises six questions related to the frequency, the degree of dependence and the consequences of cannabis use, and frequency of use as the number of days of use in the past month. Pre-legalization, any risky use was 4.6% and 8.7%, and days of use were 8.1 and 8.9 among <18 and 18+ year-olds, respectively. Post-legalization, any risky use was 4.9% and 13.3%, and days of use were 8.8 and 10.7 among <18 and 18+ year-olds, respectively. However, risky use in <18 and 18+ year-olds pre- and post-legalization were not significantly different from each other using either approach. Past-month users aged 18+ experienced an increase in the number of days of use, relative to users aged <18, post legalisation (RR=1.5, CI=1.01,2.23), but no significant difference was found when compared to Chilean students. Following legalization, days of marijuana use may have slightly increased among adolescent users, but legalization was not associated with changes in risky marijuana use. An evaluation of the middle- and long-term impact of national recreational marijuana legalization on adolescents is still needed.
UNDERSTANDING THE IMPACT OF PAID MATERNITY LEAVE POLICY ON CHILDHOOD DIARRHEA THROUGH MEDIATION ANALYSIS: EVIDENCE FROM 40 LOW-AND-MIDDLE-INCOME COUNTRIES Yan Chai* Yan Chai, , (University of California, Los Angeles)

Background Previous analyses on paid maternity leave policy have focused mainly on understanding its impacts on children’s health in LMICs, without unpacking the underlying mechanisms of the associations. The overall aim of the study is to examine the impact of 1-month increase in paid maternity leave policy on childhood diarrhea and the possible mediating roles of breastfeeding duration. Methods We merged longitudinal data measuring national maternity leave policies with information on diarrhea related to 1,073,970 live births occurring between 1996 and 2014 in 40 LMICs that participated at least twice in the Demographic and Health Surveys (DHS) between 2000 and 2015. We first ran a difference-in-difference regression model to test the total effect of longer paid maternity leave on the incidence of bloody diarrhea, we then calculated controlled direct effects by running a series of difference-in-difference regression models with different breastfeeding duration as mediators. Effects were estimated on the risk ratio scale from log-binomial regression models that included country and year fixed effects. All models incorporated robust standard errors and respondent-level sampling weights. Results The average weighted proportion of children under five with bloody diarrhea in the past two weeks was 1·60% (SD = 0.004) in countries that changed their policies and 1·34% (SD = 0.001) in countries that did not. A one-month increase in the legislated duration of paid maternity leave was associated with a 35% (RR 0·65, 95% CI 0·50–0·86) reduction in the risk of bloody diarrhea. Breastfeeding at least six months mediates this effect by 98% and breastfeeding at least 12 months mediates this effect by 95%. Conclusion Extending the duration of paid maternity leave policy appears to lower diarrhea incidence in children under five years of age in LMICs. This effect is largely mediated by breastfeeding duration. Further research is required to explore additional and more complex causal pathways.
Introduction: Cancer is among the leading causes of death globally. In Latin America and Chile, it is the second cause of death. Chile has had more than a decade with the Explicit Health Guarantees policy, one of the most recognized and valued social protection policies in the health sector, however to date there is no impact evaluation of this policy. Objective: To evaluate the impact of Explicit Health Guarantees (GES in original spanish) on cancer mortality in Chile between 2002 and 2015. Methodology: An ecological analytical study was carried out to analyze mortality data before and after the implementation of the GES. Mortality data from 2002-2016 were obtained from the Department of Statistics and Health Information (DSHI) of the Ministry of Health. Direct standardization was performed with the WHO standard population as a reference. The annual rates with moving averages of 3 periods and mortality proportions were estimated. Then, discontinuous regression was performed as a measure of the impact of the GES on each of the cancers under study. Results: A difference was observed between the Pre-GES (b = .0009) and Post-GES (b=.0192) regression slopes for cervical cancer, both to change in the trend of the mortality structure, and for mortality rates. Gallbladder cancer also has a difference in mortality between Pre-Ges (b = -0.0040) and Post-Ges (b = -0.0226). There is a slight reduction in mortality at the population level for colorectal cancer. No impact is observed in the mortality trend in stomach or breast cancer since GES. Conclusions: These results show that there is a positive impact of GES reducing mortality of some types of cancer in Chile at the population level.
EVALUATING THE IMPACT OF THE MATERNAL HEALTH VOUCHER SCHEME IN RURAL BANGLADESH: A QUASI-EXPERIMENTAL INTERRUPTED TIME-SERIES ANALYSIS

Arijit Nandi* Arijit Nandi, Thomas J. Charters, (McGill University)

Bangladesh has achieved substantial improvements in population health in the face of persistent economic poverty. However, use of maternal health services remains lower than in neighboring Asian countries, and rates of maternal mortality remain higher than Sustainable Development Goal targets. In 2007, the government of Bangladesh implemented the Maternal Health Voucher Scheme (MHVS) to reduce demand-side barriers to maternal health services. This program provided pregnant women living in poorer sub-districts with vouchers to cover the costs of three antenatal care check-ups, safe delivery by skilled birth attendants, one postnatal care checkup, management of complications from designated providers, and transportation. We conducted an interrupted time-series evaluation of the MHVS on use of maternal health services, neonatal mortality, and infant mortality in a sample of over 20,000 live births to women surveyed as part of the serial cross-sectional Bangladesh Demographic and Health Survey (BDHS) between 1997 and 2014. Primary measures of maternal health services included receipt of antenatal care, skilled birth attendance, delivery in a health facility, postnatal care use, and Caesarian section. The introduction of the MHVS was associated with a 1.6 percentage-point (95% CI 0.0, 3.2) increase in skilled birth attendance and a 0.8 PPT (95% CI -0.7, 2.4) increase in health facility delivery, as well as increases in the proportions of women who reported these outcomes over time. We did not find effects of the program on other health services, including the receipt of three or more antenatal care visits, or delivery by caesarean section. Additionally, our analyses showed no impact of the program on risks of neonatal or infant mortality. Further analyses assessed the impact of the program on social inequalities in our primary measures and we repeated analyses using a difference-in-differences approach.
Rates of prescription and non-prescription opioid use, as well as opioid-related overdoses, have risen dramatically in the U.S. over the past 20 years. Suicide rates have increased substantially during the same period. Although opioid abusers often suffer from underlying mental health problems, social isolation, and serious physical conditions related to chronic pain – known risk factors for suicide – very few studies have examined the prospective link between opioid overdose and suicide. We conducted a retrospective matched cohort study examining the association between opioid overdose and subsequent suicide mortality using statewide, all-payer, individually linked emergency department (ED) data from California, linked to state death records. Risk of suicide from 2010-2013 was examined among opioid overdose patients who presented to an ED between 2010-2012 (identified using ICD-9-CM diagnostic codes; n=15,146) and comparison patients, who were randomly selected from all other patients and matched 3:1 to opioid patients on age, sex, visit month, and zipcode (n=90,332). Cumulative incidence of suicide mortality among opioid overdose patients was 10 times that of comparison patients (1.0% vs. 0.1%, log-rank test p<0.001). In Cox regression models that controlled for patient demographics, comorbid conditions, and past-year history of ED visits for substance use, self-harm, and pain-related problems, opioid overdose patients' risk of suicide was 7.5 times higher than comparison patients' (95% CI=4.73, 11.83), and 15 times higher for drug poisoning suicides (95% CI=7.01, 34.89). These associations were somewhat stronger among women and older age groups. Findings suggest that while the absolute risk of suicide among opioid overdose ED patients remains low, it is substantially higher than that of other ED patients and the general population. Opioid overdose patients should be treated and monitored not only for opiate addiction, but also for suicidal thoughts and plans.

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The rapid rise of fentanyl overdose mortality in the U.S. is unprecedented; it has increased almost 10-fold in the past 5 years. The availability, use, and sequelae of fentanyl exhibit extensive regional heterogeneity. As such, a comprehensive view of fentanyl’s spread at sub-state geographies is critical for public health programming and resource allocation. Moreover, since fentanyl is present both as an adulterant of heroin and sold on its own, identifying the distinct area-level characteristics associated with fentanyl mortality, heroin mortality, and the ratio of fentanyl-to-heroin mortality may help explain fentanyl’s regional heterogeneity. We used county-level mortality data from CDC WONDER to generate annual maps of fentanyl mortality rates from 2013 to 2017. To identify correlates of rates of fentanyl mortality, heroin mortality, and the log ratio of fentanyl to heroin mortality (all aggregated from 2013-2017), we considered a diverse set of over 50 variables used to inform the Robert Wood Johnson Foundation County Health Rankings, which capture counties’ physical, socioeconomic, demographic, and health characteristics. We used LASSO regression to select subsets of variables most predictive of each mortality measure and calculated standardized bivariate linear regression coefficients for each retained variable. Several indicators of low socioeconomic status (lower percentage of adults with a college education and higher unemployment and uninsured rates) and poor health (higher rates of adult smoking, physical inactivity, and obesity) were correlated with both heroin and fentanyl mortality rates. Correlates of a higher fentanyl-to-heroin mortality ratio included higher rates of diabetes, physical inactivity, and mental distress, and a higher percentage of residents over 65. Findings highlight distinctions between places where fentanyl predominates, which may be helpful for program planning and understanding underlying drivers of the epidemic.
SURVEILLANCE OF EMERGENCY MEDICAL SERVICES RESPONSE WITH NALOXONE ADMINISTRATIONS — NORTH CAROLINA, APRIL–SEPTEMBER 2017
Lauren Tanz*, Lauren Tanz, Scott Proescholdbell, Susan Kansagra, (Epidemic Intelligence Service, Centers for Disease Control and Prevention; North Carolina Department of Health and Human Services)

Background: Naloxone administrations can serve as an important indicator of opioid overdoses. In North Carolina, emergency medical services (EMS) responders complete patient care reports for suspected opioid overdoses. Reports are delivered electronically from EMS agencies to the EMS Performance Improvement Center, and then to the NC Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT), a syndromic surveillance system. To determine if monitoring EMS naloxone administrations in NC DETECT could be used for opioid overdose surveillance, we evaluated NC DETECT’s accuracy and utility. Methods: To calculate sensitivity and positive predictive value (PPV), we compared EMS naloxone administrations in NC DETECT during April 1–September 30, 2017, with patient care reports from 3 EMS agencies. Stakeholder interviews were used to assess utility of monitoring EMS naloxone administrations. Results: NC DETECT captured 97.1% of patient care reports with naloxone administration, indicating high sensitivity. All (100%) naloxone administrations in NC DETECT were in patient care reports, demonstrating excellent PPV. Stakeholders reported that EMS data on naloxone administrations provide near real-time and precise geographic information and capture reports of people not transported to the emergency department. However, EMS can appropriately administer naloxone to any unconscious patient, even those not experiencing an overdose, limiting its utility as a proxy for true overdoses. Additionally, overdose documentation in patient care reports from paramedics and emergency medical technicians is inconsistent. Conclusions: NC DETECT provides an accurate estimate of EMS naloxone administrations and could guide prevention and intervention strategies. However, EMS naloxone administrations might not be an accurate proxy for EMS responses to true opioid overdoses. Standardizing data entry by responders (e.g. specific keywords) might improve opioid overdose surveillance using EMS data.
PREDICTING DRUG OVERDOSE DEATHS IN RHODE ISLAND: A COMPARISON OF MACHINE LEARNING METHODS AND VARIABLE SELECTION PROCEDURES

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Introduction. The drug overdose epidemic in the United States continues to rise, with more than 72,000 deaths in 2017. Rhode Island ranks 10th highest for drug overdose mortality in the country. We sought to predict fatal overdose events using machine learning methods to identify the highest risk neighborhoods. Method. All drug overdose deaths occurring in Rhode Island between 2014 and 2017 were geocoded to their incident address, with annual counts aggregated to the census block group level. We dichotomized the outcome of interest as ≥1 overdose death vs. no overdose death in 2017 for each census block group. In addition to overdose deaths in prior years, we extracted a set of >200 predictors from the American Community Survey and compared the performance of 7 machine learning algorithms (random forests, gradient boosted trees, LASSO regression, elastic net, linear discriminant analysis, kernel support vector machine, and ridge regression) by using area under the ROC curve (AUC), sensitivity, specificity, and positive predictive value. Results. The random forest algorithm performed the best among all 7 algorithms tested (AUC=0.59, mean accuracy=0.648, range: 0.621-0.690). By using 10-fold cross-validation and out-of-bag error (number of random variables used in each tree=14, OOB error smallest value = 35.83%), we identified the model and set of variables with the best predictive performance. Median rent as percentage of household income, percent in units who moved in 2010 or later, and Hispanic segregation index were the top 3 important variables by mean decrease in accuracy. The final estimates for each census block group and the observed 2017 data are shown (figure). Conclusion. Although we observed some overlap between the observed pattern of drug overdose deaths and predicted values at the census block group level, additional data are needed to improve accuracy of the model and effectively inform public health programming and resource allocation.

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Background: The United States is experiencing a public health emergency from drug overdoses. Recent increases in drug overdose deaths have also been reported in some other high-income countries, suggesting that the problem is broader and spreading. We compared the trends in premature mortality rates from drug overdoses in 13 countries of the Organisation for Economic Co-operation and Development (OECD) from 2001–15.

Methods: We estimated age-, sex-specific and age-standardized premature mortality (25–64 years) rates (ASRs) due to drug overdoses in 13 eligible OECD countries with high-quality death certificate data in the WHO Mortality Database. Drug overdose deaths were defined using ICD-10 codes: X40-X44, X60-X64, X85, Y10-Y14, or F11-F16 and F19. We also conducted joinpoint regression to estimate sex-specific average annual percent changes (AAPCs) in ASR during 2001–2015. Results: Of these 13 countries, the US had the highest premature mortality rate due to drug overdoses for both men and women in 2015 (ASR=35/100,000 in men; 20/100,000 in women), more than double those of any other country in the study. During 2001–2015, the trends of drug overdose mortality varied substantially by country. Rates increased significantly in Estonia (AAPC=6.9%/year in men; 7.9%/year in women), the US (4.3%/year in men; 5.3%/year in women), Australia (3.9%/year in men; 3.2%/year in women), and Netherlands (1.5%/year in men; 2.6%/year in women). In contrast, significant decreases were observed in Norway (-3.2%/year in men; -2.0%/year in women), Spanish men (-4.0%/year), and Danish women (-2.2%/year). Conclusion: We identified wide variations between countries in rates and trends. Detailed evaluation of the policies and public health practices in the countries with declining rates can help identify approaches to avoid further premature deaths.

S/P indicates work done while a student/postdoc
ALCOHOL- AND DRUG-RELATED OFFENSES AND RISK FOR FUTURE FIREARM SUICIDE AMONG AUTHORIZED PURCHASERS OF HANDGUNS IN CALIFORNIA

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Background: Firearm ownership and substance misuse are associated with one another, and each is a risk factor for suicide. Less is known about whether substance misuse is associated with firearm suicide among firearm owners, despite interest in policies that restrict firearm access on the basis of substance misuse. Aim: To determine whether, among legal handgun purchasers in California, an alcohol- or drug-related criminal history is associated with future firearm suicide. Methods: The study population consisted of all Californians ages 21-49 who legally purchased a handgun in 2001. Study members contributed time beginning with their first purchase in 2001 and ending in 2013, unless censored prior. Data on handgun purchases, criminal history, and mortality were obtained from California's Dealer's Record of Sale files, Automated Criminal History System, and Death Statistical Master Files, respectively. Cox proportional hazards models will test the hypotheses that, conditional on other (non-alcohol and drug-related) criminal history, arrests and convictions for alcohol- and drug-related offenses are associated with increased firearm suicide risk, with the greatest risk among those with a history of both alcohol- and drug-related offenses. To assess the specificity of associations, we will also examine risk for non-firearm suicide. Results: Of 79,927 legal handgun purchasers, 2,510 had an alcohol-related criminal history (arrest or conviction), 2,483 had a drug-related criminal history, and 503 had a history of both alcohol- and drug-related offenses at the time of purchase. There were 427 suicides: 357 firearm, 70 non-firearm. Conclusions: Should alcohol- and drug-related criminal history at the time of purchase be associated with firearm suicide, our findings will help identify concentrated suicide risk among firearm owners and inform the development of enforceable restrictions on access to firearms for persons with high-risk substance use.
ASSOCIATIONS BETWEEN OXIDATIVE STRESS AND RISK FOR PRETERM BIRTH IN PUERTO RICO
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Preterm birth (PTB; gestational age <37 weeks), the leading cause of infant morbidity and mortality worldwide, disproportionately impacts pregnancies in Puerto Rico. Oxidative stress and inflammation have been implicated as contributors to adverse birth outcomes, including PTB, and these associations have not been explored in Puerto Rico. In this preliminary analysis from the Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) pregnancy cohort (N=438), we examined associations between urinary oxidative stress biomarkers and PTB. 8-iso-prostaglandin F2α (8-iso-PGF2α), its primary metabolite, and prostaglandin F2α (PGF2α) were included as biomarkers of oxidative stress or inflammation and were measured in urine samples collected at up to 3 timepoints across pregnancy (mean 18, 24, 28 weeks gestation). Logistic regression models were used to calculate adjusted odds ratios (OR) for associations between geometric average biomarker concentrations from each woman (visits 1-3) and PTB. The geometric mean of all biomarker concentrations was higher among women who went on to deliver preterm compared to full term. Averaged levels of 8-iso-PGF2α, its primary metabolite, and PGF2α were associated with increased odds of PTB (OR=1.55, 95% confidence interval [CI]=1.03-2.33; OR=1.66, 95% CI=1.06-2.62; OR=2.00, 95% CI=1.31-3.04, respectively). Our results suggest that oxidative stress and inflammation, as measured by these biomarkers, may be important contributors to PTB. Further research is needed to improve our understanding of the role these biomarkers may play in the causal pathway for preterm birth.
THE ASSOCIATION BETWEEN VIGOROUS PHYSICAL ACTIVITY AND TIME TO PREGNANCY

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Introduction

Vigorous physical activity (VPA) can modulate hormonal status, including ovulation, and thereby influence time to pregnancy (TTP). However, the association has been inconclusive. Prior studies primarily focused on recreational physical activity, neglecting potentially more common modes of VPA. We aimed to evaluate the association between VPA combining modes and TTP.

Methods

Right from the Start (2000-2012) is a community-based cohort that enrolled women in early pregnancy from southern US. During first-trimester interview, women recalled number of cycles of trying. We used cycles of trying and self-reported cycle length to derive cycles at risk. Women also reported the type, frequency, and duration of up to three activities for each mode of VPA (recreational, outdoor/indoor household, occupational, child/adult care, and other activities). We summed the minutes across activities and modes to obtain the cumulative VPA performed. We used a discrete-time proportional hazards model to estimate fecundability ratios (FRs) and 95% confidence intervals (CIs), adjusting for a priori confounders (maternal age, race, BMI, alcohol/smoking use, education, income, and intercourse frequency). We also assessed for effect modification by BMI using a likelihood ratio test.

Results

Among 3,357 women, 36% reported some mode of VPA (median [interquartile range] 75 [30-180] minutes/week) and 27% became pregnant during the 1st cycle of trying. We observed no association between hours of VPA performed and TTP (FR [95% CI] 1.01, 0.99, 1.02) and no effect modification by BMI (p = 0.19). Results were also similar when restricted to women enrolled prior to conception.

Conclusion

VPA across modes does not appear to influence TTP in this cohort. Since VPA may vary within individuals across time, future study may benefit from measuring VPA as a time-varying covariate. Additional data about body composition and ovulatory function would also enhance understanding of VPA and fecundability.

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**Figure. Directed acyclic graph for vigorous physical activity (VPA) and time to pregnancy (TTP)**

Boxed covariates are candidate confounders that will be adjusted for.

Background: There is limited research on the validity of birth certificate data for maternal weight, obesity, and gestational weight gain (GWG). Objective: As part of a study of antidepressant use and GWG, we investigated the validity of pre-pregnancy maternal weight and body mass index (BMI) and GWG from birth certificates. Methods: Our study population was women enrolled in Kaiser Permanente Washington (KPWA) with a singleton, live birth from 2004–2014 who filled ≥1 antidepressant prescription in the 6 months before pregnancy. Comparing birth certificate values with clinical measurements from the electronic medical record (considered the gold standard), we calculated the Pearson correlation and mean difference with 95% confidence intervals (CIs) for pre-pregnancy weight and body mass index (BMI) and GWG. We also calculated the sensitivity and specificity of birth certificate data for pre-pregnancy BMI ≥30 kg/m^2 and percent under-reporting or over-reporting GWG by >10 lbs. Results: For the 1012 women with non-missing data from both sources, birth certificate measures had high validity for pre-pregnancy weight when compared with the electronic medical record (correlation: 0.98, mean difference: -0.39 lbs, 95% CI: -0.93 to 0.16 lbs). For pre-pregnancy BMI, the correlation was also high (0.97, mean difference: 0.04 kg/m^2, 95% CI: -0.07 to 0.15 kg/m^2). Pre-pregnancy BMI ≥30 kg/m^2 had good sensitivity (92%) and specificity (96%). GWG also had high validity (correlation: 0.81, mean difference: -0.55 lbs, 95% CI: -1.14 to 0.03 lbs). Among women in all BMI categories, 19% of women misreported GWG by >10 lbs; this was most common in women with BMI ≥30 kg/m^2 (26%) or 25.0–29.9 kg/m^2 (21%) and less common in women with BMI 18.5–24.9 kg/m^2 (12%). Conclusions: Overall, maternal weight measures derived from birth certificates had high validity for women using antidepressants before pregnancy, although substantial misreporting of GWG was more common in women with BMI ≥25.0 kg/m^2.
PREDICTORS OF UP-TO-DATE VACCINATION IN THE NATIONAL IMMUNIZATION SURVEY-CHILD  
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Background: Early childhood vaccination is below US national objectives. Children are recommended to receive a series of vaccines to protect against several infectious diseases, beginning with hepatitis B (HepB) vaccination at birth. Identifying behavioral and demographic characteristics that predict up-to-date (UTD) vaccination can assist in development and targeting of interventions. The objective of this study was to identify predictors of UTD vaccination in a nationwide sample. Methods: Data from the National Immunization Survey (NIS) – Child were used to examine predictors of UTD vaccination of children ages 19-35 months. Participants were eligible for inclusion if they had adequate provider data (n = 15,333). Probabilities of vaccination and risk differences were estimated from predictive margins after weighted unadjusted and adjusted logistic regression models using Stata SE version 15.1. Results: Most (73.9%) children were UTD. In the adjusted model, children who received the HepB vaccine within 3 days of birth had 20.0% (95% confidence interval (CI) 16.2-23.9%) higher UTD vaccination compared to children who did not receive the HepB vaccine within 3 days of birth (79.0% (95% CI 77.5-80.6%) vs. 59.0% (95% CI 55.4-62.6%). Children were more likely to be UTD if they were older, firstborn, privately insured, household income above poverty, received Women, Infants, and Children (WIC) benefits, had mothers with more education, or had mothers who were married. In comparison, Census region, language in which the survey was taken, maternal age group, child's race/ethnicity, and child's sex were not associated with UTD vaccination after adjustment. Conclusion: Receipt of the birth dose of HepB vaccine is a strong predictor of UTD vaccination at ages 19-35 months. Whether refusal or delay of HepB vaccine is useful as an intervention target should be explored.
ANTIBIOTIC TREATMENT OF BACTERIAL VAGINOSIS TO PREVENT PRETERM BIRTH: AN IPD META-ANALYSIS WITH IMPUTATION OF MISSING STUDIES

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OBJECTIVE: To determine, using individual participant data (IPD) and imputing results of trials not providing IPD, whether antibiotic treatment (RX) of bacterial vaginosis (BV) during pregnancy reduced preterm birth (PTB), prolonged pregnancy, is more effective in women with a previous PTB or if given earlier in pregnancy, and whether effects of metronidazole (MZ) and clindamycin (CM) differed. METHODS: Eligible trials randomized pregnant women with BV who did not already have labor or PROM to antibiotics or control and collected gestational age at delivery. Trials were identified from a Cochrane Systematic Review (2013), and searches of clinicaltrials.gov, Cochrane Central Register of Controlled Trials, WHO ICTRP and Web of Science. References were reviewed for additional trials. Analysis used one-step logistic and Cox random effect models. Subgroup analysis used interaction terms with RX. Trials not providing IPD were incorporated by multiple random hot-deck imputation, with trials providing IPD as donors. Imputation was done separately for MZ and CM trials. RESULTS: There were 121 references from 96 studies; 23 trials (11,979 women) were eligible. Thirteen trials (6915 women) provided IPD. Since the effects of MZ and CM differed, major analyses were stratified by antibiotic. Among IPD trials, MZ did not reduce PTB (odds ratio 1.00, 95% confidence interval 0.84-1.17), but CM reduced PTB by 41% (0.59, 0.42-0.82). Imputing results of non-IPD trials did not change the results for MZ (0.95, 0.81-1.11), but negated the beneficial effect of CM (0.90, 95% CI 0.72-1.12). Hazard ratios mirrored ORs. In IPD studies, CM appeared more beneficial when given at 20-21 wks but not earlier or later. There were no other important or significant interactions observed. CONCLUSION: Among trials providing IPD, CM but not MZ prevented PTB, but after imputing data from non-IPD trials, the clindamycin IPD results were negated, supporting current clinical recommendations regarding treatment.
Frequency of extreme ambient temperature events is increasing. Pregnant women may be especially susceptible to physiological changes caused by extreme temperatures, such as inflammation and increased heart rate, which can lead to poor pregnancy outcomes including stillbirth. Although the etiology of stillbirth is often unknown, changes in ambient temperature represent an understudied potentially modifiable risk factor. Singleton deliveries in the Consecutive Pregnancies Study (Utah, 2002-2010) were analyzed. We identified the first stillbirth case per mother (n=498) via medical records. Ambient temperature was derived from the Weather Research and Forecasting model and air pollution data were based on modified Community Multiscale Air Quality models.

We conducted a case-crossover analysis to estimate the hazard ratio (HR) and 95% confidence interval (95% CI) of stillbirth by each increase of 1°C Celsius. Risk periods included day of delivery and each of the 7 days prior to delivery. Two control periods were utilized: two weeks prior and two weeks after delivery. Models were adjusted for relative humidity, ozone, and particulate matter <2.5 microns. During the week prior to delivery, daily risk of stillbirth significantly increased between 5-7% for each 1°C Celsius increase in temperature. For example, on the day of delivery, risk of stillbirth increased by 6.1% for each 1°C Celsius increase (95% CI: 1.03-1.09) and the highest risk observed was HR=1.07 (95% CI: 1.04-1.10) for 3 days prior to delivery (Figure 1). Our findings suggest temperature may be a modifiable risk factor for stillbirth, although the underlying biologic mechanisms remain to be explored. These findings highlight the importance of understanding ambient environmental effects on pregnancy outcomes.
REPLICATING RANDOMIZED TRIAL RESULTS WITH OBSERVATIONAL DATA USING THE PARAMETRIC G-FORMULA: AN APPLICATION TO INTRAVENOUS IRON TREATMENT IN HEMODIALYSIS PATIENTS

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Large high-quality randomized trials are costly, time-consuming, and inflexible to different selection criteria and intervention protocols. A practical alternative is to apply the parametric g-formula, an extension of standardization, to cohort studies. This method can help guide complex treatment decisions by mimicking one or more randomized trials to estimate dynamic treatment effects in the presence of treatment-confounder feedback loops. To assess the potential validity of this approach using real-world data, we attempted to replicate results from the recently published PIVOTAL trial (Macdougall et al., NEJM 2018) by applying the g-formula to compare anemia management strategies in an international cohort study of hemodialysis patients (DOPPS).

PIVOTAL patients were randomized to a proactive high intravenous iron (IVI) dose or a reactive low IVI dose, with administered doses based on serum levels (updated monthly) of transferrin saturation (TSAT) and ferritin, markers of iron stores. We identified 711 DOPPS patients who roughly met the PIVOTAL inclusion criteria and used Monte Carlo simulation to predict monthly data under the 2 PIVOTAL intervention strategies. The figure compares the mortality risk for each treatment group in the PIVOTAL trial and the DOPPS simulation. In the simulation, we observed higher 1-year mortality risk in the high (11.9%) vs. low (9.4%) IVI dose arm (RR=1.26). In the PIVOTAL trial, 1-year mortality risk was comparable between groups and slightly lower (~7.5%) than in the simulation. Discrepancies may be attributable to model misspecification in our simulation or differences between the two study populations. Our findings are promising for using observational data to guide complex treatment decisions by designing and mimicking custom randomized trials with the parametric g-formula. As illustrated in our application, however, we need to better understand the accuracy of this approach to enhance its credibility in clinical research.

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**Figure:** Cumulative incidence of mortality (%)

- **DOPPS simulated:** Results of our application of the parametric g-formula to the DOPPS cohort
- **PIVOTAL observed:** Actual results of PIVOTAL randomized trial, curves roughly recreated based on Figure 2b (Macdougall Ic et al. Intravenous Iron in Patients Undergoing Maintenance Hemodialysis. N Engl J Med. 2018 Oct 26)
- **Definition of high vs. low intravenous iron (IVI) protocols:**
  - **High IVI dose:** give 400 mg/month IVI and discontinue if ferritin >700 ng/mL or TSAT >40%
  - **Low IVI dose:** give 100-400 mg/month IVI and discontinue if ferritin >200 ng/mL and TSAT >20%

S/P indicates work done while a student/postdoc

Background: Evidence for the impact of statins on cancer risk is inconsistent, with observational studies and randomized trials producing conflicting results. In the absence of a randomized trial of adequate size and follow-up to comprehensively evaluate this relationship, we emulated a target trial of statin therapy and total and site-specific cancer among UK adults. Methods: We used Clinical Practice Research Database primary care electronic health records in the CALIBER platform of 722,213 UK individuals aged ≥30 between 1998 and 2016, with no history of cancer, no statin prescription in the past year, no statin contraindication, and LDL cholesterol <5 mmol/L. We used pooled logistic regression to estimate the intention-to-treat and per-protocol effects of statin therapy on cancer outcomes via hazard ratios and survival curves. To estimate the per-protocol effect, we used inverse probability weighting for adherence adjustment. Results: Over a maximum of 10 years of follow-up (median 3.3 years), 27,937 individuals developed cancer. The intention-to-treat hazard ratio (95% confidence interval) was 1.02 (0.99-1.05) for total cancer, 0.99 (0.91-1.08) for female breast cancer, 1.03 (0.95-1.12) for colorectal cancer, 0.97 (0.88-1.07) for hematological cancer, 1.06 (0.93-1.20) for melanoma, 1.07 (0.99-1.16) for lung cancer, 1.01 (0.94-1.08) for prostate cancer, and 1.10 (0.99-1.23) for urothelial cancer. The per-protocol hazard ratio was 0.99 (0.95-1.03) for total cancer, 0.94 (0.84-1.05) for female breast cancer, 0.96 (0.85-1.08) for colorectal cancer, 0.86 (0.75-0.98) for hematological cancer, 1.21 (1.01-1.45) for melanoma, 1.04 (0.92-1.18) for lung cancer, 0.93 (0.83-1.03) for prostate cancer, and 1.16 (0.98-1.36) for urothelial cancer. Conclusion: These findings suggest that statin therapy does not influence the incidence of cancer over a median of 3.3 years of follow-up. However, small effects cannot be completely ruled out for particular types of cancer.

S/P indicates work done while a student/postdoc
INCRETIN-BASED DRUGS AND THE RISK OF LUNG CANCER IN PATIENTS WITH TYPE 2 DIABETES

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Background: Dipeptidylpeptidase-4 (DPP-4) inhibitors and glucagon-like peptide-1 (GLP-1) receptor agonists are medications that are commonly used in the treatment of type 2 diabetes. While there is biological evidence that they may have an effect on lung tissue, no observational study has assessed their association with lung cancer incidence. Objective: To determine whether use of DPP-4 inhibitors and GLP-1 receptor agonists is associated with an increased risk of lung cancer in patients with type 2 diabetes. Methods: This is a population-based cohort study using the United Kingdom Clinical Practice Research Datalink, a large database of anonymized primary care medical records. We identified a cohort of patients initiating antidiabetic drugs between 2007 and 2017, with follow-up until 2018. Use of DPP-4 inhibitors and GLP-1 receptor agonists was modelled as a time-varying exposure and compared with use of other second-to-third-line antidiabetic drugs. Exposures were lagged by 1 year for cancer latency purposes. Time-dependent Cox models were used to estimate adjusted hazard ratios (HRs) with 95% confidence intervals (CIs) of incident lung cancer associated with use of DPP-4 inhibitors and GLP-1 receptor agonists overall, by cumulative duration, and time since initiation. Several sensitivity analyses were conducted, including marginal structural modeling and a competing risks analysis. Results: The cohort included 130,340 patients, of whom 790 were newly diagnosed with lung cancer during follow-up. Overall, use of DPP-4 inhibitors or GLP-1 receptor agonists was not associated with an increased risk of lung cancer (HR: 1.07, 95%CI: 0.87-1.32 and HR: 1.02, 95%CI: 0.68-1.54, respectively). Similarly, there was no evidence of duration-response relationships, and sensitivity analyses yielded consistent findings. Conclusions: In this large population-based study, use of DPP-4 inhibitors or GLP-1 receptor agonists was not associated with an increased risk of lung cancer.
ORAL CORTICOSTEROID USE DURING PREGNANCY AND RISK OF PRETERM BIRTH Kristin Palmsten* Kristin Palmsten, Gretchen Bandoli, Gabriela Vazquez-Benitez, Min Xi, Diana L Johnson, Ronghui Xu, Christina D Chambers, (HealthPartners Institute)

Background: The impact of oral corticosteroid (OCS) dose and gestational timing on preterm birth (PTB) is unknown. Methods: Pregnant women with rheumatoid arthritis (RA) (n=528), inflammatory bowel disease (IBD) (n=217), and asthma (n=234) enrolled in the MotherToBaby Pregnancy Studies were included. Information was collected by phone interview plus by medical record review. We estimated risk ratios (RR) for OCS dose (prednisone equivalent dose) trajectories before gestational day 140 and hazard ratios (HR) and for time-varying exposure to OCS and other disease-related medications between gestational days 139 and 259 (i.e., gestational week 37). Associations were adjusted for propensity scores which included validated self-reported measures of disease severity for RA and asthma and other potential confounders. Results: PTB risk was 15.5% for RA, 14.3% for IBD, and 8.6% for asthma subcohorts. For RA, compared with no OCS, PTB risk was increased in high (adjusted (a)RR: 4.77 (95% confidence interval (CI): 2.76, 8.26)) and medium (aRR: 1.81 (95% CI: 1.10, 2.97)) but not low (aRR: 1.38 (95% CI: 0.79, 2.38)) cumulative OCS dose trajectories during the first 140 gestational days, and disease modifying antirheumatic drug (DMARD) exposure was not associated with PTB (biologic DMARD aHR: 1.08 (95% CI: 0.70, 1.66); non-biologic DMARD aHR: 0.87 (95% CI: 0.55, 1.38). OCS exposure ≥10 mg of prednisone equivalent dose after gestational day 139 versus none was associated with an increased PTB rate (aHR: 2.45 (95% CI: 1.32, 4.56), whereas <10 mg of prednisone equivalent dose equivalent was not (aHR: 1.18 (95% CI: 0.60, 2.30). Overall, the aHR for OCS exposure after gestational day 139 versus none was 1.64 (95% CI: 0.92, 2.92). Results for IBD and asthma were imprecise although there was a signal for high OCS dose for IBD. Conclusions: Higher but not lower OCS doses earlier or later in pregnancy were associated with an increase in PTB.
ESTIMATING THE EFFECT OF IMPLANTABLE CARDIOVERTER DEFIBRILLATORS ON MORTALITY IN PATIENTS WITH LONG QT SYNDROME USING MARGINAL STRUCTURAL MODELS

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Background: Implantable cardioverter defibrillators (ICD) are important treatment options to prevent sudden cardiac death (SCD). For young patients with congenital long QT syndrome (LQTS), current practice guidelines recommend ICD therapy for patients with a history of aborted cardiac arrest, or patients who remain symptomatic (i.e. syncope) despite beta blocker treatment. However, for treatment-naïve patients with syncope as the first symptom and profound QT prolongation, the effect of ICD on improving survival remains unknown. The Rochester LQTS Registry offers a unique opportunity to examine ICD effectiveness in these patients for whom ICD implantation is controversial. Methods: We included 496 patients from the Registry (enrolled from the US and Canada from 1980 to 2017) who had a QTc ≥ 500ms and a first symptom of syncope occurring while off beta blockers. Follow-up started from the date of the index syncopal event (i.e. symptom initiation). We estimated the effect of ICD on survival censored at the age of 50 years using inverse probability weighted marginal structural Cox models, which allows adjustment for time-varying confounders (e.g. cardiac events) that can be affected by previous ICD. These confounders cannot be appropriately accounted for by traditional time-varying Cox models. Stabilized weights of treatment and censoring were used. Results: The average age at baseline (symptom initiation) was 14.7 years. During a median follow-up of 20.2 years (interquartile range: 10.3-29.8 years), 158 patients received an ICD and 51 patients died. Having an ICD was associated with a 79% decrease in the risk of mortality (HR=0.21, 95% CI based on robust SE: 0.08 – 0.55), controlling for baseline covariates and time-varying beta blocker treatment and cardiac events. The distribution of weights over time is shown in Figure 1. Conclusion: Our preliminary findings suggest that ICD was protective in this LQTS subgroup, which can inform clinical decision making on ICD implantation.

![Figure 1. Distribution of stabilized weights over time. The box for each time point shows the location of the mean (○), median (middle horizontal bar) and the 25th and 75th percentiles (border horizontal bars). Vertical lines extend to the most extreme (largest/smallest) observations within the upper and lower fence (upper fence: 1.5 × IQR above the 75th percentile; lower fence: 1.5 × IQR below the 25th percentile). Observations beyond the vertical lines are plotted individually.](image_url)
UNHEALTHIER FOOD ENVIRONMENTS ASSOCIATED WITH HIGHER HOSPITALIZATION RATES AMONG ADULTS WITH DIABETES BUT NOT IN MOST EXTREME “FOOD SWAMPS”
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Background: Prevention of diabetic complications depends on dietary intake, but diet can be impacted by one’s food environment. Research on neighborhood effects suggests characteristics of places can have nonlinear relationships with health outcomes. This study examines whether food swamps are associated with hospitalizations among diabetic adults across counties over time and whether this relationship is curvilinear.

Methods: Longitudinal county-level analysis using data from USDA Food Environment Atlas, AHRQ Health Care Cost and Utilization Project, CDC Behavioral Risk Factor Surveillance Survey, and HHS Area Health Resource File. Sample includes 832 counties across 16 states with observations in 2010, 2012, and 2014. Food swamp severity is measured as the percentage of food outlets in a county that are unhealthy (fast food outlets and convenience stores). Analyses use hierarchical linear mixed models with county random intercepts and control for relevant health systems-related and sociodemographic covariates and state and year indicators. Curvilinear associations are explored using quadratic terms.

Results: Mean food swamp severity is 54.06% unhealthy outlets (SD=11.03). Mean hospitalization rate is 276.25 hospitalizations per 1,000 adults with diabetes (SD=87.63). In adjusted models, food swamp severity has a significant positive and nonlinear association with hospitalization rates among diabetic adults (severity: $\beta=2.245$, p=0.014; severity2: $\beta=-0.017$, p=0.034), leveling off after a point of saturation by unhealthy outlets (~65%) achieved by only 15% of observations. Conclusions: Food swamps are associated with greater rates of hospitalizations among diabetic adults in a curvilinear manner. Policies that limit oversaturation of the environment with unhealthy outlets may help prevent morbidity and mortality among adults with diabetes, at least until a certain point of saturation. More severe food swamps may necessitate more extensive interventions in order to prevent complications.

A principal goal of diabetes management is glucose control, an outcome that is influenced by multiple factors. Environmental parameters, especially built and sociodemographic environments, can impact the ability to control diabetes. Indeed, epidemiological studies have associated specific environmental factors and diabetes control; however, the impact of multidimensional environmental status has not been assessed. The Environmental Quality Index (EQI) is a novel and comprehensive quantitative metric that captures five environmental domains for the period 2000-2005. We conducted county-level analyses of age-adjusted diabetes control prevalence rates, for 2004-2012, in association with the EQI and domain-specific indices using random intercept multilevel linear regression models clustered by state, controlling for county-level rates of obesity and physical inactivity.

Analyses were stratified by four rural-urban strata, and results are reported as prevalence rate differences (PRD) with 95% CIs comparing the highest quintile/worst environmental quality to the lowest quintile/best domain specific quality. Decreased overall environmental quality was associated with increased diabetes control across all counties (PRD:1.09, 95%CI:1.04,1.14) and in more urban areas; however, poorer overall environmental quality was associated with reduced diabetes control in more rural counties. For all counties, poorer sociodemographic factors were associated with reduced diabetes control (PRD:-1.23, 95%CI:-1.18,-1.29) with the strongest results in the most rural counties (PRD:-1.46, 95%CI:-1.36,-1.56). Decreasing quality in the built environment domain also was associated with decreasing prevalence rates of diabetes control for all counties and urban-rural strata. Overall environmental quality exerts effects on diabetes control that vary across the rural-urban spectrum; in contrast, poor sociodemographic and built environmental factors impact diabetes control nationally.

S/P indicates work done while a student/postdoc
Non-alcoholic fatty liver disease (NAFLD) is thought to mediate the effect of obesity on the risk of type 2 diabetes (T2D), but this relationship has not been formally explored. We assessed the estimated effect of BMI on T2D risk and evaluated to what extent NAFLD mediates this relationship using data from the Multi-Ethnic Study of Atherosclerosis (2002-2013), a cohort of adults ages 45-85 without cardiovascular disease at baseline. BMI was categorized as normal (<25, or 30, or >27.5 for Chinese). Incident T2D was defined as first observation of a fasting glucose >126 mg/dL or use of any diabetes medications during follow-up. Liver attenuation was measured at baseline by CT scans and categorized into quartiles of fat density. We fit a Weibull marginal structural model to estimate the total effect, natural direct effect and natural indirect effect of BMI on T2D risk with mediation by NAFLD. Among 4,541 participants free of T2D at baseline, 557 new cases of T2D occurred over 34,310 person-years. After adjusting for dietary quality, kcal/day, education, physical activity, age and gender, compared to those with normal weight, those with overweight had 2.2 times the rate of T2D (95% CI: 1.6-3.1), and those with obesity had 4.5 times the rate of T2D (3.2-6.2). The mediation analysis showed that NAFLD explained approximately 21% of the total estimated effect of overweight on T2D risk (HR indirect effect: 1.2 [1.1-1.3]), and approximately 22% of the total estimated effect of obesity on T2D risk (HR indirect effect: 1.4 [1.3-1.5]). These relationships were similar in whites, Chinese-Americans, blacks and Hispanics. These data suggest that the estimated effect of obesity on T2D risk is partially explained by the presence of NAFLD. Future studies among adults with NAFLD should investigate the effects of therapeutic agents that target liver fat reduction in their ability to prevent or delay T2D onset.
FASTING PLASMA GLUCOSE, DIAGNOSIS OF GESTATIONAL DIABETES, AND THE RISK OF LATE STILLBIRTH: A MEDIATION ANALYSIS IN A CASE-CONTROL STUDY FROM ENGLAND, UK

Peter WG Tennant* Peter WG Tennant, Tomasina Stacey, Lesley ME McCowan, Edwin A Mitchell, Jayne Budd, Minglan Li, John M D Thompson, Devender Roberts, Bill Martin, Alexander EP Heazell, (Leeds Institute for Data Analytics, University of Leeds, Leeds, UK)

BACKGROUND: Women with gestational diabetes mellitus (GDM) receive enhanced antepartum care due to perceived higher risks of adverse outcomes. Previous observational studies have however only observed modest effects from GDM, provoking debate about the need for enhanced care and threshold for diagnosing GDM. This confusion may be explained if a harmful effect of hyperglycaemia is masked by a protective effect of care. This study thus estimated the effects of glucose concentration and enhanced care on risk of late stillbirth in women without pre-existing diabetes. METHODS: 291 case pregnancies ending in late stillbirth (≥28 weeks’ gestation) and 733 control pregnancies were recruited from 41 maternity units in England, UK. 94 cases and 277 controls without pre-existing diabetes received a fasting plasma glucose (FPG) test. In England, GDM diagnosis is advised if FPG ≥5·6mmol/L, but other tests are preferred. Causal mediation analysis thus explored the effects of raised FPG (≥5·6mmol/L) and GDM diagnosis on risk of late stillbirth. Odds ratios (OR) were estimated by logistic regression conditioning on confounders identified by directed acyclic graph. RESULTS: On average, women with raised FPG experienced twice the risk of stillbirth as women with normal FPG (OR=1.97, 95% CI=0.61-6.32) but this varied by GDM diagnosis. Women with raised FPG not diagnosed had quadruple risk of stillbirth as women with normal FPG (OR=4.22, 95% CI=1.04-17.02) while women with raised FPG who were diagnosed had similar risks with normal FPG (OR=1.10 95% CI=0.31-3.91). Stillbirth risk in women with raised FPG was thus around four-times lower for those who received a GDM diagnosis (OR=0.26, 95% CI=0.07, 0.93). CONCLUSIONS: Women with raised FPG experience higher risk of late stillbirth. If diagnosed with GDM (and treated accordingly), this appears to be mostly mitigated. Inconsistent diagnosis however leave many women with borderline hyperglycaemia exposed to higher risks of stillbirth.

S/P indicates work done while a student/postdoc
GESTATIONAL DIABETES AND LONGITUDINAL ULTRASONOGRAPHIC MEASURES OF FETAL GROWTH IN THE NICHD FETAL GROWTH STUDIES-SINGLETONS

Mengying Li*

Objectives: Gestational diabetes (GDM) is associated with increased risk for large for gestational age birth. Yet, longitudinal fetal growth trajectories in women with GDM and the timing of alterations related to GDM is not well understood, particularly in early pregnancy. This study aims to investigate these critical data gaps. Study Design: The NICHD Fetal Growth Studies–Singleton Cohort enrolled women at 8w0d to 13w6d gestation from 12 U.S. clinical centers and randomized them among four ultrasonology schedules for longitudinal fetal measurement. GDM was defined using the Carpenter-Coustan Criteria, impaired glucose tolerance (IGT) was defined as 2-hour plasma glucose in the 75 g or 100 g oral glucose tolerance test (OGTT) 140–199 mg/dL, and normal glucose tolerance (NGT) was defined by no elevated values on either the OGTT or 50 g glucose challenge test. Results: One hundred and seven women developed GDM, 118 developed IGT, and 2,020 had NGT. Most fetal growth measures were larger at 10-12 weeks and became smaller at 14-16 weeks in GDM than NGT group. At 28 weeks, abdominal circumference (AC) and estimated fetal weight (EFW) became larger in GDM group, and the differences persisted through 40 weeks (at 40 weeks: AC: 368 vs. 355 mm, p = 0.03; EFW: 3866 vs. 3558 g, p = 0.003). The associations were modified by the family history of diabetes (p-interaction < 0.001), such that GDM-related early pregnancy growth alterations were only seen in women with a family history of diabetes, whereas GDM-related late pregnancy overgrowth was only seen in those without. IGT group also had larger EFW than the NGT group at 36-40 weeks. Conclusion: GDM-related fetal growth alterations appeared to start as early as 10 weeks of gestation. Fetal overgrowth related to GDM was solely driven by AC and started at 28 weeks of gestation, suggesting current GDM diagnosis and treatment timing (often after 24-28 weeks) may be too late to normalize fetal growth.
Urinary incontinence (UI), the involuntary loss of urine involving physical exertion (stress UI), urgency (urgency UI), or both (mixed UI), is a common condition in women of all ages. The distribution of UI types differs by race: urgency UI is high among black women, whereas stress UI is high among white women. Gestational diabetes (GD) is a major risk factor for type-2 diabetes (T2D), which in turn is a risk factor for UI. Black women with a history of GD are at highest risk of subsequently developing T2D, compared to other racial groups. It is unknown whether there is an association of GD with UI risk that is independent of T2D among black women as the few published studies have involved mostly white and Asian women. Using data from the Black Women’s Health Study (BWHS), a follow-up of U.S. black women aged 21-69 at baseline in 1995, we assessed the association between history of GD (reported in 1997, 1999, and 2009) and UI frequency and type (reported in 2011). The analytic sample consisted of 28,980 parous women among whom 1,611 reported having a history of GD, and 14,935 reported experiencing UI in the past year versus never. Odds ratios (OR) and 95% confidence intervals (95% CI) were estimated using separate logistic regression models among women with and without T2D and adjusted for age, body mass index, parity, menopausal status, estrogen use, socioeconomic status, diet, diuretic use, and vigorous activity. Associations of GD and UI were strongest among women without T2D (N=23,827): comparing women with a history of GD vs, no history, the OR (95% CI) for experiencing UI of any type at least weekly was 1.31 (1.07-1.60). Additionally, GD was positively associated with stress UI (OR=1.16 (95% CI: 0.97-0.38)), urgency UI (OR=1.23 (95% CI: 1.02-1.50)), and mixed UI (OR=1.21 (95% CI: 0.96-1.51)). These results suggest that women who experience GD without subsequent T2D may be at increased risk of UI and may benefit from early intervention efforts.
DOES THE TYPE AND TIMING OF EDUCATIONAL ATTAINMENT INFLUENCE HEALTH? A NOVEL APPLICATION OF SEQUENCE ANALYSIS

Anusha Vable* Anusha Vable, Catherine dP Duarte, Alison K. Cohen, M. Maria Glymour, Robert K. Ream, Irene H. Yen, (University of California San Francisco)

Education is an established predictor of health, but health effects of different type and timing of education are understudied. Non-traditional education trajectories, especially delayed or interrupted completion, are increasingly common. We constructed education sequences using data from National Longitudinal Survey of Youth 1979, followed until age 50 (N=7,168 individuals; 250,880 person-years of education data). We used sequence analysis to characterize similarity of sequences based on the number of changes necessary to convert one education sequence to another and hierarchical cluster analysis to group similar sequences. Age 50 mental (MCS) and physical (PCS) health component summary scores from the SF-12 were predicted by linear regression models adjusted for birth cohort, race, parental education, Southern birth, and childhood rural residence. Data supported 16 unique educational trajectories based on highest schooling level (< high school [HS], HS, GED, Associates Degree [AA], Bachelor’s Degree [BA], or graduate work) and timing of school attendance (e.g., straight-through, interrupted, delayed; see figure). All GED trajectories predicted poorer physical and mental health than receiving a HS diploma (e.g. PCS beta for GED and a delay before getting an AA, compared to HS only = -2.79; 95%CI:-4.73,-0.84). All AA trajectories predicted similar PCS and MCS scores as HS only (e.g. PCS beta for AA immediately after HS, compared to HS diploma only = 0.56, 95%CI: -0.56,1.68). Those with interrupted education before getting a BA had poorer PCS than those who went straight-through (beta = -2.12, 95%CI: -4.10,-0.15). Non-traditional education trajectories predict poorer health than traditional trajectories when attaining degrees often considered equivalent in health research: a GED did not confer the same health benefits as an HS diploma, and those with interrupted schooling before attaining a BA did not attain the equal physical health as those without interruptions.

S/P indicates work done while a student/postdoc
CAUSAL METHODS FOR EVALUATING THE HEALTH EFFECTS OF MIGRATION HISTORY
Adina Zeki Al Hazzouri* Adina Zeki Al Hazzouri, Maria Glymour, Audrey Murchland, Leslie Grasset, 
(Columbia University)

Background: Immigrants to the US are selected on markers of early life socioeconomic status (e.g. education) and health status (e.g. taller stature), which in turn predict health outcomes later in life. These selection effects may confound the magnitude of disparities in health outcomes. Methods: We merged harmonized data from the Mexican Health and Aging Study (MHAS) and the Health and Retirement Study (HRS) - restricting to Mexican born individuals. Individuals who ever migrated to the US (n=2,479) were defined as exposed, compared to those who never migrated to the US (n=16,747). To calculate the propensity to migrate from Mexico to the US, we used participant reported information on time-constant (eg gender, parental education) and time-varying factors (e.g., years of education completed, labor force participation, smoking status) to construct a lifecourse data set in which each participant contributed an observation for each year beginning birth (age 0) till either age at migration to the US or age at last observed study interview. We fit a discrete time logistic model predicting migration at each year of life. We constructed a parallel simulation with 4 age-periods to model counterfactual contrasts for any age of migration, with the potential outcomes being: Y_mj0nj1nj2nj3n, Y_mj0nj1nj2nj3y, Y_mj0nj1nj2y, _mj0nj1y; where j1n refers to still in Mexico (did not migrate) by age period 1 and j1y refers to having migrated by age period 1 (see Figure). It follows that in order to estimate the effect of never migrating at every possible age period, we must contrast Y_mj0nj1nj2nj3n (never migrated) to the other three possible potential outcomes. Results: Major predictors of migration included age, gender, education, parental education, height, smoking status and job status. Conclusion: We estimated age-specific models for migration probabilities with time-varying predictors, allowing for calculation of weights to estimate counterfactual contrasts for any age of migration.

Figure: counterfactual outcomes for the effect of migration in four age period.
Restrictive immigration policies and resulting deportation worry have been shown to have adverse impacts on health in cross-sectional research. No research has evaluated the long-term impacts of deportation worry on health, including cardiovascular disease (CVD) risk factors. Using data from an ongoing community-based cohort of Mexican-origin adult women (n = 580), we used linear mixed models to evaluate the association between deportation worry self-reported at the 2012 – 2014 study visit and blood pressure (BP), body mass index (BMI), and waist circumference (WC) measured at the same visit and visits 2 and 4 years later. Covariates included socio-demographic characteristics, nativity/years in the US, and prior depressive symptoms. We used inverse probability of attrition weights to account for cohort attrition and multiple imputation to address missing covariate data. Nearly half of participants (48%) reported high deportation worry; 24% reported moderate worry and 28% reported being not at all worried. Compared to being not at all worried, reporting a lot of deportation worry was associated with steeper increases in systolic and diastolic BP (SBP, DBP) and mean arterial pressure (MAP) over the four-year period, although there was also evidence of non-linear trends for SBP and MAP (Figure 1). For example, reporting a lot of deportation worry was associated with a steeper initial increase in SBP ($\beta$ for interaction between deportation worry and linear year term: 4.06; 95% CI: 1.16, 6.95); followed by a declining slope ($\beta$ for interaction with quadratic year term: -0.82, 95% CI: -1.58, -0.07) relative to reporting being not at all worried. Initial disparities by level of deportation worry in pulse pressure and BMI remained stable, while disparities in WC diminished slightly over the four-year period. Deportation worry may contribute to persistent or widening disparities in CVD risk factors among US immigrants and their family members.
SETTING MATTERS IN THE RELATIONSHIPS OF REPORTED INTERPERSONAL DISCRIMINATION WITH CARDIOVASCULAR HEALTH: FINDINGS FROM CARDIA

Ganga Bey*, Ganga Bey, Catarina Kiefe, (University of Massachusetts Medical School)

Background: Simultaneous experiences of interpersonal racial and gender discrimination may be measured as either protective or damaging to cardiovascular health (CVH) depending on psychosocial characteristics associated with race and gender and the setting in which the interaction is reported to have occurred. Methods: We used data from 3,758 black and white adults in CARDIA, a community-based, multi-city cohort assembled in the mid-1980s. Racial and gender discrimination in eight possible settings were assessed using the Experiences of Discrimination scale at year 7 (1992-93) and CVH at year 30 was evaluated using a 12-point composite outcome with higher scores indicating better health. Separate multivariable linear regressions evaluated the associations between simultaneous reports of racial and gender discrimination and CVH score in each possible setting stratified by gendered race. Results: Mean (SD) CVH scores at year 7 were 9.4(1.7), 9.4(1.6), 10.3(1.4), and 9.4(1.8) among black women, black men, white women, and white men, respectively. Table: For black women, reporting both racial and gender discrimination while receiving medical care was the only setting in which exposure predicted poorer CVH; in some settings, reported experiences of discrimination were protective. For black men reporting both forms of discrimination while getting a job, at work, at school, and while receiving medical care was associated with poorer CVH. Among white persons, reported discrimination while getting housing and by the police or courts (women), and in public and at work (men) predicted a lower CVH score. Conclusions: The setting in which discrimination is reported may be an important indicator of whether discriminatory experiences are negatively associated with CVH, providing insight on distinct effect pathways among racially diverse women and men.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Black women</th>
<th>Black men</th>
<th>White women</th>
<th>White men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting a job</td>
<td>0.0 (0.3, -0.0)</td>
<td>-0.3 (-0.6, 0.0)</td>
<td>-0.6 (-1.3, -0.1)</td>
<td>-0.5 (-1.1, -0.1)</td>
</tr>
<tr>
<td>Getting housing</td>
<td>-0.1 (-0.3, -0.2)</td>
<td>0.2 (+0.5, -0.1)</td>
<td>-1.5 (-2.5, -0.4)</td>
<td>-0.4 (-1.5, -0.7)</td>
</tr>
<tr>
<td>At work</td>
<td>0.1 (-0.2, -0.4)</td>
<td>-0.4 (-0.7, -0.1)</td>
<td>-0.4 (-0.9, -0.1)</td>
<td>-1.0 (-1.6, -0.3)</td>
</tr>
<tr>
<td>At school</td>
<td>-0.3 (0.0, 0.6)</td>
<td>-0.4 (-0.8, 0.0)</td>
<td>-0.1 (-0.6, -0.5)</td>
<td>-0.3 (-1.1, -0.6)</td>
</tr>
<tr>
<td>Receiving medical care</td>
<td>-0.5 (0.5, -1.1)</td>
<td>-0.7 (-0.9, -0.1)</td>
<td>-1.5 (-3.8, -0.7)</td>
<td>-1.1 (-2.7, -0.5)</td>
</tr>
<tr>
<td>By the police or courts</td>
<td>-0.1 (-0.2, -0.4)</td>
<td>0.1 (+0.4, -0.2)</td>
<td>-1.1 (-2.9, -0.3)</td>
<td>-0.3 (-0.9, -0.4)</td>
</tr>
<tr>
<td>At home</td>
<td>-0.1 (-0.3, -0.2)</td>
<td>0.1 (+0.6, -0.1)</td>
<td>-0.2 (-0.5, -0.4)</td>
<td>0.2 (-0.5, -0.3)</td>
</tr>
</tbody>
</table>

Notes: Differences are adjusted for age, sex, years of education, systolic blood pressure, fasting glucose, smoking status, and physical activity. Higher scores indicate poorer health.
DISENTAGLING LIFE-COURSE SOCIO-ECONOMIC DETERMINANTS OF ADULT INFLAMMATION: A MULTI-COHORT STUDY USING A COUNTERFACTUAL MEDIATION FRAMEWORK Cristian CARMELI* Cristian CARMELI, Johan Steen, Dusan Petrovic, Benoît LEPAGE, Murielle BOCHUD, Peter Vollenweider, Paolo VINEIS, Silvia STRINGHINI, (Institute of Social and Preventive Medicine, Lausanne University Hospital, Lausanne, Switzerland)

Adverse socio-economic conditions in early life have been related to increased levels of inflammation in adulthood, but whether this effect is independent from later in life social circumstances and life style behaviours remains to be established. Understanding those pathways is important for putting appropriate interventions into place. In this study, we aimed to investigate the role of middle life socio-economic circumstances (educational attainment), adulthood socio-economic position, adulthood financial difficulties in meeting basic needs and behavioural risk factors (obesity, current smoking, physical inactivity, high alcohol consumption) in mediating the effect of childhood socio-economic conditions (paternal occupational position) on adulthood low-grade inflammation. We gathered data from two Swiss population-based cohorts (COLAUS and SKIPOGH), for a total of 5,843 participants (mean age 60y, 55% women). Inflammation was measured from circulating blood levels of C reactive protein. Total effects and decomposition in pathway-specific effects were estimated through the natural effect model under a counterfactual mediation framework. To test for life-course structures, we built four trajectories of life-course socio-economic positions (high-high being the reference, stable low, upward and downward). Low father’s socio-economic conditions were associated to higher inflammation in adulthood. Later in life socio-economic experiences alone explained 33% of the effect, following a pathway passing through education. Adding lifestyle behaviours to the mediators explained 50% of the total effect. An accumulation of adverse socio-economic positions revealed to be the most likely life-course model. Financial difficulties explained 10% of the total effect of the accumulation of low socio-economic status over the life-course on inflammation. Biological embedding, other environmental risk factors or residual confounding could explain the latent effect of paternal occupation.

S/P indicates work done while a student/postdoc
ESTIMATES OF PROTECTION FROM NATURAL IMMUNITY AGAINST ENTERIC INFECTIONS AND DIARRHEA IN A LONGITUDINAL BIRTH COHORT


In the wake of the success of the rotavirus vaccine and continued high morbidity of diarrheal diseases in low-resource settings, research and investment in other enteric vaccines is high. However, despite natural immunity being a key pre-requisite for a successful vaccine, the amount, if any, of natural immunity acquired after infection for many enteropathogens is unknown. We used highly sensitive molecular diagnostics for 29 enteropathogens to identify infections and pathogen-attributable diarrhea episodes among 1715 children in the 8-site MAL-ED birth cohort. We used the Anderson-Gill extension of the Cox model to estimate the effects of previous infections on the incidence of subsequent infections and diarrhea for the top 10 causes of diarrhea (Figure 1). We used associations with negative control pathogen outcomes to correct bias due to confounding by unmeasured heterogeneity of exposure. A prior rotavirus infection was associated with 39% lower hazard (95% CI: 25, 50) of subsequent rotavirus diarrhea and 21% lower hazard (95% CI: 8, 32) of subsequent rotavirus infection. There was slightly less protection due to prior infections for norovirus GII and astrovirus. There was strong protection against Cryptosporidium diarrhea (61%, 95% CI: 38, 76), but no protection after infections with the bacterial pathogens, adenovirus 40/41, or sapovirus. The bias analysis suggested that there may be modest natural protection against Shigella diarrhea, but not subsequent infection. We estimated moderate natural immunity to viruses, and little or no protection against bacterial pathogens. These estimates of functional protection reflect natural immunity, heterogeneity of pathogens, and unmeasured heterogeneity of exposure. Because rotavirus showed relatively strong evidence of natural immunity, vaccines against other major causes of diarrhea may be more difficult to develop. Vaccines currently in development, such as for Shigella, likely need to provide heterotypic protection.

*S/P indicates work done while a student/postdoc
Studies of zoonotic disease transmission commonly collect data on a large number of exposures representing many dimensions of animal contact. Such studies frequently include study design and analytic choices, including case-control matching and stepwise regression, whose proper use is more nuanced than is widely understood. We re-analyzed data from a matched case-control study (N=73 pairs) of animal-related risk factors (P=797, p=35 included in stepwise selection) for moderate to severe childhood diarrhea, conducted in rural Kenya from 2009-2011. First, to explore the risk of stepwise model overfitting, we simulated data representing the underlying population in which this study was conducted, then evaluated consistency of variables selected by stepwise models when case-control pairs were chosen at random from this simulated population. Next, we proposed an a priori variable selection approach not subject to this bias. Finally, we proposed latent variable modeling as a complementary approach and performed Item Response Theory modeling on these data, with animal contact as the latent trait. Our simulation showed that variables selected varied considerably across subsamples. Our a priori alternative suggested a positive trend for household's sharing of water sources with livestock or poultry, child's presence for poultry slaughter, and child's habit of playing where poultry sleep or defecate. Our item response theory model found a moderate but non-significant effect of animal contact on risk of diarrheal disease (OR 1.21, 95% CI 0.78, 1.87, unit= 1 standard deviation). For many animal contact measures only a few pairs were discordant, suggesting case-control matching compromised the power of these analyses. Automated methods of model selection are appropriate for prediction models when fit and evaluated on separate samples. However when the goal is inference, these methods can produce misleading results. Furthermore, case-control matching should be done with caution.
COMPARED TO WHOM? REFERENCE POPULATION MATTERS WHEN CALCULATING RELATIVE MEASURES OF STI AND HIV RATES BY SEXUAL RISK CATEGORY

Jeremy Grey*
Jeremy Grey, Elizabeth Torrone, (Centers for Disease Control and Prevention)

In 2016, estimates of the number of gay, bisexual, and other men who have sex with men (MSM) in the United States were published using data from national surveys with information on sexual behavior. Comparable estimates of men who have sex with women only (MSW) have not been published. As a result, estimated rates of HIV and other sexually transmitted infections among MSM — men ≥18 years who had sex with men in the past 5 years — have been compared to populations that included young and/or sexually inactive men, which might bias estimated relative disparities. We calculated national rates of reported HIV and primary and secondary (P&S) syphilis among MSM and among MSW using varying definitions of MSW. These included restrictions by sexual behavior and by age. We limited our analysis to 43 states with sufficient reporting of sex partner information among P&S syphilis cases. In 2016, the rate of P&S syphilis among MSM was 351.1 per 100,000. This rate was 130 times the rate among MSW (2.7 per 100,000) when the denominator was restricted to men who had not had sex with men in the past 5 years; 100 times the rate among MSW (3.5 per 100,000) when restricted to men ≥18 years who had not had sex with men in the past 5 years; and 73 times the rate among MSW (4.8 per 100,000) when restricted to men ≥18 years who only had sex with women in the past 5 years. Similar trends were seen for HIV, with rate ratios comparing MSM to MSW of 289, 221, and 160. Although rate ratios remained high regardless of definition, analyses that compared MSM to other men using broad criteria seemed to overestimate disparity measures. Therefore, ensuring congruent denominators when calculating relative disparities in HIV and P&S syphilis rates is essential.
SUSTAINED VIROLOGIC RESPONSE AS A SURROGATE MARKER FOR HEPATOCellular CARCINOMA AFTER TREATMENT OF HEPATITIS C VIRUS INFECTION Rohit P. Ojha* Rohit P. Ojha, Tzu-Chun Chu, Brooke R. MacDonald, (JPS Health Network/UNT Health Science Center School of Public Health)

Background: Sustained virologic response (SVR), defined as undetectable hepatitis C virus (HCV) RNA 12-weeks post-treatment completion, is a ubiquitous surrogate marker for adverse long-term outcomes such as hepatocellular carcinoma (HCC) in randomized controlled trials and observational studies of recently developed direct-acting antiviral regimens for HCV. Nevertheless, the validity of SVR as a surrogate marker has not been adequately assessed. We aimed to assess the validity of SVR as a marker for hepatocellular carcinoma among people with HCV. Methods: We systematically reviewed published literature between May 1, 2011 and June 1, 2018 to identify studies that assessed the association between SVR and HCC after treatment with direct-acting antivirals. We abstracted information about HCC incidence rate by SVR status from each study to estimate the HCC incidence proportions at 5- and 10-years of follow-up using the exponential formula. Incidence proportions were applied to each study population to construct 2 x 2 tables for estimating sensitivity and specificity, where no SVR was the index category to facilitate interpretation. We used hierarchical logistic regression to estimate meta-analytic summary sensitivity and specificity of no SVR as a marker for HCC at 5- and 10-years across studies. Results: We identified 4 studies that reported sufficient data for analysis, which comprised 61,475 individuals treated with direct-acting antivirals for HCV. The 5-year summary sensitivity and specificity of no SVR as a marker for HCC were 32% (95% confidence limits [CL]: 28%, 35%) and 93% (95% CL: 90%, 96%). The 10-year summary sensitivity and specificity of no SVR as a marker for HCC were 29% (95% CL: 25%, 33%) and 95% (95% CL: 92%, 97%). Conclusions: Our results suggest that SVR has high specificity as a marker for 5- and 10-year HCC, but a substantial proportion of HCC cases have SVR. Our findings may inform recent controversy about the value of SVR as a surrogate marker.
SPATIOTEMPORAL DISTRIBUTION OF DENGUE, CHIKUNGUNYA AND ZIKA CASES ACROSS DIFFERENT ETHNIC GROUPS IN BRAZIL AND COLOMBIA

Mabel Carabali*, Mabel Carabali, Antonio Lima Neto, Mathieu Maheu-Giroux, Andrea Caprara, Jay S. Kaufman, (McGill University, Canada)

Although the overall notification of dengue, chikungunya and zika cases across different ethnic groups does not seem to be substantially different, a disproportionate number of fatal dengue cases and a differential rate of zika cases and congenital zika syndrome have been reported among non-whites in Brazil and Colombia. Our objective is to assess the overall and disease-specific distribution across different ethnic groups; to do so we propose the assessment of the disease and mortality burden of notified cases, across and within ethnic groups, using a dynamic cohort design. The data comprised publicly available individual-level sociodemographic and clinical information on all notified cases from 2008-2017 in Cali, Colombia (n=90,259) and Fortaleza, Brazil (n= 395,620). Using Bayesian multilevel mixed-effects analysis, we fitted separate models for each city, including random spatially-structured effects for neighborhood and time, and accounting for time-varying covariates. To obtain ethnic-specific estimates and the respective absolute measure of disparity, ethnicity-specific models were used to estimate marginal Incidence Rates (IR) and Incidence Rate Ratios (IRR) with 95% credible intervals (95% Cr.Int) by site, where the absolute disparity measure is the IR-Difference. The Bayesian analysis was implemented using Integrated Nested Laplace Approximations (INLA). Preliminary analysis for chikungunya, adjusting only for the spatial autocorrelations and socioeconomic covariates show an IRR= 1.07 (95% Cr.Int = 1.06, 1.08) for non-whites compared to whites. The Human Development Index showed an IRR= 0.75 (95% Cr.Int = 0.66, 0.86). Marginal IRDs and excess risk per neighborhood are plotted on maps for each disease. To correct for the possible bias due to underreporting in the surveillance data, we adjusted the estimates using a range of possible rates of underreporting as a sensitivity analysis.
Background: Methicillin-resistant Staphylococcus aureus (MRSA), causes significant problems in intensive care units (ICUs). We explore how population structure impacts mathematical models used to study MRSA within an ICU. Methods: We used a stochastic compartmental model to represent an 18-bed ICU in an acute care hospital. We considered three population structures: a random mixing model, a random mixing model with separate classes for nurses and physicians, and a highly structured model that assigned patients to a specific nurse, creating a strict meta-population structure. We further explored the meta-population by introducing an additional parameter, gamma, which determined the proportion of contact a nurse had with patients directly assigned to them, allowing a hybrid of the previous models. The outcome of each stochastic simulation was the number of MRSA acquisitions in a single year. Model sensitivity was analyzed for each model and across the parameter space of gamma. Results: The meta-population model had the fewest MRSA acquisitions and variability. Parameter sensitivity was consistent among all models in directionality, but not magnitude, the smallest changes being in the meta-population model. The relationship between gamma and MRSA acquisitions was non-linear, with values of gamma below 0.40 (95% CI: 0.37, 0.42) largely resembling the random mixing model, and values above rapidly approaching the stricter model. Discussion: A meta-population model with some allowance for nurse-patient interactions outside strict assignments represents a more realistic representation of an ICU setting. A specific hospital’s value of gamma may determine whether a random mixing model or a stricter meta-population model are acceptable approximations. The use of an incorrect population structure may dramatically impact the estimated efficacy of simulated interventions.
Using Human Genetics to Identify a Novel Biomarker for Idiopathic Pulmonary Fibrosis. Agustin Cerani* Agustin Cerani, Stephanie Ross, Deborah Assayag, David A. Schwartz, Mark Lathrop, Paul Wolters, J. Brent Richards, (McGill University)

Introduction: Idiopathic pulmonary fibrosis (IPF) is a lethal disease with limited effective treatments. There is, therefore, an urgent need to find and validate biomarkers for diagnosis, prognosis, as to serve as potential drug targets. We undertook combined genetic epidemiology and metabolomics studies to identify a metabolic biomarker for idiopathic pulmonary fibrosis. Methods and Results: To identify potential metabolites associated with idiopathic pulmonary fibrosis, we combined GWAS for IPF and blood metabolites and identified a shared genetic determinant at isovaleryl dehydrogenase (IVD). The product of this gene is an enzyme whose inhibition is known to increase its substrate, the metabolite isovaleryl carnitine (IVC). Through two-sample Mendelian randomization (MR), we observed that genetically decreased IVC levels were strongly associated with increased risk of IPF (p < 9.8 x 10^-4). We confirmed this result by using another blood metabolomics GWAS in a second MR study (p < 5.5 x 10^-7). We next found that the non-coding alleles from the two metabolite GWAS that were associated to decreased IVC blood levels increased IVD expression (p< 2.10 x 10^-20). We therefore tested whether low IVC levels were associated with IPF risk in a study of 382 cases and 217 control. We found that decreased IVC blood concentration was associated with a 26% increase in IPF risk (OR: 1.26 per 50 nM decrease, equivalent to an IQR drop in IVC; 95% CI: 1.00 -1.60, p =0.048). Conclusions: IPF presents important unmet clinical needs. Building on strong complementary evidence from genetics and metabolomics data, we found that low IVC levels were associated with higher risk of IPF. IVC represents a clinically relevant biomarker and its enzyme, IVD, could represent an entirely novel IPF drug target.
ESTIMATING THE EFFECTS OF EDUCATION OF LATE-LIFE COGNITION: A META-ANALYSIS OF INSTRUMENTAL VARIABLES STUDIES BASED ON COMPULSORY SCHOOLING LAWS Audra Gold* Audra Gold, Audrey Murchland, Willa Brenowitz, M. Maria Glymour, (University of California, San Francisco)

Background: Compulsory schooling laws (CSLs) are commonly used as instrumental variables (IVs) to estimate the causal effect of schooling on later-life health, which avoids confounding by eliminating individual characteristics. A recent systematic review, Hamad et al. (2018), identified 89 articles evaluating the health effects of education using CSL based IVs. IV analyses sacrifice statistical power for reduced confounding bias, so meta-analyses of these results are essential. We conducted a meta-analysis of studies using CSLs to estimate the effects of years of schooling on late-life cognition. Methods: From the articles identified by Hamad’s systematic review, we restricted our analysis to 6 studies evaluating the effects education on cognitive domains (12 effect estimates for global cognition, memory, or executive function based on 117,988 cognitive assessments). We extracted and normalized coefficient estimates to conduct a random-effects meta-analysis, combining IV-based estimates of the effect of an additional year of schooling on late life cognition, using a robust variance estimation to account for multiple effect estimates in the same studies. We evaluated whether effect estimates differed by outcome domain or gender. Results: The studies were from the U.S., Europe, and China. The meta-analyzed effect estimate for each additional year of schooling on cognition (pooling all domains) was 0.21 (95% CI: 0.13, 0.28) (Figure). There was substantial between-study heterogeneity (I²=72%). Effects for memory (0.28; 95% CI: 0.18, .38) were larger than for executive function (0.09, 95% CI: 0.01, 0.16). We found no evidence of differences by gender or when using a fixed effects meta-analysis model. Conclusion: Although individual IV study estimates are often imprecise, our meta-analysis of results from CSL studies indicates a substantial effect of additional educational attainment on subsequent cognitive outcomes.
ELEVATED DEPRESSIVE SYMPTOMS AND THE RISK OF STROKE AMONG THE MEXICAN OLDER POPULATION Erika Meza*, Erika Meza, Jacqueline M. Torres, (University of California, San Francisco)

Previous studies suggest that depression contributes to an increased risk of stroke morbidity and mortality in older adults. However, no studies have looked at the association between elevated depressive symptoms and stroke in low and middle-income countries (LMICs) which are experiencing rapid aging, a growing burden of chronic disease morbidity, and limited infrastructure for addressing population mental health. We studied the effect of elevated depressive symptoms on the incidence of stroke using data from the Mexican Health and Aging Study (MHAS), a national longitudinal study of adults ≥ 50 years at baseline (2001). 7,363 age-eligible direct respondents without stroke at baseline were included in the analytic sample with follow-up waves in 2003, 2012 and 2015. Baseline elevated depressive symptoms were measured using a 9-Item modified Centers for Epidemiologic Studies – Depression scale (cutoff score >5) and stroke was measured by self-report or next-of-kin interview. We used Cox proportional hazards models to estimate adjusted hazard ratios (HRs). Covariates included socio-demographic characteristics (e.g. age, gender, economic status) and select co-morbid health conditions. After an average follow-up time of 10.67 (SD: 1.57) years, 273 strokes were reported. The hazard ratio for stroke incidence in respondents with elevated depressive symptoms at baseline was 2.16 (95% CI: 1.41 - 3.31) relative to those with score ≤ 5. The hazard rate remained significant after adjusting for covariates including sex, age and education (HR: 1.85; 95% CI: 1.20-2.85). In further research, we will account for competing risks of mortality and loss-to-follow up and examine associations by gender. Our results extend prior research from high-income countries, suggesting that strategies to reduce depressive symptoms may also affect stroke incidence in a middle-income country setting experiencing rapid aging. Findings should be replicated in other LMICs.
LIFE COURSE SOCIAL DISADVANTAGE AND THE AGING IMMUNE SYSTEM: FINDINGS FROM THE HEALTH AND RETIREMENT STUDY
Grace A Noppert* Grace A Noppert, Rebecca Stebbins, Jennifer Dowd, Allison Aiello, (University of North Carolina at Chapel Hill)

Background: Life course immune dysfunction and infection history play an important role in age-related health declines and act as a potential mediator of health disparities. Previous research has documented a consistent association between current socioeconomic status (SES) and cytomegalovirus (CMV) in younger adult populations, but little is known about the relationship between life course SES and CMV in older populations.

Methods: Using a nationally representative sample of 4,264 aging adults from the Health and Retirement Study (HRS) 2016 Venous Blood Sample along with demographic and social data from previous waves, we investigated the association between life course SES and CMV among older adults. Logistic regression models were used to examine the association between CMV Immunoglobin G (IgG) antibodies and both adult SES (educational attainment and household income to poverty ratio) and childhood SES (a latent variable based on childhood conditions), adjusting for age, sex, race/ethnicity, marital status, and smoking status.

Results: Using educational attainment as a marker of adult SES, we found that those with less than a high school education had 3.47 times the odds of being in the highest tertile of CMV response compared with those with a college education or above. Those in the 1st and 2nd tertile of CMV response also showed similar associations, though smaller. We also found a statistically significant association between our childhood SES measure and CMV response in adulthood. Individuals who experienced more disadvantage in childhood had 1.56 times the odds of being in the highest tertile of CMV response compared to those coming from less disadvantaged backgrounds. Notably, this association was only slightly attenuated when controlling for adult SES.

Conclusion: Our results suggest that both adult and childhood SES influence aging of the immune system. Future research on the accumulation of disadvantage over the life course on immunity is warranted.
HERPES SIMPLEX VIRUS AND ALZHEIMER’S DISEASE: A MENDELIAN RANDOMIZATION STUDY Kwok Man Ki* Kwok Man Ki, C Mary Schooling, (The University of Hong Kong)

Background: Herpes simplex virus (HSV) infection has been implicated in late-onset Alzheimer’s disease (AD) because HSV can cross the blood-brain barrier and induce neuronal damage via recurrent reactivation. Observationally, some but not all studies have found HSV infection associated with cognitive decline or late-onset AD, but are subject to confounding and selection bias. Currently, two Phase II trials of anti-HSV drugs are in progress; no definitive evidence of causality on HSV infection in late-onset AD pathogenesis is available. To address this gap, we assessed if HSV infection was a genetically valid target for late-onset AD using separate-sample Mendelian randomization (MR). Methods: We obtained single nucleotide polymorphisms (SNPs) strongly (P-value<5*10-6) and independently (r²<0.05) associated with HSV infection from the UK Biobank, the US 23&Me Study and the French Milieu Interieur cohort (total n=450,581). We applied these SNPs to the largest, extensively genotyped meta-analysis of cognitive function (n=300,486), and late-onset AD (total n=455,258 with n=79,145 cases, 47,793 proxy cases, and 328,320 controls) study. We combined SNP-specific Wald estimates using inverse variance weighting. Sensitivity analyses included MR-Egger, weighted median, and MR-PRESSO to address potential pleiotropy. Results: Genetically predicted log odds of HSV infection was not associated with cognitive function (mean difference 0.0004 per HSV infection, 95% confidence interval (CI) -0.001 to 0.001), or late-onset AD (odds ratio (OR) 0.999, 95% CI 0.998-1.001) with directionally consistent results from MR-Egger and weighted median. Estimates using SNPs from the UK Biobank, the 23&Me Study, or the Milieu Interieur cohort separately showed similar findings. Conclusions: HSV infection does not appear to be a genetically valid target of intervention in late-onset AD, suggesting a rethink of the relevance of HSV and the need to identify alternative mechanisms of and interventions for late-onset AD.
Recent studies have found lower risks of mortality in caregivers than non-caregivers, but studies of the impact of caregiving on functional decline have mixed results. This may be due to not accounting for the level of caregiving intensity or changes in caregiving status. We examined this association among 769 older women (baseline mean age 81 years) participating in the Caregiver-Study of Osteoporotic Fractures who reported 0 or 1 limitation in instrumental or basic activities of daily living (I/ADLs) at baseline and had up to 4 follow-up interviews over 9 years (1999-2009). We hypothesized that high-intensity caregivers (n=128) would have a reduced risk of functional decline and low-intensity caregivers (n=172) would have a similar risk compared to non-caregivers (n=469). High-intensity caregivers were women who helped a relative or friend with any of 4 specific I/ADLs: dressing, transferring, bathing, toileting; low-intensity caregivers assisted with other I/ADLs (e.g., shopping, finances); non-caregivers helped with zero I/ADLs. Incident functional decline (reporting 2+ I/ADL limitations at > 1 follow-up interview) was assessed through 2009. Cox proportional hazards models using age-based risk sets were used to estimate adjusted hazard ratios (aHR) and 95% confidence intervals (CI), controlling for baseline (age, race, education) and time-varying (marital status, perceived stress, comorbidities) covariates. Compared to non-caregivers, high-intensity caregivers had lower hazard of functional decline (aHR = 0.75, 0.52-1.08) as did low-intensity caregivers (aHR= 0.73, 95% CI 0.54-0.98). Accounting for competing risk of mortality did not alter associations, nor did defining caregivers based on other combinations of I/ADLs. Overall, older women caregivers, regardless of intensity, had a lower hazard of functional decline. Results support a pattern often described as the Healthy Caregiver Effect. Whether associations extend to other populations merits investigation.
Recent stressful life events, lifetime trauma, and cognitive decline in the Health and Retirement Study

Rebecca C. Stebbins* Rebecca C. Stebbins, Allison E. Aiello, Y. Claire Yang, Grace A. Noppert, (UNC - Chapel Hill)

Research has suggested that exposure to psychosocial stress may influence cognition in adulthood. However, few studies have examined the influence of exposure to stressors across the life course on the rate of cognitive decline and dementia in later life. Using data from 9,550 participants 50+ years old in the Health and Retirement Study, we investigated variation in cognitive decline trajectories by the number of recent stressful events experienced in the past 5 years and traumatic events experienced over the life course over a 10 years period. Separate linear mixed effects models accounting for repeated outcome measurements were used to examine the association between pre-baseline stressors, measured as total lifetime traumatic events and total recent stressful events, and TICS scores. We found that experiencing 1 or 2+ recent stressful events in the past 5 years was not associated with accelerated cognitive decline compared to experiencing no recent stressful events, adjusting for age, sex, race, and education (p-values 0.35 and 0.09, respectively). While not statistically significant, the recent stressful event and cognitive decline association was in the hypothesized direction, with those experiencing more stressful events having faster rates of cognitive decline. Furthermore, experiencing more traumatic events was not statistically significantly associated with rate of cognitive decline (p-value 0.07). These findings do not support a strong impact of stressors experienced across the lifecourse on cognitive health. However, further study is warranted to investigate whether sensitive periods or trajectories of exposure may provide useful evidence for this relationship.

S/P indicates work done while a student/postdoc
AMYLOID BURDEN AS A PREDICTOR OF FUTURE DECLINE IN MEMORY AND EXECUTIVE FUNCTION MEASURES Sarah Ackley* Sarah Ackley, Teresa Filshtein, Charles DeCarli, Evan Fletcher, Baljeet Singh, Rachel Whitmer, M. Maria Glymour, (UCSF)

Background: Although Amyloid β (Aβ) is thought to initiate a cascade of pathology culminating in Alzheimer’s related cognitive decline, it accumulates in brain tissues one to two decades prior to measurable cognitive decline. Clinical use of expensive amyloid imaging is premised on the assumption of improved predictive value of such data. The value of Aβ measures in predicting future cognition is uncertain, however, in settings where repeated past cognitive measures are available. Methods: We used data on 156 cognitively normal participants from the UC Davis Alzheimer’s Disease Center cohort who contributed an average of 5.6 memory and executive function assessments over 9.6 years (standard deviation=8.0) of follow-up and underwent PET imaging to assess amyloid uptake (SUVR) on average 7.8 years after earliest cognitive assessment. We assessed whether SUVR improved predictions of subsequent cognitive measures compared to models based on memory and executive function measures prior to PET and basic covariates. We chose the models that minimized the total mean squared error of the predictions for held-out individuals using a 10-fold crossvalidation procedure with a penalized time-series regression model. We then evaluated whether the addition of SUVR to these models improved post-PET cognitive predictions. Results: The base model for memory explained 60% of the variance in future memory scores and adding SUVR to the model did not improve predictions of future memory over this base model (p=0.32). The base model for executive function explained 75% of the variance and adding SUVR improved predictions of executive function (p=0.002), with a 4.7% (95% CI: 0.8%-11.6%) reduction in the mean-squared error in predictions. Conclusion: In this cohort, the addition of SUVR slightly improved predictions of executive function measures but not memory, compared to models based only on longitudinal cognitive assessments and demographics.
AN ENVIRONMENT-WIDE STUDY OF ADULT COGNITIVE PERFORMANCE IN THE 23ANDME COHORT
Stella Aslibekyan* Stella Aslibekyan, Yunru Huang, Robert Gentleman, 23andMe Research Team, (23andMe)

BACKGROUND: With the emergence of web-based data collection methods, large digital health cohorts offer the opportunity to conduct behavioral and epidemiologic research at an unprecedented scale. The size and breadth of such data sets enable discovery of novel associations across the phenotypic spectrum. METHODS: To comprehensively characterize the role of environmental factors in cognitive performance, we deployed the validated digital symbol substitution test (DSST) online to 23andMe research participants who provided informed consent (n=150,904, 50-85 years of age). We tested cross-sectional associations between DSST performance and 680 independent phenotypes using linear regression models adjusted for age, sex, time of cohort entry, and ancestry. Effects were expressed per standard deviation of exposure to facilitate comparisons across phenotypes. RESULTS: 380 phenotypes were significantly associated with DSST performance after adjustment for multiple testing (false discovery rate of 0.05). The significantly associated phenotypes largely clustered into the following categories: psychiatric traits (e.g. bipolar disorder with mania, β per 1 SD = -2.13, P-value=2 x 10^-19), education (e.g. highest math class completed, β per 1 SD = 2.07, P-value<1 x 10^-300), leisure activities (e.g. playing a musical instrument, β per 1 SD = 1.73, P-value<1 x 10^-300), social determinants (e.g. household income, β per 1 SD = 1.20, P-value= 9 x 10^-277, and lifestyle (e.g. years smoked, β per 1 SD = 0.95, P-value= 1 x 10^-85). CONCLUSIONS: We have conducted the largest study of cognitive performance to date, strengthening the existing body of evidence in support of correlations with many known social, lifestyle, and clinical exposures. Upon successful validation and further causal modeling, these insights may inform future interventions and risk stratification efforts. Our study illustrates the potential of large-scale digital cohorts to contribute to epidemiologic discovery.
ASSOCIATION OF SLEEP-DISORDERED BREATHING WITH TOTAL HEALTHCARE COSTS AND UTILIZATION IN OLDER MEN: THE OUTCOMES OF SLEEP DISORDERS IN OLDER MEN (MROS SLEEP) STUDY Tien Vo* Tien Vo, Allyson Kats, Lisa Langsetmo, Brent Taylor, John Schousboe, Susan Redline, Ken Kunisaki, Katie Stone, Kris Ensrud, (Division of Epidemiology & Community Health, School of Public Health, University of Minnesota, Minneapolis, MN)

Study objectives: To determine the associations of sleep-disordered breathing (SDB) with subsequent healthcare costs and utilization including inpatient and post-acute care facility stays among community-dwelling older men.

Methods: Participants were 1316 men (mean age 76.1 years) in the Outcomes of Sleep Disorders in Older Men (MrOS sleep) study who were enrolled in a Medicare Fee-For-Service plan. Primary SDB measures including apnea-hypopnea index (AHI) and oxygen desaturation index (ODI) were collected using in-home level 2 polysomnography. Incident healthcare costs and utilization were determined from claims data in the subsequent 3-year period. Results: 529 (40.2%) men had ≥1 hospitalization in the 3-year period. Compared to those without sleep apnea (AHI <5), men with moderate to severe sleep apnea (AHI ≥15) had a higher odds of all-cause hospitalization (odds ratio [OR] adjusted for age and site 1.43, 95% confidence interval [CI] 1.07-1.90). This association was slightly attenuated after further adjustment for traditional prognostic factors including education, body mass index, comorbid medical conditions, and health status (OR=1.36; 95% CI 1.01-1.83). Similar associations were observed for ODI. However, measures of SDB were not related to subsequent healthcare costs (total or outpatient) or odds of post-acute skilled nursing facility stay. Conclusions: Older men with SDB have an increased risk of hospitalization, not entirely explained by the greater prevalence of comorbid conditions, but not higher subsequent total healthcare costs. These findings indicate a need to evaluate the impact of SDB treatment on subsequent healthcare utilization. Keywords: sleep-disordered breathing, sleep apnea, Medicare, hospitalization, healthcare costs and utilizations, older men

S/P indicates work done while a student/postdoc
PARTICIPATION IN SPECIFIC LEISURE-TIME ACTIVITIES AND RISK FOR ALL-CAUSE MORTALITY IN ADULTS Anna K. Porter* Anna K. Porter, Kelly Evenson, (The University of Southern Mississippi)

Purpose: Evidence of the benefits of participation in specific leisure-time activities is limited. We examined the association between self-reported participation in the most reported leisure-time activities and risk for all-cause mortality in a nationally-representative sample of adults. Methods: Data are from 1999-2006 United States’ National Health and Nutrition Examination Survey and included adults aged 20 and above. Participants were asked to report what specific leisure-time activities they performed at a moderate to vigorous intensity for at least 10 minutes over the past 30 days. Leisure-time activities examined included walking, bicycling, and running (including jogging and treadmill), operationalized as any vs. no participation. Participants were linked with death certificate records from the National Death Index; follow-up data was through December 31, 2011. For each of the activities, hazard ratios with 95% confidence intervals (CI) for all-cause mortality was estimated using weighted Cox proportional hazard models, adjusted for baseline covariates. Results: Of 18,220 participants (N=193,084,340), 2,902 died during a mean 8.2 years of follow-up. Mean age at the time of the survey was 46.5 (20-85 years), 51% of participants were female, and 72% white. Walking was reported by 39.9% of participants, bicycling by 12.6%, and running by 18.1%. As compared to no reported walking, walking was significantly associated with a 0.59 times lower risk for all-cause mortality (95% CI 0.53, 0.66). As compared to no reported bicycling, bicycling was significantly associated with a 0.67 times lower risk of all-cause mortality (95% CI 0.51, 0.90). As compared to no reported running, running was significantly associated with a 0.57 times lower risk of all-cause mortality (95% CI 0.45, 0.74). Conclusions: Participating in moderate to vigorous level walking, bicycling, or running was associated with reduced risk of mortality even after controlling for all other physical activity.
CHILDHOOD SENSATION-SEEKING AND PROBLEM GAMBLING IN YOUNG ADULTHOOD
Natalie S Levy* Natalie S Levy, Cristiane Duarte, Luis Segura, Julián Santaella-Tenorio, Mayumi Okuda, Melanie Wall, Chen Chen, Maria Ramos-Olazagasti, Glorisa Canino, Hector Bird, Silvia S Martins, (Columbia University Mailman School of Public Health)

Background. Gambling and problem gambling are prevalent among minority youth, though rates vary by sex. Identifying early-life predictors of youth gambling is needed to design interventions. We aim to evaluate childhood sensation seeking as a predictor of gambling and problem gambling in Puerto Rican young adults and differences by sex. Methods. Data were from the Boricua Youth Study (BYS) Gambling cohort - 731 young adults ages 18-29 years who completed the original BYS in Puerto Rico and New York City and consented to re-interview about gambling behavior in 2014-18. Childhood sensation seeking was assessed at 3 waves using an adapted Sensation Seeking Scale for Children. Age-adjusted sensation seeking trajectories (low, normative, accelerated and high) were generated using growth mixture models. Any past-year and problem gambling were assessed using the Canadian Adolescent Gambling Inventory. After descriptive analyses, overall and sex-stratified effects of childhood sensation seeking trajectory on gambling outcomes were estimated using multinomial logistic regression adjusted for age, sex and site. Results. 47% of participants reported past-year gambling (male-54%, female-40%) and 9% reported problem gambling (male-12%, female-6%). In the low sensation seeking class 62% were female whereas males were the majority (59-74%) in other classes. Respondents in the high sensation seeking class had lower adjusted odds of gambling (OR: 0.36 95% CI: 0.14, 0.93) compared with those in the normative class; this relationship was observed among males but not females. No significant associations between sensation seeking class and problem gambling were observed overall or by sex. Conclusion. Childhood sensation seeking trajectories did not increase the risk of gambling or problem gambling in Puerto Rican young adults but patterns varied by sex. Alternative hypotheses for elevated prevalence of problem gambling in this population should be explored (e.g. antisocial trajectories).
OBJECTIVELY MEASURED PHYSICAL ACTIVITY AND HEALTH-RELATED QUALITY OF LIFE AS PREDICTORS OF MORTALITY IN U.S. ADULTS

Peter Hart* Peter Hart, , (Montana State University - Northern)

Background: Few national-level studies have examined the effects of both physical activity (PA) and health-related quality of life (HRQOL) on mortality in adults. The purpose of this study was to examine the ability of PA and HRQOL to predict all-cause mortality in U.S. adults. Methods: Data for this research came from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) and its 2011 mortality-linked National Death Index (NDI) file. Moderate-to-vigorous PA (MVPA, min/day) was objectively determined by accelerometry and participants were categorized into low or high groups using the median. HRQOL was assessed by a single question asking participants to rate their general health. Participants rating their health as “good”, “very good”, or “excellent” were considered to have good HRQOL whereas those rating it “fair” or “poor” were considered to have poor HRQOL. Cox proportional hazard regression was used to determine the independent effects of MVPA and HRQOL on all-cause mortality while controlling for covariates. Results: In the fully adjusted females model, participants were at greater risk of mortality if they engaged in low amounts of MVPA (Hazard Ratio (HR)=2.82, 95% CI: 1.02-7.85) and had poor HRQOL (HR=7.19, 95% CI: 2.30-22.51) with no significant (p=.133) MVPA-by-HRQOL interaction. Conversely, the equivalent males model saw a significant (p=.002) MVPA-by-HRQOL interaction, resulting in an analysis of simple effects. In the fully adjusted males with good HRQOL model, participants were at greater risk of mortality if they engaged in low amounts of MVPA (HR=2.92, 95% CI: 1.56-5.49). However, in the males with poor HRQOL model, MVPA could not significantly predict mortality (HR=1.04, 95% CI: 0.49-2.24). Conclusion: Results from this study indicate that MVPA and HRQOL independently predict all-cause mortality in U.S. female adults. In U.S. male adults, MVPA predicts all-cause mortality only in those with good HRQOL.
HYPOTHETICAL INTERVENTIONS ON PHYSICAL INACTIVITY AND TV VIEWING IN RELATION TO ALL-CAUSE MORTALITY: AN APPLICATION OF THE PARAMETRIC G-FORMULA

Yi Yang, Brigid Lynch, Allison Hodge, Pierre-Antoine Dugue, Elizabeth Williamson, Paul Gardiner, Elizabeth Barr, David Dunstan, Neville Owen, Dallas English, (The University of Melbourne; Cancer Council Victoria, Australia)

Long-term effects of physical inactivity and sedentary behaviours such as TV viewing on mortality have been inferred from observational studies, in the absence of feasible randomised trials. These studies typically used a single exposure time point and adjusted for confounding using conventional regression approaches. The associations observed do not reflect the potential effects of population interventions, and could be subject to bias due to inappropriate adjustment of time-varying confounding. Using data from the Australian Diabetes, Obesity and Lifestyle Study, where data were collected at three time points, we applied the parametric g-formula to estimate cumulative risks of death under various hypothetical interventions on physical inactivity and/or TV viewing, while adjusting for time-varying confounding. We compared these risks to the risk under no intervention, and to the risk under a hypothetical ‘worst-case’ scenario where everyone had weekly physical activity of 300 minutes (RR=0.83, 0.73 to 0.94, compared with the risk under no intervention; RR=0.66, 0.46 to 0.86, compared with the worst-case scenario). Reducing daily TV viewing to <2 hours in addition to physical activity interventions did not show added survival benefits. Reducing TV viewing alone was the least effective intervention (RR=1.06, 0.93 to 1.20, compared to no intervention; RR=0.85, 0.60 to 1.10, compared to the worst-case scenario). Our results suggested that, in this cohort of Australian adults, the risk of death could have been lowered by sustained interventions that increased physical activity. Interventions that reduced TV viewing would not have lowered all-cause mortality.
This article traces the emergence of lean principles in genomics research and connects this new way of doing science with many of the current pitfalls of precision medicine in its attempts at improving population health outcomes. Precision medicine has a history of public funding, yet the benefits in clinical settings are very slowly being realized due to a variety of factors, such as uncertainty regarding relevant treatments after identifying disease risk, lack of cost-effectiveness studies for general population-level interventions, and letting a culture of "over promise and under deliver" permeate some areas of genomics research. The article concludes with insights into the challenges and opportunities that will need careful consideration and consultation with the wider society in order to decide whether to turn off the "tap" for investment of public funds in research on genomics and other "omics." Ultimately, this article argues for a moderate course correction in how public funds are invested to truly improve the health of all of us, and not just some of us.
DIFFERENCES IN LONGITUDINAL DISEASE ACTIVITY MEASURES BETWEEN RESEARCH COHORT AND NON-COHORT PARTICIPANTS WITH RHEUMATOID ARTHRITIS USING ELECTRONIC HEALTH RECORD DATA


Research using electronic health records (EHR) may offer advantages over traditional observational studies, including lower costs and greater generalizability to a broader patient population. However, little research is available that directly evaluates the potential benefits and weaknesses of each study design within a single population. We examined differences in baseline demographics and disease outcomes, as well as longitudinal predictors of disease activity, between RA patients enrolled in a cohort study with more standardized data collection and patients whose data comes purely from the EHR within the same health system. A total of 377 individuals diagnosed with RA and >2 clinic visits within 12 months between 2013-2017 from the EHR of a public hospital were included. Approximately half were also enrolled in an RA cohort study. No significant baseline differences between cohort (n=187) and non-cohort (n=190) participants were found with respect to sex, age, race/ethnicity, smoking status, or disease activity measures. Variables with a higher prevalence of missing data in non-cohort individuals compared to cohort individuals included language, BMI, smoking status, and certain disease activity measures. Mixed effects models demonstrated that black, non-Hispanic race/ethnicity was associated with a higher CDAI score over the study period compared to white, non-Hispanic individuals in non-cohort participants, while no association was found in cohort participants (p-interaction = 0.07). Non-cohort participants from the EHR were comparable to a research cohort drawn from the same health system across some variables, but demonstrated more severe disease trajectories in racial/ethnic minorities. While challenges remain given the prevalence of missing data for specific variables in the EHR, utilizing EHR data repositories may inform our understanding of disease trajectories for RA patients who are not adequately captured in research cohorts.

S/P indicates work done while a student/postdoc
Ovarian germ cell tumors are the primary ovarian malignancy affecting girls and young women. Comparisons of international incidence of ovarian germ cell tumors have not been evaluated in the literature and their etiology is not well described. While trends have reportedly been stable, there have been some reports of increasing incidence in 10-19-year-olds. International incidence comparisons could inform etiologic hypotheses. The aim of this analysis was to evaluate geographic variation in ovarian germ cell tumor incidence and trends. Rates of ovarian germ cell tumor incidence were extracted from the Cancer Incidence in 5 Continents (CI5) from 1988-2012. Rates of cancers in women and girls were calculated for ages 0-9, 10-19, and 20-39 and standardized to the 2015 world population. To overcome small numbers in individual registries, numerators and denominators were aggregated within regions corresponding to the United Nations Statistics Division (UNSD) geoscheme. Incidence rates were compared in subregions and average annual percent change (AAPC) was estimated using Poisson regression. Robust standard errors were used to calculate 95% Wald confidence intervals. Overall, the largest incidence was observed in 10-19-year-olds. Eastern Asia saw the greatest incidence in the 0-9 and 10-19 age categories, whereas the greatest incidence was observed in Central America for the 20-39 age category. Significant increases in incidence were seen in Eastern Asia, Oceania, Western Europe, Southern Europe, and North America for one or more age groups. The only statistically significant decrease in incidence was seen among the 20-39 age category in Southern Asia. Evaluating 25 years of ovarian germ cell tumor incidence, the highest incidence rates and largest increases in incidence were seen in Eastern Asia. Future studies should focus on etiologic features that may account for geographic variation and increases in incidence of ovarian germ cell tumors.
HEIGHT AND SEX DIFFERENCES IN CANCER RISK: RESULTS FROM THE HEALTH PROFESSIONALS FOLLOW-UP STUDY AND NURSES’ HEALTH STUDY  Benjamin Fu*, Benjamin Fu, Mingyang Song, Edward Giovannucci, Lorelei Mucci, (Harvard T.H. Chan School of Public Health)

Background: Incidence rates for most cancers are higher in men than in women, even after controlling for risk factors such as smoking and alcohol use. Sex differences in height, which is positively associated with risk of many cancers, may explain some of the discrepancy under the hypothesis that taller height is a proxy for overall number of stem cells as well as hormonal exposures. Methods: We examined associations between sex and incidence of cancer overall for those cancers shared by men and women (all sites excluding reproductive organs and breast), as well as specific cancers, using two prospective cohort studies: the Health Professionals Follow-up Study (n=51,418 men; 1986-2012) and the Nurses’ Health Study (n=117,063 women; 1980-2012). We calculated multivariable-adjusted hazard ratios (HRs) and 95% confidence intervals (CIs) using Cox proportional hazards models of the association between sex and cancer risk. To assess the effect of height on these associations, models were additionally adjusted for reported height at baseline. Results: Men had a higher risk of cancer at shared sites than women (HR=1.23, 95% CI: 1.18-1.29). This association was attenuated after adjusting for height (HR=1.08, 95% CI: 1.02-1.15). Incidence also differed at several specific sites: compared to women, men had higher risk of melanoma, non-Hodgkin lymphoma, and cancers of the pancreas, kidney, and bladder, and lower risk of lung and thyroid cancers. As with shared sites, hazard ratios for most specific sites were reduced after adjusting for height. Results from a mediation analysis of height are forthcoming and will be presented. Conclusions: Height attenuated associations between sex and cancer incidence, and may be an important factor in understanding differences in cancer risk between men and women. Higher risk of lung cancer in women may be due in part to differences in the underlying smoking distribution between the two studies.
A COMPARISON OF RISK FACTORS FOR METASTASIS AT DIAGNOSIS IN HUMANS AND DOGS WITH OSTEOSARCOMA  Brandon Diessner* Brandon Diessner, Tracy Marko, Ruth Scott, Andrea Eckert, Kathleen Stuebner, Ann Hohenhaus, Kim Selting, David Largaespada, Jaime Modiano, Logan Spector, (University of Minnesota)

Background: Canine osteosarcoma (OS) is a relevant spontaneous model for human OS. Identifying similarities in clinical characteristics associated with metastasis at diagnosis in both species may substantiate research aimed at using canine OS as a model for identifying mechanisms driving distant spread in the human disease. Methods: This retrospective study included dog OS cases from three academic veterinary hospitals and human OS cases from the SEER program. Associations between clinical factors and metastasis at diagnosis were estimated using logistic regression models. Results: In humans, those with trunk tumors had a higher odds of metastasis at diagnosis compared to those with lower limb tumors (OR= 2.38, 95% CI: 1.51, 3.69). A similar observation was seen in dogs with trunk tumors compared to dogs with forelimb tumors (OR = 3.28, 95% CI 1.36, 7.50). Other associations were observed in humans but not dogs. Humans aged 20 – 29 years had a lower odds of metastasis at diagnosis compared to those aged 10 – 14 years (OR = 0.67, 95%CI: 0.47, 0.96); every 1-cm increase in tumor size was associated with a 6% increase in the odds of metastasis at diagnosis (95% CI: 1.04, 1.08); compared to those with a white, non-Hispanic race, a higher odds was observed among those with a black, non-Hispanic race (OR: 1.51, 95% CI: 1.04, 2.16), and those with a Hispanic origin (OR 1.35, 95% CI: 1.00, 1.81). Conclusion: A common mechanism may be driving trunk tumors to progress to detectable metastasis prior to diagnosis in both species.
SIMILAR PREVALENCE OF COLORECTAL NEOPLASIA BETWEEN PATIENTS WITH AND WITHOUT HUMAN IMMUNODEFICIENCY VIRUS Caitlin Murphy*, Caitlin Murphy, Adil Faqih, Benjamin Hewitt, Ezra Burstein, John Abrams, Purva Gopal, Hannah Fullington, Amit Singal, (University of Texas Southwestern Medical Center)

Background: Increasing availability of antiretroviral therapy (ART) for human immunodeficiency virus (HIV) has led to prolonged survival and rising incidence of non-HIV-defining cancers among patients with HIV. Compared to the general population, risk of colorectal cancer may differ among those with HIV due to immunosuppression, oncogenic viral coinfections, and higher prevalence of risk factors. However, few studies describe prevalence of neoplasia in this population. Methods: We identified patients diagnosed with HIV and receiving care in two large healthcare systems in Dallas, TX. Eligible patients were prescribed ART for ≥ 6 months and received a colonoscopy between January 2010 and December 2017. We reviewed endoscopy and pathology reports using a structured data collection form, including polyp number, size, and histology. Among those age ≥ 50 years, we calculated a standardized prevalence ratio as the ratio of observed to expected number of advanced adenomas using an age- and sex-matched cohort of patients without HIV. Results: Of 1,152 patients with HIV, most were male (79.7%), non-Hispanic black (42.6%), and received Medicare (35.3%) or financial assistance (35.2%). Median age was 52 years (IQR: 49 – 56 years). Most (64.9%) patients had a viral load below lower limits of detection (<48 copies/mL), and median CD4 count was 450 cells/mm3, at the time of colonoscopy. Two-thirds (n=762, 66.1%), of patients had normal findings, 5.9% had hyperplastic polyps, 17.5% had 1-2 small (<1 cm) adenomas, 9.6% had advanced adenomas, and 1.0% had colorectal cancer. Among those age ≥ 50 years (n=833), the standardized prevalence ratio of advanced adenomas in patients with HIV was 0.96 (95% CI 0.79, 1.16) compared to those without. Conclusion: Patients with HIV have similar prevalence of colorectal neoplasia as patients without HIV. As the HIV population continues to live longer and benefit from ART, average risk colorectal cancer screening will become increasingly important.
Objective: In free-living populations the adoption of modifiable cancer risk behaviors occur in distinct patterns throughout a population. The multidimensional associations of several behaviors could exhibit meaningful interactions that confer different risks for cancer, yet studies have typically examined the risk of cancer associated with single risk factors. Methods: Using data from the Alberta Tomorrow Project cohort, we conducted a latent class analysis of a subset of established colorectal cancer (CRC) risk behaviors (smoking, alcohol consumption, physical activity, body mass index (BMI), fruit and vegetable consumption, and consumption of red and processed meat) and assessed the risk of developing CRC for each latent class compared to the low risk class with Cox proportional hazards models. Results: During a median follow-up of 13.23 years, 267 CRC cases occurred among study participants (n=26,460). Seven unique behavioral profiles were identified, where the low risk group consisted of never smokers with normal BMI and moderate engagement in other behaviors. Compared to the low risk group, the groups with the highest risk of CRC were individuals that were highly active, current smokers, that engaged in high risk alcohol consumption and consumed high volumes of processed and red meat (multivariable-adjusted hazard ratio [HR]: 2.87, 95% CI, 1.43-5.77); high meat consumers that were overweight or obese (HR: 2.48, 95% CI, 1.27-4.83); former smokers that were obese (HR: 2.46, 95% CI, 1.28-4.70); and individuals with low physical activity, low fruit and vegetable consumption, and low meat consumption (HR: 2.34, 95% CI, 1.23-4.45). Conclusion: For CRC, engaging in multiple lifestyle-related risk behaviors appears to confer a similar risk regardless of the specific behaviors that are adopted. These results suggest that for prevention of CRC, interventions targeting combinations of risk behaviors are required and a reductionist approach may not be sufficient.
Adult cancer mortality has previously been reported to be inversely associated with elevation or altitude. The association of age-adjusted cancer incidence and county elevation was studied using data from eight of the nine SEER areas during 1973-2015. Counties (N=198) were stratified into tertiles according to elevation (999 feet) as given in the Area Health Resource File from the Health Resources and Services Administration. Standardized incidence ratios (SIR) and 95% confidence intervals (CI) were calculated for the middle and high-elevation strata, with the low-elevation stratum being the referent group. Total cancer incidence (for all sites combined) among white males was inversely associated with elevation, declining from 559.8 per 100,000 in lower-altitude counties and 561.9 (SIR: 1.004, 95% CI: [1.000, 1.007]) per 100,000 in medium-altitude counties to 499.0 (SIR: 0.891, 95% CI: [0.888, 0.895]) per 100,000 in high-altitude counties; a similar inverse association was detected for every specific form of cancer among white males, except for cancer of the prostate. Similarly, total cancer incidence (for all sites combined) among white females was inversely associated with elevation, declining from 439.5 per 100,000 in lower-altitude counties and 426.0 (SIR: 0.970; 95% CI: [0.967, 0.973]) per 100,000 in medium-altitude counties to 376.6 (SIR: 0.857, 95% CI: [0.854, 0.870]) per 100,000 in high-altitude counties; a similar inverse association was detected for every specific form of cancer among white females except for multiple myeloma and cancer of the cervix.
ATROPHIC GASTRITIS IS RELATED WITH ESOPHAGEAL CANCER: A DESCRIPTIVE STUDY IN TAIWAN Jing Kao* Jing Kao, Chien-An Sun, Yu-Ching Chou, (School of Public Health, National Defense Medical Center, Taipei)

Background: There were over 2,200 people diagnosed as Esophageal Cancer (EC) and 1,500 cases were dead of EC in Taiwan each year. Atrophic Gastritis (AG) has been considered as a potential risk factor in developing esophageal cancers. However, there was no evidence in Taiwan that confirmed the relationship. We conducted a descriptive study examined the incidence of EC with AG in a large-scale, population-based Chinese cohort. Methods: From 2000 to 2013, about 5,347 new cases with AG were identified in Taiwan's National Health Insurance Research Database (NHIRD). We investigated incidence rates in different sex, age groups and periods for EC. For the trends in age, we assessed the change in the incidence rates by linear trend analysis. Results: The incidence of EC was 3.04 in 2008 among people with AG per 10,000 individuals, and was 1.63 among people without AG. Moreover, the incidence rate was 3.03 among men and 1.04 among women. After stratifying age into 5 groups (20-29, 30-39, 40-49, 50-59, ≥60), we could find that the incidence rate of EC per 10,000 individuals was 0.33 in 20-29 years old, 0.81 in 30-39 years old, 1.9 in 40-49 years old, 1.8 in 50-59 years old, 2.99 in 60-69 years old respectively. Trend test in AG with EC after stratifying age into 5 groups (20-29, 30-39, 40-49, 50-59, ≥60) was significant (P for trend= 0.003). Also, the incidence of EC was 1.63, 3.12, 2.76 per 10,000 individuals by visiting 0 time, 1-3 times, 4-6 times in AG visiting records respectively. Conclusion: The incidence rate of EC was higher in men and became greater in the elders in the past 14 years. Our findings suggested that there may some significant correlations existed in EC patients with AG. Keywords: Esophageal cancer (EC), National Health Insurance Research Database (NHIRD), Atrophy gastritis (AG).
SEVERE ACNE AND BREAST CANCER John Murphy*, John Murphy, Katie O'Brien, Alexandra White, Dale Sandler, (National Institute of Environmental Health Science, Epidemiology Branch)

Background Hormonal imbalance early in life is thought to be associated with breast cancer risk. Severe acne may arise from hormonal imbalance and could serve as an indicator of increased breast cancer risk. We explored whether severe acne was associated with breast cancer. Methods We used data from the Sister Study, a large (n=50,884) prospective cohort of women who had a sister diagnosed with breast cancer, but who were free of breast cancer themselves at baseline. Participants completed a structured questionnaire that included demographics, lifestyle factors and medical history, including any diagnosis of severe acne. Adjusted Cox proportional hazard models were used to estimate hazard ratios (HRs) and 95% confidence intervals (95% CIs) for the association of severe acne and breast cancer (invasive disease or ductal carcinoma in situ). Results During an average of 8.4 years of follow-up, there were 3,049 breast cancer cases diagnosed. Ever being diagnosed with severe acne was associated with a higher risk of breast cancer (HR=1.22; 95% CI: 0.97, 1.53), particularly in women who were diagnosed prior to age 18 years (HR=1.39; 95% CI: 1.02, 1.88). Results were similar when limited to invasive cancers. Conclusion Our study supports a positive association between severe acne – a potential marker of hormonal imbalance – and breast cancer risk. These findings could be used to identify women who may be at a higher risk of breast cancer.
Background: Obesity is an established risk factor for papillary thyroid cancer (PTC). PTC incidence rates have increased significantly over time in the US, including advanced-stage and large tumors. We quantified the impact of the rising prevalence of overweight and obesity on these increasing incidence rates. Methods: We used data from the NIH-AARP Diet and Health Study (participants aged ≥50 years) to estimate adjusted hazard ratios (HRs) for PTC (overall and by tumor size) by categories of body mass index (BMI) with Cox regression models. Population attributable fractions (PAFs) for obesity (assuming a 10-year latency period) were calculated using the estimated HRs, and obesity prevalence estimates from annual National Health Interview Surveys. PAFs were applied to cancer incidence data among ≥60-year-olds from the Surveillance, Epidemiology, and End Results (SEER)-13 Program to estimate overweight/obesity-attributable and -unrelated rates. Annual percent changes were estimated with Joinpoint. Results: In the NIH-AARP Study, obesity (30+ kg/m2) was associated with a 30% increased risk of PTC (HR=1.30, 1.04-1.61) and a >5-fold increased risk of large (>4 cm) PTC (HR=5.42, 95% CI 2.24-13.1) compared to normal BMI (18.5-24.9 kg/m2). Between 1995 and 2015, the PAF for overweight/obesity increased from 11 to 16% for all PTCs and 51 to 63% for large PTCs. PTC rates in SEER increased 5.9%/year during 1995-2015, with stronger increases observed for overweight/obesity-attributable (7.0%/year) cases than overweight/obesity-unrelated cases (5.1%/year). Similar patterns were observed for large PTCs. During 1995-2015, overweight/obesity accounted for 13% and 59% of the increases in incidence rates for total and large PTCs, respectively. Conclusions: The rising overweight and obesity prevalence in the US contributed to the increase in PTC incidence rates from 1995 to 2015. By 2015, 1 in 6 PTCs (and nearly 2/3 of large PTCs) was attributable to being overweight or obese.
JOINPOINT REGRESSION ANALYSIS OF TRENDS IN INCIDENCE RATES OF CHILDHOOD LEUKEMIA IN KUWAIT:1980-2014
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Background: Leukemia is the most common cancer in children younger than 20 years with varying incidence worldwide. This study evaluated trends in the age-standardized incidence rates (ASIRs) (per million person-years) of childhood leukemia (CL) diagnosed at age 0-19 years in Kuwait from 1980 to 2014, overall and by specific cohorts defined by age, sex and nationality. Methods: This retrospective cohort study included 1077 CL (lymphoid, myeloid, undifferentiated) cases who were confirmed by hematology and/ or cytology and recorded in Kuwait Cancer Registry. We used mid-year relevant Kuwait population as denominator and the World Standard Population as a reference to compute CL ASIRs (per million person-years), overall and for specific cohorts defined by age (0-4, 5-9, 10-14, 15-19 years), sex (male, female) and nationality (Kuwaiti, non-Kuwaiti). Joinpoint regression analysis was used to evaluate trends in CL ASIRs (per million person-years). Average annual percent change (AAPC) and its 95% CI was used to interpret the observed trends.

Results: During 1980-2014, an overall CL ASIR (per million person-years) was 53.1 (95% CI: 20.9, 85.2). From 1980 to 1993, a significant decreasing trend in CL ASIRs was observed (AAPC = - 6.8; 95% CI: -12.1, -1.1; p < 0.023). However, over 1994-2014, a non-significant increase in CL ASIRs was noticed. From 1980 to 2014, cohorts’-specific trends revealed significantly increasing CL ASIRs among 10-14 years old, Kuwaiti males (AAPC = 4.7%; 95% CI: 2.9, 6.4; p = 0.001). Conclusions: From 1980 to 2014, the overall CL ASIR (per million person-years) was 53.1. From 1980 to 1993, a significantly decreasing trend in CL ASIRs was observed. However, during the subsequent period, an overall non-significant increasing trend in ASIRs was noticed. Additionally, 10-14 years old, Kuwaiti males had significantly increasing CL ASIRs during the entire study period. However underlying risk factors for this increasing trend remains uncertain and need further studies.
RELATIONSHIPS OF MEASURES OF TERMINAL DUCTAL LOBULAR UNIT INVOLUTION WITH BREAST EPITHELIAL SPATIAL ARRANGEMENT IN BENIGN BREAST BIOPSIES

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Purpose: Reduced involution of terminal duct lobular units (TDLUs), the epithelial structures from which most breast cancers arise, is associated with increased breast cancer risk among women with benign breast disease (BBD). Prior digital pathologic studies of breast biopsies have suggested that spatial organization of epithelial regions (i.e., smaller distances between epithelial neighbors) is characteristic of breast cancer, as distinct from BBD. In this study, we assessed whether TDLU involution was associated with epithelial spatial organization among women diagnosed with BBD. Methods: Using digitized whole slide images of 699 BBD biopsies from 614 women ages 40-65, three measures inversely related to TDLU involution were assessed visually by a pathologist: TDLU density (count/100 mm²), median TDLU span (µ), and median number of acini/TDLU. Epithelial organization was defined using area-Voronoi diagrams as a median ratio, with elevated ratios indicating closer proximity of each epithelial region to its neighbors. Ordinal multivariate logistic regression examined associations between tertiles of TDLU metrics with epithelial organization, adjusting for age, BMI and biopsy type. Results: Biopsies that displayed reduced TDLU involution and higher ratios of epithelial organization were more apparent in younger women (P<0.0001). TDLU metrics in the highest vs. the lowest tertile were associated with higher epithelial organizational ratios: TDLU density OR=4.19, 95%CI: 2.61-6.73; span OR=3.0, 95%CI: 1.93-4.66, acini OR=6.06, 95%CI: 3.50-10.5; p-trend<0.0001 for all. Similar findings were observed in analyses stratified by BBD diagnosis. Conclusion: We observed positive relationships of epithelial organizational ratios with TDLU metrics that have been previously linked to breast cancer risk in BBD patients. Future studies aimed at better understanding the significance of breast epithelial spatial arrangement may provide important etiological clues for breast cancer.
ASSOCIATIONS OF INSOMNIA, SHORT SLEEP AND SLEEP FRAGMENTATION WITH HYPERTENSION AMONG AFRICAN-AMERICANS: THE JACKSON HEART SLEEP STUDY
Dayna A. Johnson* Dayna A. Johnson, Na Guo, Tamar Sofer, James Wilson, Susan Redline, (Emory University)

Background: African-Americans have a high prevalence of hypertension, including uncontrolled hypertension. Few studies have examined the extent to which reduced sleep quality/duration contribute to hypertension among African-Americans. We examined the associations of actigraphy-based sleep indices and subjective sleep reports with prevalent, uncontrolled, and resistant hypertension among African-Americans. Methods: Sleep measures included, insomnia, actigraphy-based short sleep (80mmHg, use of antihypertensive medication, or self-reported hypertension; uncontrolled and resistant hypertension as high BP with use of 1-2 and >3 antihypertensive medications, respectively. Logistic regression models were fit to test associations between each sleep phenotype and hypertension group adjusted for covariates. Results: Insomnia and short sleep were common (22.8% and 26.1%, respectively), and 7% had the ISSP. The mean WASO was 54.5 minutes (23.5) and 30.0% had low sleep efficiency. There was a high prevalence of hypertension (86%), uncontrolled (47%) and resistant hypertension (14%). Low sleep efficiency and longer WASO were associated with prevalent hypertension [aOR=1.70 (95% CI: 0.88, 0.97) and aOR=1.01 (1.00, 1.02), respectively]. Short sleep and the ISSP were associated with higher odds of resistant hypertension [aOR=1.82 (1.02, 3.26) and aOR=3.60 (1.34, 9.67), respectively]. Conclusion: Objective indices of reduced sleep continuity were associated with an increased odds of prevalent hypertension. In contrast, short sleep duration and ISSP were associated with resistant hypertension. Thus, with further research, sleep may be a target for reducing the burden of hypertension among African-Americans.
Background: To reduce cardiovascular disease (CVD) risk, we tested an online intervention to improve healthy lifestyle for women with recent preeclampsia. Methods: We conducted a randomized controlled nine-month clinical trial, Heart Health 4 Moms (HH4M), among 151 U.S. women with preeclampsia within five years. Sample size was planned to detect differences of 0.5 standard deviation units in primary outcomes between study arms. Preeclampsia history was validated by medical records; women with chronic hypertension were excluded. The intervention included online educational modules, a community forum, and communication with a lifestyle coach. The control group received internet links to CVD risk reduction information. Primary outcomes were self-efficacy to eat a healthy diet and increase physical activity; change in physical in/activity; adherence to the Dietary Approaches to Stop Hypertension diet; and knowledge of and personal control over CVD risk. Secondary outcomes were weight and blood pressure. Results: In the intervention arm, 84% of participants accessed at least one online educational module; 89% completed at least three scheduled calls with the coach. At nine months, intervention participants reported significantly greater knowledge of CVD risk factors (corrected p=0.01), increased self-efficacy for healthy eating (p=0.03) and less physical inactivity than controls (p=0.0006). The groups did not differ in sense of personal control of CVD risk factors, self-efficacy for physical activity or reported physical activity. There were no differences in secondary outcomes between groups. Conclusions: The HH4M program improved CVD risk knowledge, self-efficacy to achieve a healthy diet, and reduced physical inactivity among women with recent preeclampsia.
PHENOTYPES OF CARDIOVASCULAR DAMAGE AND THE ASSOCIATION WITH COGNITIVE DECLINE AMONG OLDER ADULTS: A LATENT CLASS ANALYSIS APPROACH Lindsay Miller*
Lindsay M Miller, Chenkai Wu, Calvin Hirsch, Mary Cushman, Oscar Lopez, Michelle Odden, (Oregon State University)

The association between markers of subclinical cardiovascular disease (SCVD) and cognitive function is well established, however, current tools for addressing subgroups of SCVD have focused on the overall burden of disease. Identifying risky combinations of characteristics may lead to a better understanding of pathophysiologic changes that underlie cognitive decline. Participants included 5,072 older adults from the Cardiovascular Health Study free of cardiovascular disease at baseline and followed for 6 years. Using latent class analysis, we identified cardiovascular damage phenotypes based on vascular (internal intima-media thickness, ankle arm index, white matter grade, and brain infarctions), cardiac (major echocardiogram abnormalities, ST2 and N-terminal pro-brain natriuretic peptide) and inflammatory (interleukin-6, galectin-3 and cystatin C) markers. Using the maximum probability assignment rule, participants were assigned to phenotypes based on the highest posterior probability of membership. We used adjusted linear mixed effects models to evaluate the association between phenotype and cognitive decline, measured annually using the Modified Mini Mental State Exam. The analysis yielded 5 prevalent phenotypes: healthy (65%), cardiac damage (10%), inflammatory (10%), multisystem morbidity (11%), and vascular damage (4%). The vascular damage phenotype had the greatest rate of decline at 0.88 points per year (95% CI= -1.33, -0.44), followed by the high multisystem morbidity phenotype (β=-0.72, 95% CI= -1.07, -0.38), the inflammatory phenotype (β=-0.67, 95% CI= -0.95, -0.38), and the cardiac phenotype (β=-0.45, 95% CI= -0.70, -0.21) compared to the healthy phenotype. Among patterns of cardiovascular damage, vascular damage appears to have the greatest influence on cognitive decline. Identification of these phenotypes may give rise to more informed clinical interventions.
Objective: To determine the extent to which duplicate records introduce bias in a statewide electronic health record- and health insurance claims-based surveillance system of individuals with a rare chronic condition (congenital heart defects). Methods: The Colorado Congenital Heart Defects Surveillance System (COCHD) is comprised of individuals aged 11-64 years in active care for a congenital heart defect (CHD) from a diverse network of health care systems and a statewide all payers claims database. A probability-based identity reconciliation algorithm based on direct and indirect personal was implemented to identify individuals with duplicate records. Factors associated with an individual having a duplicate record were evaluated with univariate analyses. A sensitivity analysis was conducted to determine the extent to which bias introduced by duplicate records confounds the relationship between CHD severity and cardiac mortality, inpatient hospitalization and major adverse cardiac events. Results: Duplicate cases were more likely to be in the youngest (aged 11-17), and less likely to be in the oldest (aged 51-64), age groupings (p<0.0001), were more likely to have known race and ethnicity, dual private and public health insurance (p<0.0001) and have a change in health insurance status over the three-year surveillance period (p<0.0001). Duplicate cases were more likely to have a severe heart defect (p<0.0001), a CHD co-morbidity (all p-values <0.05) and higher health care utilization (all p-values <0.001). After implementation of the identity reconciliation algorithm, the age-adjusted odds ratio (OR) between CHD severity (severe vs. moderate/minor) and in-patient hospitalization was reduced by 19% (though still statistically significant) and age adjusted OR between CHD severity and major cardiac events was reduced by 14% and was no longer statistically significant. The relationship between CHD severity and mortality was non-significant both before and after de-duplication.
The relationship of early-life adversity with adulthood weight and cardiometabolic health status in the 1946 National Survey of Health and Development

Ellie Robson*, William Johnson, Ellie Robson, Wahyu Wulaningsih, Tom Norris, Mark Hamer, Rebecca Hardy, William Johnson, (Loughborough University)

Background Evidence linking early-life adversity with an adverse cardiometabolic profile in adulthood is equivocal. This study investigates early-life adversity in relation to weight and cardiometabolic health status at age 60-64 years. Methods We included 1,059 individuals in the 1946 National Survey of Health and Development (NSHD). Data on adversity between ages 0-16 years were used to create a cumulative childhood psychosocial adversity score and a socioeconomic adversity score. Cardiometabolic and weight/height data collected at ages 60-64 years were used to create four groups: metabolically healthy normal weight (MHNW), metabolically unhealthy normal weight (MUNW), metabolically healthy overweight/obese (MHO), and metabolically unhealthy overweight/obese (MUO). Associations between the two exposure scores and weight/health status were examined using multinomial logistic regression, with adjustment for sex and age at the outcome visit. Results 62% of normal weight individuals were metabolically healthy, whereas only 34% of overweight/obese individuals were metabolically healthy. In a mutually adjusted model including both exposure scores, a psychosocial score of ≥ 3 (compared to 0) was associated with increased risk of being metabolically unhealthy (compared to unhealthy) in both normal weight adults (RR 2.49; 95% CI 0.87, 7.13) and overweight/obese adults (1.87; 0.96, 3.61). However, the socioeconomic adversity score was more strongly related to metabolic health status in overweight/obese adults (1.60; 0.98, 2.60) than normal weight adults (0.95; 0.46, 1.96). Conclusion Independently of socioeconomic position, psychosocial adversity in childhood may be associated with a poor cardiometabolic health profile, in both normal weight and overweight/obese adults.
HOUSEHOLD FOOD INSECURITY IN THE UNITED STATES AND ITS ASSOCIATION WITH RISK OF MORTALITY AMONG U.S. ADULTS: AN ANALYSIS OF NATIONAL DATA

Yangbo Sun*, Buyun Liu, Shuang Rong, Yang Du, Guifeng Xu, Linda G Snetselaar, Robert Wallace, Wei Bao, (University of Iowa)

Background: Food insecurity is not only present in developing countries but also in developed countries such as the United States. However, the long-term health impact of food insecurity remains unclear. We aimed to examine the current status, secular trends in prevalence of adults living with household food insecurity in the United States and its associations with all-cause, CVD and cancer mortality in U.S. adults. Methods: This was a population-based prospective cohort study of a nationally representative sample of 29,042 adults (≥20 years) who participated in the National Health and Nutrition Examination Survey (1999-2010). The participants were linked to mortality records through December 31, 2011. The exposure was household food insecurity was measured using the USDA Food Security Survey Module. We categorized the participants as having or not having household food insecurity, following the USDA classification guidelines. The outcomes were all-cause, cardiovascular disease (CVD), and cancer mortality. Results: In 2016, an estimated 11.4% of American adults were living in households with food insecurity at least some time during the year, including 7.0% with household low food security and 4.3% with very low food security. During 180,250 person-years of follow-up, 2,294 deaths occurred, including 547 CVD deaths and 579 cancer deaths. After adjustment for age, gender, race/ethnicity, socioeconomic status, dietary and lifestyle factors, and BMI, participants with household food insecurity had higher risk of all-cause, CVD and cancer mortality, with the multivariable-adjusted HRs (95% CIs) as 1.29 (1.04, 1.59), 1.66 (1.13, 2.46), and 1.56 (1.11, 2.19), respectively. Conclusions: Household food insecurity is common in the United States and it is associated with increased risk of excess death in U.S. adults.
ASSOCIATION BETWEEN CARDIOVASCULAR HEALTH AND COGNITION: EFFECT MODIFICATION BY SERUM VITAMIN D LEVEL: THE CARDIOVASCULAR AND METABOLIC DISEASES ETIOLOGY RESEARCH CENTER (CMERC) COHORT

YE JIN JEON*, YE JIN JEON, Hyeon Chang Kim, Sun Jae Jung, (Department of Public Health, Yonsei University, Seoul, Korea)

[Objective] Few studies assessed the role of vitamin D on the association between cardiovascular risk factors and cognitive function. The purpose of our study was to investigate the association between cardiovascular health and cognitive function according to vitamin D in Korean adults. [Methods] This study included 840 men and 1,811 women (mean age: 57.23) from the Cardiovascular and Metabolic Diseases Etiology Research Center (CMERC) Cohort. Life’s simple seven tools (American Heart Association, 2010) were used to calculate cardiovascular health score. Cognitive function was evaluated using the Korean version of the Mini-Mental State Estimation for dementia screening (MMSE-DS) and serum 25-hydroxyvitamin D were measured. Generalized linear regression models (GLMs) were used after adjusting for age, sex, socio-economic status, and alcohol consumption. We further stratified the association by vitamin D cutoff points according to Institutes of Medicine (IOM) criteria and conducted a sensitivity analysis with the population median vitamin D level. [Results] There was a negative association between low cardiovascular health score (0-3: poor cardiovascular health) and MMSE-DS score (β= -0.01, p-value=0.9318). Among men with high vitamin D level, low cardiovascular health score group showed significantly low MMSE-DS score (β= -0.48, p-value=0.029). However, among men with low vitamin D group, the association was opposite with no statistical significance. (β=0.23, p-value=0.0804). In women, similar differences were observed, but both strata according to vitamin D level showed no statistical significance. [Conclusion] Our findings suggest that vitamin D is an effect modifier for the association between cardiovascular health and cognitive function, especially in men. In higher vitamin D group, cognitive decline was worse among people with poor cardiovascular health. [Key words] Cardiovascular health, Cognitive Function, MMSE-DS, Vitamin D
Mechanisms underlying the role of non-HLA genetic risk variants in T1D are poorly understood. Methylation is a modifiable factor that may provide a link between genetic variation and disease. We conducted a methylation quantitative trait loci analysis (mQTL) to test the association between genetic variation and methylation. We evaluated whether methylation changes were associated with 12 genes (14 SNPs) that were previously significantly associated with T1D in the DAISY prospective cohort of children at increased risk of T1D, including: PTPN22, INS, PTPN2, UBASH3A, C1QTNF6, GLIS3, IL2RA, ERBB3, GSDMB, BACH2, IL27, and RNLS/C10orf59. Genome-wide DNA methylation (Illumina 450K platform) was tested in peripheral blood samples collected prior to T1D onset in a nested case-control study of 40 individuals who developed T1D and 41 controls who did not develop T1D in DAISY. After adjusting for age and sex, we identified 6 probes where methylation was significantly associated with a SNP (Benjamini and Hochberg FDR adjusted p-value <0.05). One probe (cg09046979 FDR=0.0051) was associated with the IL27 gene (rs4788084) while the remaining five probes (cg02749887 FDR=0.0005, cg19586845 FDR=0.0108, cg21574853 FDR=0.0137 Figure 1.A, and cg22068589 FDR<0.0001) were associated with the INS gene (rs698). At these 6 probes, we tested for differences between T1D cases and controls. After adjusting for the high risk DR3/4 genotype, age, sex, and cell proportions, cg21574853, an open sea probe upstream from the INS transcription start site, was hypermethylated in T1D cases (p=0.0044, Figure 1.B). These findings have important implications because the INS locus is regarded as the second most important locus in T1D. The association between rs689 and cg21574853 in the current study suggests methylation may have a role in the relationship between INS variation and T1D. More importantly, methylation was measured prior to disease, indicating that methylation levels preceded T1D.

![Figure 1. Box Plots of Genotype-Methylation and Methylation-Phenotype Associations](image)

**Figure Description:** Methylation levels by genotype and phenotype (T1D case vs T1D control). (A) Methylation levels (% methylation) by rs689 genotype at the cg08241307 probe. (B) Percent methylation at the cg21574853 probe in T1D cases vs T1D controls. Based on previous studies, the minor allele is known to be protective against T1D.
ASSOCIATION BETWEEN MATERNAL GESTATIONAL DIABETES AND RISK OF ABNORMAL BLOOD GLUCOSE IN CHILDREN IN EARLY LIFE. Sabrina Karim*, Sabrina Karim, Jihong Liu, Liwei Chen, Anwar T. Merchant, Khoa Truong, Lu Shi, (University of South Carolina)

Background: Gestational diabetes mellitus (GDM) affects 4-8% of pregnant women. The hyperglycemic intrauterine environment impacts the developmental health of the offspring from infancy through adulthood. Yet current research mostly focuses on late childhood or adulthood outcomes of offspring born to mothers with GDM. Objective: To examine whether offspring born to mothers with GDM are more likely to have abnormal blood glucose levels in early childhood (i.e. birth to 5 years of age) than offspring born to mothers without GDM. Methods: A retrospective cohort was established using electronic medical records from two large hospitals in South Carolina, by restricting to women aged 15-45 years with a singleton live birth between January 2007 and April 2017, and offspring who had at least one laboratory test done during the five-year follow-up period since the delivery. Maternal diagnosis of GDM during the index pregnancy was assessed using ICD-9-CM or ICD-10-CM codes. Abnormal blood glucose for the offspring was defined as blood glucose level being above standardized normal level. Multinomial logistic regression models were used. Results: Out of 7910 mother-infant dyads, around 13% of the mothers were diagnosed with GDM. The risk of an abnormal blood glucose was higher in children born to mothers with GDM than those born to mothers without GDM after adjusting for child's gender, maternal race, rural residence, and type of insurance [Adjusted Odds Ratio (AOR): 1.35; 95% CI: 1.15-1.56]. The association was similar among boys [AOR: 1.43; 95% CI:1.14-1.78] and girls [AOR: 1.27; 95% CI:1.03-1.57]. The association was significant among younger mothers (< 30 years)[AOR: 1.67; 95% CI: 1.29-2.15] but not among older mothers (≥30 years). Discussion: Our findings suggest that offspring born to mothers with GDM had elevated risk of abnormal glucose in early childhood. Early diagnosis of offspring can help to prevent future complications associated with abnormal blood glucose.
TYPE 2 DIABETES MELLITUS AND THE RISK OF COMMUNITY-ACQUIRED PNEUMONIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Patients with type 2 diabetes mellitus (T2DM) are at greater risk of infections. A recent meta-analysis reported that diabetes was associated with an increased risk of respiratory infections but did not specifically assess community-acquired pneumonia (CAP) and did not differentiate between types of diabetes. The objective of our systematic review and meta-analysis was to determine if T2DM is associated with the risk of CAP.

Methods: We systematically searched MEDLINE, EMBASE, CINAHL, and ProQuest theses and dissertations for articles evaluating the association between T2DM and CAP between 1946 (start of MEDLINE) and August 2018. We searched the grey literature through Global Health (Ovid), Global Index Medicus of the World Health Organization, and Google scholar. We included cohort and case-control studies published in English or French. We excluded studies of type 1 diabetes and those assessing the risk of hospital- or ventilator-acquired pneumonia. The quality of individual studies was assessed using Robins-I tool. Data were pooled across studies using DerSimonian and Laird random-effects models with inverse variance weighting. The study is registered with PROSPERO (CRD42018116409).

Results: Our systematic review included 9 articles reporting on 11 studies. All studies were published between 2004 and 2017, and follow-up ranged from 1 to 35 years. When data were pooled across studies (Figure), T2DM was associated with an increased risk of CAP in both cohort (adjusted relative risk: 1.68, 95% confidence interval [CI]: 1.63 – 1.74, I2: 69.2%) and case-control studies (1.29; 95% CI: 1.15 – 1.44, I2: 22.1%); the presence of substantial heterogeneity (I2: 95.2%) prevented pooling across designs. Estimates differed between studies reporting on T2DM (1.48, 95% CI: 1.26 – 1.74, I2: 97.4%) and those that did not specify diabetes type (1.75, 95% CI: 1.64 – 1.87, I2: 52.3%).

Conclusions: T2DM is associated with a clinically important increased risk of CAP.
IMPACT OF THE CHINESE FAMINE OF 1959-61 ON TYPE 2 DIABETES EPIDEMICS: A SYSTEMATIC REVIEW AND META-ANALYSIS L.H. Lumey* L.H. Lumey, Chihua Li, (Columbia University)

Background A recent systematic review found no relation between prenatal exposure to the Chinese Famine and long-term health outcomes except for schizophrenia. Multiple highly-cited reviews, however, still interpret the famine as an important contributor to current and future type 2 diabetes (T2D) epidemics in China and suggest that potential epigenetic mechanisms in the context of the famine should be further explored. We examined this question again with current data. Methods We searched English and Chinese databases for T2D studies related to the famine. From each report, the number of T2D events and populations at risk was abstracted for those who were born during the famine (famine births), after the famine (pre-famine births), and before the famine (pre-famine births). We evaluated the association between famine exposure and T2D, either using only post-famine births, pre- and post-famine births combined, or only pre-famine births as controls. The heterogeneity was assessed. Results In all, 16 reports were eligible for review. The study sample size in a meta-analysis ranged from 293 to 88830 with 3813 T2D cases in total. As reported by others T2D was more common among famine births using post-famine births as controls (OR 1.47; 95% CI: 1.20–1.80) based on random-effects models. By contrast, no increases in T2D were seen (OR 1.08; 95% CI: 0.95–1.24) among famine births by using pre- and post-famine births together as controls. A ‘protective’ famine effect by using pre-famine births as controls (OR 0.80, 95% CI: 0.69-0.94). Conclusions Uncontrolled age differences between famine and post-famine births are the most likely explanation for effects commonly attributed to the famine. Current public health efforts for prevention and treatment of T2D should, therefore, focus on well-established risk factors in China, especially the increased energy intake and sedentary lifestyles that affect the entire population, regardless of early famine exposure.
ASSOCIATIONS BETWEEN CUMULATIVE ENVIRONMENTAL QUALITY AND ORAL CLEFT BIRTH DEFECTS
Alison K. Krajewski* Alison K. Krajewski, Kristen Rappazzo, Peter H. Langlois, Lynne C. Messer, Danelle T. Lobdell, (ORISE Postdoctoral Fellow at the US Environmental Protection Agency)

The etiology of most birth defects are unknown. While genetics, maternal factors (age, smoking) and environmental exposures have all been linked to birth defects such as oral cleft (OC), cleft palate (CP), and cleft lip with and without cleft palate (CL ± CP), cumulative environmental quality (EQ) may also contribute to these associations. The Environmental Quality Index (EQI), a county-level measure of cumulative environmental exposure from 2000-2005, was used to explore potential associations with Texas Birth Defects Registry and birth records for OC, CP, and CL ± CP births between 2000 through 2006 among Texas counties. Poisson regression models estimated the prevalence ratio (PR) and 95% CI for associations between increasing percentile (%) categories (75%) of overall and domain-specific EQI (air, water, land, sociodemographic (SD), built) and OC, CP, and CL ± CP defects, adjusted for potential confounders. Comparing highest % category (worst EQ) to lowest % category (better EQ) for overall EQI, the PRs were 1.01 (95% CI: 0.93,1.10) for OC, 1.04 (0.96,1.14) for CP, and 0.99 (0.91,1.08) for CL ± CP. In domain specific analyses, the strongest associations for all three defects were seen with the SD domain. The PRs for OC were 1.74 (1.32, 2.26) and 1.35 (1.22,1.50) for mid EQ and better EQ compared to the worst EQ. The PRs for CP were 1.45 (1.08,1.90) and 1.18 (1.05,1.32) for mid EQ and better EQ compared to the worst EQ. The PRs for CL ± CP were 1.87 (1.43, 2.41) and 1.42 (1.28,1.57) for mid EQ and better EQ compared to the worst EQ. The results suggest that SD factors may contribute to the associations between OC, CP, and CL ± CP birth defects, as observed in the SD domain. This abstract does not reflect EPA policy.
INVESTIGATING THE IMPACT OF HURRICANE MARIA ON AN ONGOING BIRTH COHORT IN PUERTO RICO

Deborah Watkins* Deborah Watkins, Héctor Ramón Torres Zayas, Carmen M. Vélez Vega, Zaira Rosario, Michael Welton, Luis D. Agosto Arroyo, Nancy Cardona, Zulmarie J. Díaz Reguero, Amailie Santos Rivera, Phil Brown, Akram Alshawabkeh, José F. Cordero, John D. Meeker, (University of Michigan School of Public Health)

Prior to Hurricane Maria, Puerto Rico had 200+ hazardous waste sites, significant contamination of water resources, and marked disparities in reproductive health, including higher rates of preterm birth, low birthweight, and infant mortality compared to the mainland U.S. In 2010, the Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) Center was formed to investigate prenatal environmental exposures (e.g. phthalates) and preterm birth on the island. When Hurricane Maria struck Puerto Rico in September 2017, there were 93 pregnant participants actively involved in the study. Importantly, previous research suggests that pregnant women who experience a natural disaster are at higher risk of adverse birth outcomes. However, it is not clear whether these risks are due to stress, exposure to hazardous substances, or a combination of factors. Therefore, the aims of this research are to investigate hurricane-related chemical exposures and stress in relation to birth outcomes within the PROTECT cohort. In the fall of 2018, we administered a questionnaire regarding hurricane related experiences to women who were pregnant during Maria or who became pregnant in the aftermath (n=167). 110 women completed the questionnaire, 6 declined, 34 did not respond to calls or texts, and 6 phone numbers were disconnected. In preliminary analyses of exposure biomarkers, urinary metabolite concentrations of phthalates found in packaged foods and plastics were higher in urine samples collected after Maria compared to samples collected before. In contrast, a metabolite of a phthalate commonly used in personal care products was lower in post-hurricane samples. Analysis of questionnaire data and assessment of exposure to additional hurricane-related environmental contaminants is in progress. This work, along with ongoing community engagement efforts, will identify ways to minimize the impact of future natural disasters and climate change on maternal and child health in Puerto Rico.
SERUM BISPHENOL A AND HYPERTENSION AMONG THE KOREAN ADULTS: A CROSS-SECTIONAL STUDY

Jooeun Jeon* Jooeun Jeon, Keum Ji Jung, Yoonjeong Choi, Sun Ha Jee, (Department of Public Health, Graduate School, Yonsei University)

Objectives: To examine whether the temporal association between pre-hypertension and hypertension regarding to BPA exposure by using a cross-sectional study. Methods: The current study is based on the Korea Medical Institute (KMI, 2015-2018), a cross-sectional data of 1,500 subjects was analyzed to examine the associations of serum BPA value with pre-HTN or HTN. After stratifying by serum BPA tertiles (T), the multivariable logistic regression models adjusted for covariates examined the association of the serum BPA quartile groups with pre-HTN or HTN. Results: After applying exclusion criteria, there were 1,162 KMI subjects as a final sample. The mean age of the all of the sample was 39.2 years. We documented 372 cases of pre-HTN and 106 cases of HTN. Significant association with pre-HTN was showed with T2 and 3 versus T1 of serum BPA value (Odds Ratio (OR)=1.3, 95% Confidence Interval: 1.0-1.8 for T2; OR=1.4, 95% CI: 1.0-2.0 for T3). And, the temporal relationship was showed with only T3 versus T1 of serum BPA value, but it was no significant for HTN (OR=1.4, 95% CI: 0.8-2.3 for T3). Also, The positive association was consistently present in subgroup analyses by age, sex, smoking status, alcohol drinking, regular exercise, diabetes mellitus, serum cholesterol levels and body mass index (BMI) as independent confounding factors. Conclusions: In the general sample of Korean adults, we found that serum BPA concentration levels in humans were positively associated with HTN independent of confounding factors. If confirmed in future prospective studies, reducing environmental exposure to BPA may have a role in the prevention of hypertension. Keywords: Bisphenol A, Adult, Blood pressure, Hypertension, Cross-sectional studies * This research was supported by a grant (18162MFDS121) from Ministry of Food and Drug Safety in 2018. ‡Sun Ha Jee, PhD, MPH (Corresponding Author): jsunha@yuhs.ac

S/P indicates work done while a student/postdoc

![Graphs showing the association between serum BPA levels and blood pressure](attachment:image.png)
Exposure to ozone has been linked to reproductive outcomes, including preterm birth. In this systematic review, we summarize published epidemiologic cohort and case-control studies examining continuous ozone exposures in early pregnancy (1st and 2nd trimesters (T1, T2)) and preterm birth using ratio measures, and perform a meta-analysis to evaluate the potential relationship between them. Studies were identified by searching PubMed and Web of Science, screening according to predefined inclusion/exclusion criteria, and evaluating study quality. Effect estimates, confidence limits, study location, study years, mean or median ozone levels, exposure timing, and outcome definition were extracted for further analysis. Odds ratios were log transformed, and standard errors were estimated from 95% confidence intervals. Random effects meta-analysis was performed in the metaphor package, R 3.5.2 using RStudio. We identified 13 studies meeting inclusion criteria. Two studies did not report effect estimates for ozone, leaving 11 studies for inclusion in the meta-analysis, 9 with estimates for T1, and 6 for T2. The pooled OR (95% CI) for a 10 ppb increase in ozone exposure in T1 was: 1.07 (1.02, 1.13) with a 95% prediction interval of 0.90, 1.27; for T2: 1.04 (1.01, 1.07) with a 95% prediction interval of 0.96, 1.12. In a sensitivity analysis where the study with the strongest effect estimate was removed, pooled odds ratios were slightly attenuated but effects were similar (T1: 1.05 (1.01, 1.10), T2: 1.03 (1.01, 1.05)). In this systematic review, we identified positive associations between exposure to ozone in the 1st and 2nd trimesters of pregnancy and odds of preterm birth. High heterogeneity between studies suggests that study characteristics should be further explored to explain differences in study results. The views expressed in this abstract are those of the authors and do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency.
THE IMPACT OF HOUSEHOLD PROXIMITY TO BROWNFIELD SITES AND HIGH-TRAFFIC AREAS ON THYMIC ACTIVITY AND SYSTEMIC INFLAMMATION IN DETROIT, MICHIGAN
Evans K Lodge* Evans K Lodge, Allison E Aiello, (University of North Carolina at Chapel Hill)

Introduction: Environmental contamination from unremediated brownfield waste and high-volume traffic disproportionately impacts minority and low socioeconomic communities. The risk of exposure to industrial and traffic-related waste is particularly high in urban centers of the American Midwest. Using biomarker data from the Detroit Neighborhood Health Study (DNHS), we estimated the immunologic and inflammatory effects of household proximity to brownfield waste and heavy traffic in Detroit, MI. Methods: Using geocoded household data from 390 DNHS participants, we evaluated the impact of household proximity to brownfield sites (from the Michigan Department of Environmental Quality) and highways in Detroit’s 54 historic neighborhoods. We stratified traffic exposure by average annual daily traffic rates (from the Michigan Department of Transportation). We used linear regression to assess the impact of brownfield and highway proximity on 3 biomarkers of interest: signal-joint T-cell receptor excision circles (sjTRECs, a measure of thymic activity and adaptive immune function), C-reactive protein (CRP, a sign of systemic inflammation), and interleukin 6 (IL6, a proinflammatory cytokine). Results: Participants in our analysis were 82.3% African-American, with 65.9% earning <$35,000/year. In adjusted regression models, we found that household proximity within 200m of brownfield sites was associated with a 0.29 (95% CI = 0.55-0.02, p = 0.03) log-unit decrease in sjTRECs per million whole blood cells. We observed no associations between brownfield exposure and CRP or IL6. High-traffic areas were not associated with any biomarker of interest. Conclusions: Our results show that individuals living in close proximity to brownfield sites have significantly decreased adaptive immune function. These findings support the need for targeted brownfield clean-up in low socioeconomic and majority-minority neighborhoods to decrease racial health disparities due to environmental exposures.
ASSOCIATION BETWEEN VDR BSM I GENE POLYMORPHISM AND OSTEOPENIA AMONG ASIAN ELDERLY: A POPULATION-BASED CASE-CONTROL STUDY Guei Rung Chen* Guei Rung Chen, Dung Jang Tsai, Sui Lung Su, (National Defense Medical Center)

Background: Osteopenia is generally prevalent in the elderly population. Patients with osteopenia have higher risk of fracture and seriously affects their quality of life. The proportion of the elderly over 65 years old in Taiwan will reach 14.6% in 2019. Therefore, it is foreseeable that the number of patients with osteopenia will increase dramatically in next decades. The cause of osteopenia is relatively complicated. In addition to environmental risk factors, genetic factors also play an important role. Recent GWAS studies have found that bone density is associated with many genes. Vitamin D Receptor (VDR) gene polymorphism is reported to influence calcium absorption, which make this gene a biologically plausible risk factor for osteopenia. This study aimed to investigating association between VDR BSM I gene polymorphism and osteopenia among Asian population. Material and methods: We performed a case-control study and recruited 418 participants who received health examination at Health Management Center of Tri-Service General Hospital from March 2015 to August 2017. Demographic data were obtained by structured questionnaire, and bone mass density was measured by dual-energy x-ray absorptiometry (DEXA). Subjects with T-score lower than -1 was classified as osteopenia case group, t-score higher than -1 was classified as healthy control group. All data analyses were done by using R software version 3.4.2. Results: After adjusted for age, sex, and BMI, subjects with CT genotype shows insignificantly 52% lower risk of having osteopenia (OR = 0.48, 95% CI = 0.21 – 1.06). Subjects with T allele shows insignificantly 14% lower risk of having osteopenia (OR = 0.86, 95% CI = 0.43 – 1.72). Conclusion: Our study failed to detect significant association between VDR BSM I gene polymorphism and osteopenia among Asian elderly in present study. Key words: Gene polymorphism, Bone mineral density, Osteopenia, VDR BSM I
ASSESSING CAUSAL ASSOCIATIONS BETWEEN SERUM BILIRUBIN LEVELS AND STROKE RISK: A TWO-SAMPLE MENDELIAN RANDOMIZATION STUDY Yoonjeong Choi* Yoonjeong Choi, Jooeun Jeon, Keum Ji Jung, Sun Ha Jee, (Department of Public Health, Graduate School, Yonsei University)

Background: A number of epidemiological studies have reported that serum bilirubin, an endogenous antioxidant, is associated with cardiovascular diseases and stroke risk. However, evidence of a causal relationship between bilirubin and total stroke was not shown in our previous one-sample Mendelian randomization (MR) study. Methods: Two-sample summary MR was adopted to investigate causality using two non-overlapping Korean populations. From the Korean Genome and Epidemiology Study (KoGES), comprised of 25,406 participants, a total of 1,784 single nucleotide polymorphisms (SNPs) associated with serum bilirubin levels were discovered (p < 5.0E-8). Of these, 10 SNPs were identified as independent (R-squared < 0.005) and adopted as genetic instruments. With respect to stroke incidence, ischemic and total stroke cases (n=654 and n=1,489, respectively) with random controls (n=6,607) were selected from the Korean Cancer Prevention Study-II (KCPS-II) biobank. Several two-sample summary MR methods are employed including inverse-variance weighted (IVW), MR-Egger, and weighted median analyses. Results: We found inversely, and borderline significant causal relationship between serum bilirubin levels and ischemic stroke risk using IVW (OR per 1 mg/dL increase in bilirubin=0.30, 95% CI=0.09-1.07, p=0.06). However, no significant causal association was observed in total stroke risk (OR per 1 mg/dL increase in bilirubin=0.49, 95% CI=0.19-1.26, p=0.14). Conclusions: Our findings indicate a moderate causal relationship between high levels of bilirubin and decreased risk of ischemic stroke. And this result may explain the observational studies between bilirubin and adverse health outcomes such as ischemic stroke and other oxidative stress-related diseases.
CLINEPIDB.ORG: EPIDEMIOLOGIC DATA SHARING AND EXPLORATION THROUGH AN OPEN ACCESS RESOURCE

Brianna R Lindsay* Brianna R Lindsay, Cristina Aurrecoechea, Brian P. Brunk, Danielle Callan, Dave Falke, Steve Fischer, Danica Helb, Jay Humphrey, John Judkins, Jessica C. Kissinger, David S. Roos, Sheena Shah Tomko, Christian J. Stoeckert, Jie Zheng, (University of Pennsylvania, School of Arts and Sciences)

With the recognition that large-scale, high-quality datasets from diverse epidemiological studies hold immense potential for secondary data discovery and translational research, ClinEpiDB (https://clinepidb.org), launched in February 2018, is an open-access resource enabling investigators to maximize the utility and reach of their data and to make optimal use of data released by others. ClinEpiDB was developed using the existing infrastructure of EuPathDB (https://eupathdb.org), a collection of databases covering 170+ eukaryotic pathogens, which provides a sophisticated search strategy system enabling complex interrogations of underlying data. Currently, data integration into ClinEpiDB has occurred or is in process for NIH-supported International Centers for Excellence in Malaria Research (ICEMR), the Bill and Melinda Gates Foundation-supported Malnutrition and Enteric Diseases Network (MAL-ED), and the Global Enteric Multicenter Study (GEMS) projects. To facilitate data accessibility, heterogeneous data variables were standardized using Open Biological and Biomedical Ontology (OBO) Foundry ontologies and consistently represented in a unified semantic web framework. More than 1500 different data variables, over 50,000 participants, their associated anthropometry, demographics, and disease episodes were collected in these studies. In addition to powerful search tools, query results can be statistically analyzed and graphically visualized via interactive web applications, providing insight into distributions and exploratory associations with observational covariates. By ensuring de-identification, providing a space for critical methodological details and browser mediated access, ClinEpiDB can bridge the growing divide between researchers and data. The ClinEpiDB resource will continue to grow with integration of new datasets, enhanced tool development and significant user outreach and education.
ADOLESCENTS’ PHYSICAL ACTIVITY: CROSS-NATIONAL COMPARISONS OF LEVELS, DISTRIBUTIONS AND DISPARITIES ACROSS 52 COUNTRIES
David Bann* David Bann, Shaun Scholes, Meg Fluharty, Nikki Shure, (University College London)

Despite global concerns regarding physical inactivity, limited cross-national comparative evidence exists amongst adolescents. Using data from 52 high and low-middle income countries (2015), we compared average activity levels and disparities—for gender and socioeconomic status (family wealth quintiles). We also examined correlations with potential country-level determinants of activity—school physical education (PE) curriculum time allocation (from UNESCO), wealth (Gross Domestic Product), and income inequality (Gini coefficient; from the World Bank). The Programme for International Student Assessment was used, a representative cross-sectional survey of 15-year-olds (N=347,935). Students reported average attendance (days/week) in PE classes, and the days/week moderately (MPA) and vigorously (VPA) active outside of school. Activity levels inside and outside of school were higher in Eastern Europe than Western Europe, the Americas, and the Middle East/North Africa. Comparisons of average levels masked potentially important differences in distributions. For example, in contrast to most other nations, activity levels showed a bimodal distribution in the US (mean PE class attendance 2.4 days/week; 41.3%, 6.3% and 33.1% of students attended PE classes on 0, 2 and 5 days/week). Pro-male and pro-high wealth disparities were modest for participation inside school, but higher for MPA and VPA outside of school. The magnitude of these also differed markedly by country. Activity in school was weakly positively correlated with PE curriculum time allocation (Pearson’s r=0.33); activity outside of school was strongly negatively correlated with income inequality (e.g. r=-0.69 for MPA). Our findings reveal extensive cross-country differences in adolescents’ physical activity and highlight potential means of increasing activity, such as via country-level PE allocations. Our findings also highlight the potential utility of educational databases for use in global health research.
ASSOCIATION BETWEEN CESAREAN DELIVERY AND EARLY CHILDHOOD DISEASES IN BANGLADESH: A POPULATION BASED STUDY Md Jamal Uddin* Md Jamal Uddin, Jenifar Jahan, Mohammad NayeemHasan, Sumyea Jahan, Muhammad Abdul Baker Chowdhury, , (Department of Public Health, University of Copenhagen, Denmark)

The rate of cesarean delivery (C-section) has increased worldwide including Bangladesh over the past decades. As the C-section is a major surgery, it has a negative impact on mother and child health. However, research on this area in Bangladesh is sparse. We aimed to inspect the association between C-section delivery (vs. normal delivery) and infantile disease (e.g. cough, diarrhea, difficulty in breathing). We used multiple indicator cluster survey (MICS) data (2012-13). There were 7921 children under 2 years, of which the information of the mode of delivery (C-section vs. normal) was available for 2138 children. Important factors were considered as age and sex of child, age of mother, weight at birth, child ever been breastfed, child's weight during the survey, child's length or height, area of birth, mother's education, religion of household head, wealth index. The outcome (diseases) variable was created using the childhood diarrhea and/or cough with difficulty in breathing. Data were analyzed using Poisson regression (for count outcome) and propensity score method (for binary outcome). We found that 62% children were born in C-section. Moreover, we observed 33% of C-section babies were suffered from more than 3 diseases whereas the percentage for the normally delivered babies was 20%. The crude and adjusted Poisson analyses showed that the relative risk for the C-section was 1.06 (95% confidence interval (CI): 1.00-1.11) and 1.07(95% CI: 0.96-1.18), respectively. From the propensity scores models, the adjusted odds ratios for the C-section was 1.10 (CI:.93-1.50), though the association was not statistically significant. Our analysis shows that there was an increased risk for getting early childhood disease for cesarean delivered children. We recommend increasing public awareness for the negative impact of the cesarean delivery on the child health in Bangladesh.

Despite the substantial negative health and social impact of earthquakes, studies exploring the long-term survival in the aftermath of earthquakes are scarce. The current study sought to investigate the impact of earthquake-related housing damage on all-cause mortality using data from a prospective cohort of surviving adults with differential exposure levels to the 1988 earthquake in Armenia. A total of 23,639 individuals were followed after the earthquake for at least 3 years, with a sub-cohort of more than 1700 individuals followed up to 23 years. Housing damage was measured as no damage, moderate damage, and total destruction. Random survival forest algorithm was employed to impute the survival outcome of censored individuals. We transformed the dataset with the imputed outcomes into discrete person-time and created natural cubic splines of time since the earthquake with five knots at years 2, 6, 12, 17, and 22. The discrete time survival analysis adjusting for age, gender, education, standard of living, place of residence, earthquake related death in the family, and injury was used to obtain the hazard of death for individuals with different levels of housing damage. A Monte Carlo simulation was applied to integrate the hazards over time and estimate the cumulative survival probabilities. Those with no damage to their housing due to the earthquake had an average 23-year cumulative survival probability of 0.75 (95%CI: 0.74, 0.76) while those with a total destruction of housing had a 23-year cumulative survival probability of 0.72 (95%CI: 0.70, 0.73) (figure 1). Our results indicate that total destruction of housing had a notable and long-lasting effect on survival. The findings could help public health practitioners to target vulnerable populations and guide future research.

Figure 1. Cumulative survival probability among a cohort of the 1988 Spitak earthquake survivors during 1988-2012, by housing damage levels, using outcome data partially imputed by random survival forest algorithm.

- All the measures are standardized for age, age squared, gender, education in years, standard of living at the time of earthquake, place of residence (region), earthquake related death of a family member, and serious injury among the total baseline population
- Point estimates and 95% confidence limits are based on the 50th, 2.5th, and 97.5th percentile obtained from 5000 bootstrap sample estimates

S/P indicates work done while a student/postdoc
ASSOCIATIONS BETWEEN CADMIUM AND TASTE AND SMELL DYSFUNCTION AMONG ADULTS IN THE 2011-2014 NHANES Yi Zheng* Yi Zheng, Hui Hu, (Department of Epidemiology, University of Florida)

Background: Cadmium is a ubiquitous environmental pollutant and has been associated with many adverse health outcomes. However, little is known about the effect of cadmium exposure on taste and smell dysfunction. Methods: We used the National Health and Nutritional Examination Survey (NHANES) 2011-2014 to investigate the associations between blood cadmium and taste and smell dysfunction among 5,041 adults aged 40 years and older. Results: In logistic regression models adjusting for age, gender, race/ethnicity, and education, individuals with blood cadmium level in the highest tertiles have significantly higher odds of having smell problem (OR=1.35, 95% CI: 1.02,1.80), change in ability to smell (OR=1.55, 95% CI: 1.14,2.10), phantom odor (OR=1.74, 95% CI: 1.11,2.72), taste problem (OR=1.65, 95% CI: 1.05,2.60), and persistent taste in month (OR=1.60, 95% CI: 1.03,2.47). After further adjusting for body mass index (BMI), cigarette smoking, alcohol drinking, diabetes, high blood pressure, and lifetime head injury or loss of consciousness, consistent results were observed for taste problems (OR=1.76, 95% CI: 1.05,2.93), and no statistically significant associations were observed between blood cadmium and other outcomes. Conclusions: Our findings suggest that cadmium exposure is associated with taste dysfunction. Further studies are warranted to confirm our findings.

Significance: Exposure to structural stigma (i.e., societal norms and policies that constrain access to resources) has been proposed as an explanation for sexual orientation disparities in smoking. However, studies have not examined whether this relationship persists after adjustment for tobacco control policies nor whether the association between structural stigma and sexual minority (SM) smoking is modified by sex. Methods: A measure of SM structural stigma was developed using principal components analysis to capture multiple state-level environmental stigma indicators, including laws regarding same-sex marriage, employment non-discrimination, and hate crimes; the density of same-sex couples; and attitudes towards same-sex marriage. The outcome variable was current smoking, derived from adult respondents (ages 25 and older) from the National Adult Tobacco Survey (2012-2014). Poisson regression models stratified by sexual minority status (gay, lesbian, or bisexual v. heterosexual) were used to explore the relationship between structural stigma score and the relative risk of current smoking, with adjustment for individual and state-level socio-demographic factors, tobacco control policies, and year fixed effects. Effect modification by sex was explored using models stratified by both sexual orientation and sex. Results: In adjusted models, the relationship between the structural stigma score and current smoking was marginally statistically significant among SM individuals (RR=1.11; 95% CI=0.99, 1.24), while stigma was not associated with smoking among heterosexuals. After stratifying by sex, structural stigma was associated with greater current smoking for SM males (RR=1.23, 95% CI=1.04, 1.45). There was no association between stigma and smoking for SM females, or heterosexual males or females. Conclusions: According to our analysis, structural stigma may contribute to smoking among SM males but not SM females.
THE ASSOCIATION BETWEEN NEIGHBORHOOD POVERTY AND ADVERSE BIRTH OUTCOMES IN HISPANIC WOMEN
Brittany Rosen*, Brittany Rosen, Lisa Chasan-Taber, Penelope Pekow, Brian Whitcomb, Qian Yu, (University of Massachusetts School of Public Health and Health Sciences)

Approximately one in every nine babies in the United States is born premature and has low birth weight. Rates in Puerto Rican women (14.5%) are second only to those in non-Hispanic Black women (18.3%). Disparities also exist by socioeconomic status. However, established risk factors only account for a portion of the disparities in these adverse outcomes. Other factors that could account for these adverse outcomes include environmental, contextual, and neighborhood-level factors. These are of particular interest because of their potentially modifiable nature. Therefore, we propose to evaluate the association between neighborhood poverty and adverse birth outcomes using data from Proyecto Buena Salud, a prospective cohort study of 1,610 Hispanic women conducted from 2006-10. We will map participant addresses using census-bureau data in order to measure neighborhood poverty. Neighborhood poverty information will be abstracted from 2006-10. Participants will be placed into neighborhood groups based on census block. Information on adverse birth outcomes will be abstracted from medical records. Multivariable logistic regression will be used to model the association between neighborhood poverty and adverse birth outcomes adjusting for individual demographic, medical, and socioeconomic variables. The proposed study is innovative as the first, to our knowledge, to study neighborhood poverty and adverse birth outcomes in a Hispanic subgroup. The proposed study is significant in evaluating a potentially modifiable risk factor for birth outcomes with an impact on the future health of children.

S/P indicates work done while a student/postdoc
A BLOCK GROUP LEVEL CHILD OPPORTUNITY INDEX FOR THE BOSTON METROPOLITAN AREA

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Objectives: To determine whether the Child Opportunity Index, a measure of relative education, health and environment, and social and economic opportunities across census tracts within a metropolitan area (tract-COI) could be scaled to the block group level (bg-COI) for Boston, MA. We hypothesized that the bg-COI would provide a more precise measure of the heterogeneity of opportunity structures in a city with a high population density. Methods: We defined the target year as 2010. At the block group level, we first calculated a standardized z-score for each indicator. We then computed sub-index scores for three dimensions by averaging the z-scores. We finally calculated the overall child opportunity index score by dividing the sum of the z scores. We analyzed the internal correlations using Pearson correlation coefficients (PCC), and we investigated the correlations between bg-COI and block group level median household income, median home value and employment rate. Initial Results: Block group median household income, median home value and employment rate are highly correlated with overall bg-COI (PCC: 0.57-0.62). There is variability in the correlation of each of the subcomponents of bg-COI and the overall bg-COI (PCC: -0.21-0.72). The correlations between the three dimensions of the bg-COI are weak to moderate (PCC: 0.20-0.45), which supports the distinct dimensions they capture. Conclusions: Block group level COI preserves the multidimensional properties of the tract-level COI. We found high level correlations between bg-COI and block group housing and economic indicators. The block group level COI has the potential to be a more precise measure of the nature and degree of inequity in opportunity structures that promote optimal health, development, and wellbeing for children across metropolitan regions.

S/P indicates work done while a student/postdoc
DOMINANT PREDICTORS OF ADULT ASTHMA PREVALENCE VARY BY SEX, RACE, AND SOCIOECONOMIC STATUS IN THE UNITED STATES – FINDINGS FROM THE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM, 2001–2010

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Background: There are many risk factors for asthma that are preventable, such as obesity, smoking, and aspects of healthcare. Multivariable regression models are frequently used to determine the relative strengths of these asthma associations while controlling for potential confounders. However, comparative strength of association from a multiple regression analysis does not necessarily also reflect relative predictive ability, because factors are often correlated. Instead, relative ‘importance’ of inter-related factors is better assessed using dominance analysis, which considers covariate explanatory ability in a model, and all subsets of that model. Dominance analysis thereby encompasses all contexts of a covariate’s ability to predict the outcome and so is a highly recommended adjunct to traditional regression analyses. The relative importance of risk factors involved in U.S. asthma disparities by race and/or socioeconomic status (SES) has not yet been investigated. Objectives: Which asthma predictors are the most important among U.S. adults, and does importance vary by sex, race, and/or SES? Methods: Dominance analysis, with multivariable logistic regression using 2001-2010 BRFSS asthma prevalence data stratified by sex and either race or SES, was conducted to investigate the relative predictive abilities of eight different categorical covariates: geographic region, time period, age, body mass index, smoking status, healthcare coverage, healthcare provider, and either race or SES (as measured by education attainment). Results: The dominant predictors of U.S. adult asthma prevalence depend on sex and race, as well as education attainment. Conclusions: Dominance analysis provided additional insight into the results of multiple regression analyses on asthma prevalence, lending further support for increased recognition that elevated asthma prevalence is closely related to preventable factors of social disadvantage.
Survival differences by race/ethnicity have been reported in children and adolescents with germ cell tumors (GCTs). Whether these differences depend on stage of disease is unclear. Using the SEER 18 registries (2000-2015), we examined GCT survival differences by race/ethnicity (non-Hispanic white [NHW], non-Hispanic Black, Asian/Pacific Islander [API], Hispanic) separately for males and females aged 0-19 years. We used Kaplan Meier survival curves (Log-Rank p-values) to visualize differences in overall survival. We estimated sex-specific 5-year survival percentages. Cox proportional hazards models were used to estimate hazard ratios (HR) and 95% confidence intervals (95% CI) for the association between race/ethnicity and death. We used inverse odds ratio weighting to evaluate whether stage of disease mediated the association between race/ethnicity and death. We observed significant differences in tumor histology, tumor location and stage of disease by racial/ethnic group among males and females (all p≤0.02). In females, there were no significant racial/ethnic differences in overall survival. Male overall survival differed by race/ethnicity (p<0.0001). NHW males had the best 5-year survival (94%) and API males had the worst (85%). Compared to NHW, API and Hispanic males had significantly higher risks of death (API HR: 2.18; 95% CI: 1.32-3.56; Hispanic HR: 1.98; 95% CI:1.42-2.78) (Figure 1). This association was mediated by stage of disease among Hispanic males with gonadal GCTs (indirectHR: 1.18; 95% CI: 1.03-1.35) (23% Hispanic, 16% NHW males diagnosed at distant stage, chi-square p=0.002). The increased risk of death after a GCT diagnosis observed among Hispanic males with gonadal GCTs was mediated by stage of disease. For API and Hispanic males other unidentified factors including differences in exposures, tumor biology or treatment received may impact the observed racial/ethnic survival disparities in children and adolescents with GCTs.
Socioeconomic Inequalities in Vector Borne Diseases in Latin America: Estimating and Decomposing the Relative Concentration Index of Inequality for Dengue, Zika and Chikungunya in Colombia and Brazil

Mabel Carabali, Sam Harper, Andrea Caprara, Antonio Lima Neto, Jay S. Kaufman, (McGill University, Canada)

Dengue, chikungunya, and zika are arboviruses transmitted to humans by the same vector: Aedes sp. mosquitoes. These endemic diseases in Latin America have similar symptomatology, no specific curative treatments, and no effective vaccines. Although socioeconomic and ethnic inequalities are not evident for notified cases, dengue deaths and severe forms of zika and chikungunya are more common among people in low socioeconomic position, people with low education, and among people with African ancestry. We used data on all notified cases from 2008 to 2017 in Cali, Colombia, and Fortaleza in Brazil, to estimate the magnitude of socioeconomic inequalities. We used spatiotemporal-adjusted, neighborhood-level monthly incidence rates and income data to estimate the relative concentration index of inequality (RCI). To identify the main contributors to inequality, we decomposed the RCI and described time trends. The a priori covariates included in the RCI decomposition were age, sex, occupation, education, as well as neighborhood-level climate, entomological, and social variables. We fitted overall, disease-specific and ethnic specific-models, including semiparametric functions for time and cluster-robust standard errors. The overall RCI was -0.01 (95% CI= -0.02, 0.00) while the RCI among Whites was -0.02 (95% CI= -0.03, -0.00) and among Non-Whites was -0.04 (95% CI= -0.05, -0.03); indicating greater relative concentration of disease among people at lower incomes, which was stronger among non-whites. The main contributors to inequality were water supply (36%) and education (18%). Education was the main driver of the inequalities across ethnic groups, but a change in the distribution of covariates is expected across each arbovirus. Our quantitative assessment provides estimates using data from the last 10 years in two endemic Latin American cities that highlight the contribution of social determinants to inequality in vector-borne diseases.
NEIGHBORHOOD SOCIOENVIRONMENTAL FACTORS ASSOCIATED WITH ASTHMA EMERGENCY DEPARTMENT VISIT DISPARITIES USING A SPACE-TIME MODEL: A CASE STUDY IN SOUTH CAROLINA 1999-2015 Matthew Bozigar* Matthew Bozigar, Andrew Lawson, Erik Svendsen, John Pearce, Allison Aiello, Kathryn Cristaldi, (Medical University of South Carolina)

Long-term disparities in asthma, the leading chronic disease for children, are difficult to disentangle using existing data and methods. Limitations in previous studies using population-wide hospitalization data include inadequate control for confounders, especially when aggregated to spatial units for analysis. In this research, we employ geographic imputation, variable selection, and include numerous spatial and temporal random effects at multiple scales in a Bayesian framework to build a model of census tract risk for emergency department (ED) visits due to asthma among South Carolina children from 1999 to 2015. By reducing spatio-temporal confounding, this approach can both improve the precision of estimates of the effects of socioenvironmental factors (e.g., air pollutants, neighborhood qualities) and improve risk model fit, critical for accurately identifying disparities across numerous factors (e.g., rural/urban, race). In addition, by conducting the analysis at the census tract level, we leverage spatial units and measures devised by the US Census for homogenous population groups that further improve precision of neighborhood effects. We address potential effect modification that may occur in socioeconomically deprived neighborhoods via inclusion of interaction terms during the variable selection process. Results show that increased distance to a pharmacy was associated with increased asthma ED visit risk, and there were statistically significant air pollutant interactions with annual SO2 concentrations including CO, NO2, and O3. Furthermore, several socioenvironmental factors typically associated with poor asthma outcomes were not significant including annual particulate matter (PM) concentrations, road density, and urban residence. Contrary to findings of previous research, these results indicate an overall asthma ED visit burden in rural areas in South Carolina, but that rurality itself is not a driver when disaggregated into its components.

Ran Zhao*, Ran Zhao, Anna Prizment, Shalini Kulasingam, Benjamin Capistrant, (University of Minnesota Epidemiology and Community Health)

Objectives: To determine whether there are racial disparities in Human Papillomavirus (HPV) vaccination initiation or completion among U.S. adolescents. Methods: In this cross-sectional study, we analyzed data on U.S. adolescent boys and girls aged 9-17 years old using three of the National Health and Nutritional Examination Survey (NHANES) waves from 2011-16 (n=1519, 1533, 1417 for waves 2011-12, 2013-14, and 2015-16, respectively). The outcomes were HPV vaccine initiation among all adolescents and completion among initiators. After adjusting for age, annual family income, parent education, and insurance coverage, the ORs of initiation or completion among Hispanics, Blacks, and Asians (referred to as racial/ethnic minority) versus Whites were compared using logistic regression. Results: From 2011-2016, overall initiation was less than 40% and 30% among adolescent girls and boys, respectively. Black or Hispanic girls were more likely, and Asians less likely to initiate compared to White girls. In wave 2013-14, Hispanic girls had 2.0 times the odds of initiation compared to White girls (95% CI 1.2-3.4). Although racial/ethnic minority boys were more likely to initiate the vaccine compared to White boys, this difference was not statistically significant. Racial/ethnic minority girls were less likely to complete the series compared to White girls, while the opposite effect was seen in boys. In wave 2015-16, Black and Asian boys had 1.9 and 3.0 times the odds of completion compared to Whites (95% CI 1.1-3.5 and 1.1-7.9), respectively. Asian adolescents tended to have the lowest initiation compared to their peers. The prevalence of initiation increased from approximately 10% in 2011-12 to over 30% in 2015-16 among boys but not among girls. Conclusion: HPV vaccination status varies among racial/ethnic groups. Future efforts should be made to achieve the Healthy People 2020 goal of 80% vaccination among all U.S. adolescents and to address the gap among Asian adolescents.

Figure 1: Predicted prevalence of Human Papillomavirus (HPV) vaccine initiation among U.S. adolescents age 9-17 (A and B) and completion among initiators (C and D). National Health and Nutritional Examination Surveys (NHANES), 2011-2016.
Influenza (flu) caused 48.8 million illnesses during the 2017-18 flu season. An annual flu vaccination (AFV) is a simple, effective way of reducing the flu's impact, yet less than 50% of US adults receive one. While AFV rates are influenced by health insurance coverage, does the relationship vary based on the type of coverage? This study sought to determine if an association exists between an individual's health coverage type (HCT) and their receipt of an AFV using the 2017 Behavioral Risk Factor Surveillance System. Among respondents, 41.0% had received a flu vaccination within the last 12 months. A statistically significant difference (p<0.0001) exists between genders with men at 38.1% and women at 43.7%. When asked about their primary source of health care coverage, 12.9% purchased their own coverage, 52.7% purchased through an employer/union, 8.2% used Medicaid, 20.6% used Medicare, and 5.6% used other sources including Tricare, the VA, Indian Health Service, or “Some other source”. Medicare coverage is significantly associated with an increase in AFV for both men (AOR 1.62 [95 % CI 1.28-2.05]), and women (AOR 1.24 [95 % CI 1.02-1.53]), when compared to employer/union-based coverage. For men, other sources of coverage are significantly associated with an increase in AFV (AOR 1.67 [95 % CI 1.27-2.19]), while for women, obtaining coverage on their own is significantly associated with a decrease in AFV (AOR 0.75 [95 % CI 0.57-0.97]). For men, being married and having Medicare (AOR 1.47 [95 % CI 1.11-1.95]) or being married and having other sources of coverage (AOR 1.99 [95 % CI 1.40-2.82]), are significantly associated with an increase in AFV. For women, only being married and having Medicare coverage was significantly associated with an increase in AFV (AOR 1.56 [95 % CI 1.17-2.07]). These findings are of interest to health policy makers as it indicates improved health plan design could help the US reach its Healthy People 2020 AFV coverage goal of 70%.
In Canada, avoidable hospitalizations are those for a set of seven chronic conditions that can be effectively managed in outpatient care, including angina, COPD, and diabetes. Hospitalizations for these conditions signal inadequate access to or quality of care, and are indicative of health system underperformance. While social, gender, and geographic inequities have previously been described, these studies were based on limited cohorts. The objective of this study is to describe population-based risk factors for avoidable hospitalizations among a representative national cohort using newly available, individual-level, linked health survey and avoidable hospitalization data (N = 389,067). The cohort pools eight cycles of the Canadian Community Health Survey (2001-2011) linked to fourteen years of hospital discharge records (1999-2013), excluding those younger than 18 years or older than 75 years of age at time of interview, Quebec residents, and pregnant women. Weighted descriptive statistics were calculated to describe the cohort. Respondents who experienced at least one prospective avoidable hospitalization event were identified using International Classification of Diseases-9 and -10 codes according to standard case definitions. Preliminary results from sex-stratified univariate and age-adjusted Cox proportional hazard models identified a number of sociodemographic, behavioural, health status, and health utilization risk factors. These factors are being analyzed in multivariable models and results of this analysis will be presented. This work will uniquely advance our understanding of individual- and population-level risk factors for avoidable hospitalizations using survival analysis and novel individual-level linked data at the national level.
Objective: This study sought to determine how participation in trauma-informed peer support financial empowerment programming affects household food security, especially for those reporting depression and Adverse Childhood Experiences (ACEs), consisting of exposure to violence, abuse, and adversity. Methods: Caregivers of children <6yrs participating in TANF and other assistance programs joined The Building Wealth and Health Network for 16 sessions of trauma-informed peer-support programming that worked with participants to address emotions, social and family dynamics, and to practice financial management skills. Over the course of 12 months, participants responded to baseline and three-month surveys 2015-2017. At 12 months, all participants that responded to baseline and 12mo surveys (n=208) were categorized into two groups; those participating in ≥4 sessions (High participation) were compared to those participating in <4 sessions to assess household food security (Low participation). Participants were recruited from county assistance offices and community-based settings in Philadelphia, PA Results: Participant characteristics did not statistically differ by group. After adjusting for covariates and interaction between attendance, ACEs and depression, the treatment group was 62% less likely to report household food insecurity, compared to the control (AOR=0.38, 95% CI:0.20-0.73). After adjustment for current depression status, treatment was associated with decreased likelihood of food insecurity (AOR=0.33, 95% CI:0.12-0.91). Conclusions: Participation in trauma-informed peer support programming is associated with reduced odds of household food insecurity. Programming that utilizes a trauma-informed approach can be integrated into public assistance programming to improve food security.
CAN HEALTH LITERACY BOOST HEALTH SERVICES UTILIZATION IN THE CONTEXT OF EXPANDED ACCESS TO HEALTH INSURANCE? Shiho Kino* Shiho Kino, Ichiro Kawachi, (Harvard T.H. Chan School of Public Health)

Background Health insurance access and health literacy are critical components of “enabling resources” to encourage uptake of services. We sought to test whether health literacy boosts health services utilization in the context of expanded access to health insurance stemming from the ACA. Methods We used individual-level data from 12 states and DC included in BRFSS 2016. We conducted a two-stage least squares instrumental variables analysis. We instrumented improved access to health insurance stemming from ACA Medicaid expansion. As outcome variables, we examined cost as a barrier to needed care, having a personal doctor and receipt of routine health check-ups, flu shots, Pap tests, mammograms, sigmoidoscopy/colonoscopy and dental visits in the past year. We then tested whether the relation between improved health insurance access & health services utilization was moderated by health literacy. Health literacy was measured by a dichotomized scale comprising three items: difficulties obtaining advice or information about health, difficulties understating information from health professionals, and difficulties understanding written health information. Results We found improving health insurance access increased dental visits, health check-ups and flu vaccination. We also found the interaction effect between health insurance and health literacy on dental visits. However, there was no significant interaction effect between insurance access and health literacy for preventive services utilization. Conclusion Improved access to health insurance appears to be more beneficial for those with high health literacy in boosting dental visits. However, health literacy did not explain why people fail to access preventive services even when they obtain access to insurance.
Introduction: Estimates of retention in HIV care may be biased if patients who switch clinics are misclassified as lost to follow-up (LTFU) at their original clinic. The degree of misclassification in retention estimates due to clinic switching has not been well quantified. Methods: We harmonized clinical, laboratory, pharmacy and vital status data for HIV-infected adults initiating antiretroviral therapy (ART) in a sub-district of Cape Town, South Africa from 2012-2016. Participants were followed from ART initiation until they became LTFU (> 120 days with no visits), died, or were administratively censored in 2016. Clinic switching was defined as moving to a clinic other than where the participant started ART. We estimated the cumulative incidence of retention, over time and by gender, using Kaplan-Meier methods and considering: 1) only records from a participant's ART initiation clinic (not accounting for switches) and 2) all records (accounting for switches). We estimated risk differences and bootstrapped 95% confidence intervals to quantify misclassification in retention estimates due to clinic switching. Results: We included 3,062 adults on ART (66% women, 34% men), who contributed 61,071 person-months. Participants were followed for a median of 13-16 months, depending on if clinic switching was considered; 42 deaths occurred. Estimates of LTFU fell from 1,876 (61.3%) to 1,701 (55.6%) after accounting for clinic switching. Misclassification varied over follow-up and peaked 9 months after ART initiation, with 66.7% retained not accounting for clinic switching versus 73.7% accounting for switching (RD 7.0%, 95% CI 6.3%, 7.7%; Figure). Over time, misclassification was slightly higher among women (3%-8%), compared to men (3%-5%). Conclusions: In a large HIV treatment program in South Africa, retention in HIV care was underestimated by up to 7% due to misclassification of clinic switches. Future studies should account for misclassification due to clinic switching.
Depression is common among people living with HIV around the world and has been linked to lower retention in care and suboptimal antiretroviral therapy (ART) adherence. While recent evidence shows that ART can prevent onward HIV transmission, the success of “treatment as prevention” strategies depends on high ART adherence.

To support new global guidelines which call for initiating ART as soon as possible after diagnosis, knowledge about the prevalence and consequences of depression among newly diagnosed ART initiates is urgently needed.

From April to December 2018, we evaluated depressive symptoms among 530 HIV-infected adults who had initiated ART within the last 30 days and who were participating in an economic intervention trial at four health facilities in Shinyanga region, Tanzania. Participants were assessed upon study enrollment using the Hopkins Symptoms Checklist (HSCL-25) to identify symptoms consistent with major depression. We used generalized linear models adjusting for sociodemographic characteristics to determine the associations between: a) time since HIV diagnosis and depression; and b) depression and attendance at the subsequent clinical appointment, typically 14 to 30 days later. The majority of participants were female (62%), the median age was 35 years, and the median time since HIV diagnosis was 20 days. Nearly one in four participants had depressive symptoms (24%), with a higher prevalence among women (29%) compared to men (15%). HIV diagnosis within the past week was associated with depression after multivariable adjustment (Risk ratio = 1.49; 95% confidence interval: 1.10, 2.03). Depression was not associated with attending the subsequent clinical appointment (Risk ratio = 1.02; 95% confidence interval: 0.81, 1.28). These findings underscore the need for integrated mental health evaluation and treatment in HIV care. Longer follow-up time may further elucidate the consequences of depression on treatment outcomes among ART initiates.
SEXUALLY TRANSMITTED INFECTIONS AND SEXUAL BEHAVIOR IN THE UNITED STATES: STABILITY AND POTENTIAL BIAS OF ESTIMATES FROM THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES) Elaine W. Flagg* Elaine W. Flagg, Elizabeth A. Torrone, (Centers for Disease Control and Prevention) 

Introduction The National Health and Nutrition Examination Survey (NHANES) of the U.S. population has been administered continuously since 1999. However, declining response rates may result in biased estimates, and small gender and age-group specific sample sizes may produce unstable estimates for uncommon attributes and conditions. Methods NHANES demographic data are collected during an in-person home interview; self-interview sexual behavior data and biospecimens are collected in a mobile examination center. Gender and age-specific specimens are tested for several sexually transmitted infections (STI). We examined response rates and stability of STI prevalence estimates by gender and 10-year age group for each 2-year survey cycle through 2016 (e.g., 2003–2004 chlamydia prevalence among females aged 20–29 years); estimates with relative standard errors (RSE) between 30% and 50% are potentially unstable and those with RSE > 50% are considered unstable. Results STI test completion rates decreased from 67–72% during 1999–2001 to 53–55% during 2015–2016, while participation in the sexual behavior questionnaire declined from 67% to 49%. Gender and age-group specific prevalence estimates for herpes simplex virus type 2 were stable across the 2-year cycles, but 73% of cycle-specific HIV estimates were unstable. For chlamydia and T. vaginalis cycle-specific estimates, respectively, 36% and 19% were unstable; 47% and 63% were potentially unstable. Stability of human papillomavirus (HPV) prevalence estimates was dependent on the types examined; 29% of estimates for HPV 6 and 11 were unstable and 57% were potentially unstable. Conclusion Response rates for NHANES are decreasing for the STI and sexual behavior components, raising concerns that estimates from these data may be biased. Small gender and age-specific sample sizes in NHANES produced unstable prevalence estimates for several STIs, limiting the usefulness of these data for investigation of factors associated with STI.
MEDIATION OF RACIAL DISPARITIES IN CERVICAL CANCER AMONG WOMEN LIVING WITH HIV
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Background: Racial disparities are reported for cervical cancer screening among women living with HIV, which may be related to receipt of comprehensive HIV care. We aimed to assess whether racial disparities could be attenuated by use of a comprehensive HIV care clinic. Methods: We used data from the JPS HIV Care and Outcomes Registry, which includes people living with HIV aged ≥18 years who received care at JPS Health Network (urban health system in Texas) between January 2013 and June 2018. Non-Hispanic Black or White women living with HIV aged ≥21 years with ≥3 years of follow-up were eligible for this study. Cervical cancer screening was defined according to current guidelines. Our mediator of interest was use of JPS Healing Wings Clinic, which is funded by the Ryan White program and provides comprehensive HIV care. We used a marginal structural model to estimate a counterfactual disparity measure comparing cervical cancer screening differences between non-Hispanic Blacks and Whites assuming a hypothetical intervention that promoted use of Healing Wings Clinic rather than other primary care or specialty clinics within the health network. Results: Our study population comprised 407 women living with HIV, of whom 71% were non-Hispanic Black, 63% were aged <50 years, 46% received care at Healing Wings Clinic, and 50% were screened according to guidelines. Screening was lower for non-Hispanic Blacks compared with non-Hispanic Whites (risk difference [RD]= -1.1%, 95% confidence limits [CL]: -12%, 9.7%). If all women in this population attended Healing Wings Clinic, then RD for racial disparities would be -1.9% (95% CL: -17%, 13%). Conclusions: Assuming negligible biases, our results suggest that use of a comprehensive HIV care clinic may not reduce racial disparities in cervical cancer screening in our population. This finding may be explained by the modest racial disparities in our population given that the health system provides care regardless of ability to pay.

S/P indicates work done while a student/postdoc
VALIDITY OF SELF-REPORTED VACCINATION STATUS AMONG COLLEGE STUDENTS

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Background Little is known about the validity of self-reported vaccination status among young adults, or about reasons why they choose not to be vaccinated during a disease outbreak. From March 2013-March 2014, 9 cases of serogroup B meningococcal(MenB) disease occurred in young adults linked to University A. In response to the outbreak, the 4CMenB vaccine was made available to students during University-led clinics; students were recommended to receive 2 doses of vaccine, spaced 10 weeks apart. Methods We surveyed 607 students regarding their vaccination status 2 months after the second MenB dose was offered; 588 had complete University clinic vaccination records. 20 months after the second dose, we re-surveyed 197 students. We calculated concordance between clinic records and self-reported number and timing of vaccine doses. Results Two months after the second dose, 99.2%(95%CI: 98.4-99.9%) correctly recalled the number of doses they received. 80 participants incorrectly recalled the timing of ≥1 dose. Incorrect recall of the first dose was nearly always at a later date compared to clinic records (95.3%, 95%CI: 76.2-99.9%), and incorrect recall of the second dose was more often at an earlier date (56.5%, 95%CI: 44.8-68.2%). 20 months after the second dose, 93.9% (95%CI: 90.6-97.3%) correctly recalled the number of doses they received. 39/588 survey respondents with complete vaccination records chose not to be fully vaccinated(received ≤1 dose); common reasons cited for incomplete vaccination included concern about side effects(n=14), and a lack of concern about MenB disease(n=13). Conclusions We found that self-report accurately reflects true vaccination status among young adults up to 20 months after vaccination during an outbreak. Although medical records remain the gold standard for documenting vaccination history, our evidence suggests that self-reported vaccination status is a valid source of information in situations where accessing these records is impractical.

Background: During 2000–2016 in North Carolina (NC), reported incidence of Legionnaires’ disease (LD) increased ~4-fold, similar to national trends. To determine if increasing disease burden in NC is attributable to increased testing, we evaluated the number of LD diagnostic tests performed and positivity rate over time.

Methods: We requested reports for the number of LD diagnostic tests performed and number positive during 2010–2017, by year and test type (urinary antigen test [UAT], serology, culture, or other) from MicroNet members, representing all ~120 NC hospitals. We calculated percent of positive tests by year and test type and used Poisson regression to estimate changes in positivity rate over time. Results: Twenty hospitals provided data; 544 tests were positive, representing 47% of reported LD cases during the same period. Analyses included data from eight hospitals with complete data for all years and test types, including five of NC’s largest hospital systems. The total number of tests performed increased from 5,138 in 2010 to 9,729 in 2017. UATs were the most frequently reported test across all years (4,524 [88%] in 2010 to 7,487 [77%] in 2017); percent of positive UATs increased from 0.46% to 1.32%. Compared with 2010, rate of positive UATs was significantly higher in each year during 2014–2017; the highest rate occurred in 2017 (rate ratio [RR]: 2.85; 95% CI: 1.78–4.56). Results did not differ substantially when all test types or all hospitals were analyzed. Conclusions: Diagnostic testing for LD and number of positive tests increased during 2010–2017; therefore, increased testing contributed to increases in reported LD. However, the positivity rate increased approximately 3-fold, suggesting that increased detection as well as increases in true incidence contributed to increasing disease burden. Identification of factors that contribute to increasing LD is necessary toward implementing effective prevention and control strategies.
EMERGENCY DEPARTMENT VISITS AND INPATIENT HOSPITALIZATIONS ASSOCIATED WITH VIRAL GASTROENTERITIS Gillian AM Tarr* Gillian AM Tarr, Xiao-Li Pang, Bonita E Lee, Linda Chui, Samina Ali, Shannon E MacDonald, Otto Vanderkooi, Stephen B Freedman, (University of Calgary)

Viral gastroenteritis places a significant burden on the healthcare system. Accurate estimates of healthcare visits associated with enteric viruses in North America are limited due to a lack of systematic testing and exclusion of cases with isolated vomiting in previous studies. We estimated the rate of emergency department (ED) visits and inpatient hospitalizations associated with enteric viruses in children <18 years old with ≥3 diarrhea and/or vomiting events in a 24-hour period. Stool and/or rectal swabs from 2871 children recruited through two pediatric hospital EDs and a nursing telephone health advice line in Alberta, Canada, 2014-2017, were tested for five viruses: adenovirus, astrovirus, norovirus, rotavirus, and sapovirus. Study data were linked to provincial health administrative data to identify visits associated with an episode of gastroenteritis. The population at risk was estimated using province-wide gastroenteritis visits. Study visit rates were standardized to the Alberta population during the study period on age, year, season, and administrative health region. Norovirus was most commonly detected, associated with 756 (26.3%) episodes of gastroenteritis, followed by adenovirus (538; 18.7%). After standardization, norovirus was associated with the most ED visits, with 79.7 per 10,000 child-years (95% CI 69.2, 93.9). Rotavirus was associated with the greatest number of hospitalizations, with 9.2 per 10,000 child-years (95% CI 5.9, 14.8). Norovirus rates remained stable over the three-year study period and adenovirus rates increased almost two-fold in the final year. The visit rate for all five viruses was greatest in 12- to 23-month-old children. Our findings can inform age-specific implementation strategies for norovirus vaccines in development. The frequency of adenovirus detection and the increase in the visit rate for adenovirus-associated gastroenteritis in 2017 were unexpected and suggest a need for further research.

S/P indicates work done while a student/postdoc
Antimicrobial resistance (AMR) occurs when a population of microorganisms adapt after exposure to an antimicrobial agent, making that agent ineffective. This becomes an important public health problem when organisms persist in individuals receiving treatment. Some experts predict that deaths due to AMR could reach 10 million per year globally by the year 2050. In addition, surgery, transplant, and cancer treatment are highly dependent on preventive use of antimicrobials. These treatments will no longer be available if antibiotics become ineffective. The gold standard treatment for Staphylococcus aureus infections is the beta-lactam class of antibiotics including methicillin. Organisms that are resistant to these antibiotics, are called methicillin resistant Staphylococcus aureus (MRSA). Many individuals carry Staphylococcus aureus in their nasal passages. This may provide a reservoir for infection. It is unknown how many individuals carry a MRSA strain. Although socioeconomic status is an accepted risk factor for antibiotic resistant infection in the developing world, little is known about factors that increase the risk of MRSA nasal colonization in the United States. It is logical to hypothesize that lower socioeconomic status might also be a risk factor for nasal MRSA colonization. Using data from nasal swabs of 17,174 participants collected by the National Health and Nutrition Examination Survey (NHANES) from the general population of the United States, the prevalence of both antibiotic susceptible and resistant strains of Staphylococcus aureus by family household income, gender, age, and race were measured. Findings of this study show a strong association between low income and MRSA colonization and additional associations with female gender and advanced age. Race was not a statistically significant predictor of MRSA colonization. These results suggest that further research should be done to understand income, gender, and age disparities in these difficult to treat infections.
COMMUNITY-ASSOCIATED CLOSTRIDIUM DIFFICILE INFECTION AND ANTIBIOTIC EXPOSURE — MINNESOTA, 2009–2016
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Background: Community-associated (CA) Clostridium difficile infections (CDIs) account for an increasing proportion of CDIs nationally. Prior antibiotic use is a known risk factor for CA-CDI. We sought to identify other risk factors by comparing CA-CDI patients with antibiotic use in the prior 12 weeks to those without antibiotic use. Methods: We analyzed Minnesota Department of Health active population- and laboratory-based CDI surveillance data from 2009-2016. A CA-CDI case was defined as a C. difficile-positive specimen collected as an outpatient or ≤3 days of hospitalization from a person aged ≥1 year who resided in 1 of 5 sentinel counties and did not have CDI in the prior 8 weeks or an overnight stay in a healthcare facility in the prior 12 weeks. We limited our analysis to cases with negative laboratory results for other enteric pathogens and with symptoms consistent with CDI. CA-CDI contributing factors were ascertained by reviewing medical records and patient interviews. Results: Of 2,679 CA-CDI cases, 1,514 (56.5%) were included in the analysis. Antibiotics were not used prior to infection in 749 (49.5%) CA-CDI patients. Compared with patients with prior antibiotic use, patients without antibiotic use were younger (median age: 48.5 years versus 56 years, P <.001), more likely male (40.9% versus 35.0%, P <0.05), have preexisting inflammatory bowel disease (IBD) (11.1% versus 5.9%, P <.001), take antidiarrheal medications (11.3% versus 7.1%, P <0.05), and had animal exposures (11.5% versus 9.6%, P <0.05). In a multivariate model including these significant variables, being younger (P <.05) and having preexisting IBD (P <.005) were more likely in CA-CDI patients without prior antibiotic use before CDI. Conclusion: After exploring potential exposures, we identified CA-CDI patients without prior antibiotic use were more likely to have preexisting IBD diagnosis. This novel finding warrants further investigation as does consideration of other unexplored risk factors.
Disease surveillance is crucial for outbreak preparedness, but can be resource intensive in large nations such as Brazil. The Brazilian Ministries of Health (MH) conducts surveillance for Visceral Leishmaniasis (VL), which has high fatality locally and globally. Current VL passive surveillance in Brazil is nationwide, providing annual case counts by municipality. This study aims to determine if conducting VL surveillance on a region in Brazil instead could adequately characterize national VL burden, and to determine if case counts using the state or municipality as the unit of surveillance are equivalent, thus assessing sensitivity to the scale and resolution of surveillance. Data from the MH including annual VL case counts for all municipalities in Brazil outside of the Federal District from 2004-2014 were analyzed. Best fitting statistical distributions for nationwide case counts at the state and municipality resolution as well as for each state at the municipality resolution were compared by Kullback-Leibler (KL) divergence. Municipality-resolution distributions for individual states followed either a Zero-One Inflated Poisson (ZOIP) or Gamma distribution with varying parameters. Nationwide municipality-resolution case counts followed the ZOIP distribution, and nationwide state-resolution case counts followed a mixture of two Gamma distributions. The sum of simulated case counts from the individual state distributions differed from the distribution of nationwide state-resolution cases by KL divergence, suggesting that the two resolutions do not provide equivalent information. Differences among states’ municipality-resolution distributions and the national municipality-resolution distribution indicate that surveillance for part of the nation would not adequately characterize the entire nation’s VL burden. These results support continued nationwide surveillance by municipality and suggests that VL risk is affected by different factors at different scales.
Background Obstructive sleep apnea (OSA) and influenza (flu) have high disease burdens in the United States: over 25 million adults have OSA and flu results in 9.2 – 35.6 million illnesses and 140,000 – 710,000 hospitalizations yearly. Studies show that sleep deprivation hinders the immune response to influenza. As symptoms of OSA include insomnia and hypersomnia, we hypothesize that OSA exacerbates the effects of flu and consequently will lead to severe flu outcomes. Methods As part of the national FluSurv-NET program, the Minnesota Department of Health conducts surveillance of patients hospitalized with laboratory-confirmed flu in the Minneapolis/St. Paul metropolitan area. We assessed whether there is a relationship between diagnosed OSA and flu severity (where severe flu was determined by length of hospital stay, intensive care unit admission, and death) in people hospitalized during the 2015 – 2017 flu seasons. Logistic regression analysis, with models accounting for confounders (demographic characteristics, comorbidities, antiviral treatment, and flu vaccination), was done in SAS 9.4. Results Analysis was restricted to adults; participants (N=2,491) were 18 – 103 years old. In the dataset, 12.6% have OSA, 39.0% have severe flu, 14.2% of people with severe flu have OSA, and 11.5% of people without severe flu have OSA. After adjusting for confounders, the OR for having severe flu when comparing patients with OSA to patients without OSA is 1.23 [95% CI: 0.95, 1.59]. Conclusions Our analysis suggests that hospitalized flu patients with diagnosed OSA may have higher odds of having severe flu. As other studies show that 85% of people with OSA have not been diagnosed with OSA, systematically evaluating participants for OSA could reduce possible misclassification in future research. With flu rising these last few years, understanding risk factors for severe flu can better inform surveillance and lead to recommendations for reducing the impact of flu in high-risk groups.
TEMPORAL TRENDS AND SOCIAL INEQUITIES IN PEDIATRIC BRONCHIOLITIS ADMISSIONS PRE- VS POST- FUNDING OF RSV PROPHYLAXIS IN ONTARIO, CANADA: A POPULATION-BASED INTERRUPTED TIME SERIES ANALYSIS SPANNING NEARLY 25-YEARS Tiffany Fitzpatrick* Tiffany Fitzpatrick, Drew Wilton, Dayre McNally, Jeff Kwong, David Fisman, Astrid Guttman, (t.fitzpatrick@utoronto.ca)

Background: Bronchiolitis is a leading cause of hospital admissions among infants; ~80% are attributed to respiratory syncytial virus (RSV). Currently, there is no approved RSV vaccine; however, prophylaxis (Palivizumab) is available to reduce illness severity. In Ontario (Canada), Palivizumab has been publicly funded for infants at high risk of RSV illness since 2002. The objective of this study was to investigate temporal trends in pediatric admissions for bronchiolitis, pre vs post Palivizumab funding, and potential differences across socioeconomic factors. Methods: All infants born in Ontario Jan 1st, 1993 through Dec 31st, 2015 were followed until the earliest of their 2nd birthday, death or moving out of province using linked administrative data. All hospital admissions for bronchiolitis were identified. High-risk infants were defined according to program guidelines. Potential interactions by rurality, maternal age, neighbourhood income, and immigration status were assessed. Interrupted time series analyses were stratified by age (<6, 6-12, 12-24 months). Results: Over 13 million infants and almost 43,000 bronchiolitis admissions were included. Bronchiolitis burden was greatest among infants <6 months: admission rates dropped from 35.6 to 21.8 per 1,000 over the study period. However, among high-risk infants (<6 mos), rates declined from 216.7 to 57.5 per 1,000. Statistically significant declines in admissions were observed pre-vs-post Palivizumab both overall (p=0.0327) and among high-risk infants (0.0202). Admission rates were consistently highest among children from low income areas and born to teenage mothers; however, this gap significantly narrowed following the funded Palivizumab program. Conclusions: This large, population-based study spanning over two decades found statistically significant declines in pediatric bronchiolitis admissions following the introduction of a funded RSV prophylaxis program, along with evidence of narrowing social inequities.

S/P indicates work done while a student/postdoc
EXPOSURE TO INFORMATION ABOUT INFLUENZA AND VACCINES, PERSONAL NETWORKS, AND THE INTENTION TO RECEIVE THE SEASONAL INFLUENZA VACCINATION AMONG ADULTS WITHOUT PREVIOUS INFLUENZA VACCINATION IN TAIWAN

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Background: As a strong predictor of actual vaccine uptake, the intention to get vaccinated against influenza may vary by the degree of access to health information and social influence, but how such an intention is associated with these variables remains unclear. We aim to clarify such mechanisms regarding the intention to receive seasonal influenza vaccination, particularly among adults who had not been vaccinated during the past five years.

Method: We conducted a representative nationwide survey in 2010. Respondents’ health information includes three proxies for measuring knowledge about influenza vaccination: passive exposure to information about the (H1N1) 2009 pandemic and its vaccine, respectively, as well as active information-seeking of both topics. Indicators of social influence focus on the number of interpersonal contacts per day, the contact network’s density, and whether someone in the household had received the pandemic (H1N1) 2009 vaccination. We used structural equation modeling to investigate how the intention to receive a seasonal influenza vaccination is associated with exposure to health information and indicators of daily contacts.

Result: A subsample of 1148 (out of 1954) respondents received no influenza vaccination during the past five years. Passive exposure to information about the (H1N1) 2009 pandemic (OR=5.32, 95% CI=1.23, 23.03) and its vaccine (OR=3.03, 95% CI=1.44, 6.41) were both associated with more information-seeking of both topics, which in turn was linked to a stronger intention to receive the seasonal influenza vaccination (OR=1.97, 95% CI=1.10, 3.52). Having someone in the household with the pandemic (H1N1) 2009 vaccination (OR=1.97, 95% CI=1.12, 3.48) also was directly associated with a higher intention to get the vaccine.

Conclusion: Promotions and campaigns for influenza vaccination must take into account not only different approaches for accessing health information but also patterns of personal networks.
HOSPITAL-LEVEL PREDICTORS OF EMERGENCY ROOM VISITS WITH SPECIFIED VERSUS SUGGESTIVE CHILD MALTREATMENT DIAGNOSES

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Few studies examine predictors of identified child maltreatment (CM) in settings that commonly encounter affected children. We examined associations between hospital characteristics and receipt of an explicit CM diagnosis in emergency room (ER) visits in children ages 0-4 who received explicit or suggestive CM diagnoses. Data came from the 2014 Nationwide Emergency Department Sample, a nationally representative sample of ER visits in the United States. Specified maltreatment was defined as International Classification of Diseases 9th Edition codes indicative of explicit maltreatment. Suggestive CM codes were defined as not explicit but indicative of CM based on a validated classification method. Hospital characteristics included urbanicity, teaching status, trauma center designation, and mean ER patient age. Predicted marginal proportions accounting for the complex sample design were used to obtain prevalence ratios (PRs) adjusted for patient age, sex, median neighborhood income, primary insurance, hospital admission or transfer, and injury diagnosis. There were 30,217 visits with any suggestive or specified CM, representing 137,832 visits nationwide. For any CM, sexual abuse, physical abuse, neglect, and visits with 2+ CM types, 7.4%, 13.4%, 40.0% 1.2%, and 70.9% of visits were specified for CM, respectively. Urban hospitals, teaching hospitals, hospitals with level I or II trauma centers, and ERs with a mean patient age <18 were more likely to have any specified CM visits (aPRs=1.42(95%CI:1.15,1.74); 1.59(95%CI:1.25,2.02); 1.64(95%CI:1.34,2.01); 1.97(95%CI:1.32,2.93), respectively). CM type modified these associations, such that they were largest for neglect (e.g., aPR for teaching hospitals= 2.43(95%CI:1.39,4.27)). Although findings may be influenced by unmeasured factors (e.g., patient race, referral bias), they show most CM is not explicitly diagnosed in the ER and hospital characteristics may be associated with receiving an explicit CM diagnosis.

S/P indicates work done while a student/postdoc
MODELLING TIME LOSS FROM SPORTS-RELATED INJURIES USING UNIVARIATE RANDOM EFFECTS MODELS

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Background: Time loss (TL) is an important indicator of sport-related injury outcomes and is typically measured as a count of days from the injury event to return to sport participation. TL may be analyzed as it naturally occurs using traditional Poisson or Event-time regression methods. However, these approaches ignore various athlete and event-specific factors that determine the severity of an injury. We present a conceptual framework for an approach which enables TL to be modeled using univariate random effects count or survival regression. The purpose of including a random effect is to adjust for unobservable determinants of TL, such as injury severity, which admits a clinically relevant interpretation of observable covariate effects as being ‘severity-adjusted.’

Methods: Using data from the NCAA Injury Surveillance Program on U.S. collegiate soccer-related injuries, we fit random effects Poisson and Weibull Regression models to perform ‘severity-adjusted’ evaluations of TL. These models were used to make inferences regarding injury recovery. For purposes of comparison, we also fit standard fixed-effects Poisson and Weibull regression models. Results: Injury site, injury mechanism, and injury history emerged as the strongest predictors of recovery in our sample. In comparing random effects and fixed effects models, we noted that the incorporation of the random effect attenuated associations between most observed covariates and TL. Model fit statistics indicated that the random effects models (AICPoisson= 51870.06; AICWeibull-AFT= 51291.00) improved model fit over the fixed effects models (AICPoisson= 160695.20; AICWeibull-AFT= 53179.48). Conclusions: Our analyses serve as a useful starting point for modelling how TL naturally occurs when a player is injured, and illustrate how random effects or frailty-based approaches can help isolate the effect of potential determinants of TL.
PREVALENCE OF SUICIDE RISK FACTORS AND BEHAVIORS AMONG FIREARM OWNERS IN THE UNITED STATES, 2018
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Background Firearms are the most frequent means for death by suicide, with more than 22,000 firearm suicides each year. Programs to reduce firearm suicide must focus on firearm owners, yet very little data has been collected about suicide risk factors and behaviors within this population. This study addresses that gap. Methods A nationally-representative sample of 2,646 firearm owners ages 18+ was surveyed by Ipsos KnowledgePanel® between 11/9 and 12/2 2018. Participants completed a 15 minute (median) survey about firearm ownership, physical and mental health, suicide ideation and behaviors, and suicide risk factors. The response rate was 65.8%. Post-stratification weights were applied to adjust for non-response. We calculated the prevalence (SE 1.8%) of suicide ideation, planning, and attempts, as well as suicide risk factors. We contrasted prevalences among firearm owners with general population estimates. Results Firearm owners were average 52 years old (SD 16.2), 31.5% female, 76.9% non-Hispanic (NH) white, and concentrated in the South (44.1%). 25.0% of firearm owners reported lifetime suicide ideation, 6.6% suicide planning, and 1.8% suicide attempts compared to 13.5%, 3.9%, and 4.6% in the National Comorbidity Study. Prevalence of suicide risk factors such as Post-traumatic Stress Disorder were similar to general population estimates with the exception of chronic pain, which was 32% among firearm owners versus 20% in the National Health Interview Survey. Discussion Suicide ideation and planning among firearm owners was higher than the general population, while fewer firearm owners reported suicide attempts, potentially due to access to extremely lethal means, making such attempts fatal. Suicide risk factors were similar to general population estimates, with the exception of chronic pain, which was higher. Further investigation is warranted to determine if the presence of a firearm may itself contribute to suicide behaviors independent of other risk factors.

S/P indicates work done while a student/postdoc
Background: Child maltreatment, defined as the physical abuse, sexual abuse or neglect of persons 18 years of age and under, is a pervasive public health problem. Causes of maltreatment are unknown, though experiencing maltreatment is an assumed risk factor for perpetrating maltreatment. Prior studies of intergenerational child maltreatment (IMT) are inconclusive, in part because of methodological limitations of prior studies. Epidemiologic studies can advance this knowledge using a population health approach and focusing on surveillance and risk factor identification. Aims: This study has two aims: 1) Estimate the proportion of victims of child maltreatment who become offenders in adulthood; 2) Identify risk factors for IMT. Methods: 8,701 child protective services (CPS) records from 2000 - 2014 were linked to public school records for demographics. The transmission probability of IMT was defined as the proportion of victims in accepted CPS reports who were offenders in adulthood. Differences between types of maltreatment were assessed using a chi-squared test then adjusted for maltreatment-related risk factors and demographic covariates using log-binomial regression. Results: The overall transmission probability was 11.32%. Transmission probabilities were highest among those who experienced multiple forms of maltreatment and lowest among victims of sexual abuse. Probabilities varied by gender and race/ethnicity. Prior substantiation and out of home placement were associated with higher IMT probabilities. Discussion: The majority of CPS-involved people who experienced maltreatment did not become perpetrators. Results allow practitioners to target prevention efforts toward groups at increased risk. These findings may be underestimates as CPS contact was the only available measure of birth. Future work should use longer study periods, assess more risk factors and include multiple measures of maltreatment and birth.
EXPERIENCES OF RE-REPORTING RISK OF CHILD MALTREATMENT BY RACE AND ETHNICITY  
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Background Maltreatment re-reporting disproportionally affects racial and ethnic minorities. Specifically, Black people and Native Americans are at increased risk of re-reported maltreatment compared to white people. We typically conduct research aimed at understanding re-reporting through a population lens, treating race and/or ethnicity as predictors rather than exploring the varied and unique experiences among different racial and ethnic groups. This study sought to fill that gap to better understand risk and protective factors for child maltreatment re-reporting among different racial and ethnic groups. Methods This study relied upon integrated secondary data from the Minnesota-Linking Information for Kids (Minn-LInK) project. Minn-LInK allowed us to integrate additional data outside of that typically found within child protection systems, further enhancing the richness of data available to the study. We used data from 2000-2017 to estimate associations between child, case, and family characteristics and cross-system involvement, and maltreatment re-reporting stratified by six racial and ethnic groups: White, Black, Native American, Asian, Multi-racial, and Hispanic We utilized crude and adjusted logistic regression models to estimate OR and 95% CI for each racial and ethnic group. Results Final adjusted models revealed that older children had decreased odds of re-reporting maltreatment across all racial groups. Differences among racial groups also emerged. For example, no statistically significant protective factors emerged for Native Americans but many risk factors were evident. Conclusion Results of this study support the need for cultural responsive assessments of and responses to risk and protective factors across child serving systems. Current systems do not provide adequate opportunities to capture assessments of risk and protective factors across racial groups, thereby potentially underserving these communities.

S/P indicates work done while a student/postdoc
ASSOCIATION OF SEVERE MENTAL ILLNESS WITH LEGAL INTERVENTION INJURY: A CASE-CONTROL STUDY  Kriszta Farkas*  Kriszta Farkas, Ellicott C. Matthay, Dana E. Goin, Kara E. Rudolph, Jennifer Ahern, , (Division of Epidemiology and Biostatistics, University of California, Berkeley School of Public Health, Berkeley, CA, USA)

Police use of force is a critical public health problem in the United States. Epidemiologic research on the determinants of injuries caused by law enforcement (“legal intervention”) is limited and has mainly focused on fatal incidents, although nonfatal injuries are much more common and result in substantial healthcare costs. Individuals with mental disorders may be at increased risk of legal intervention injury because of greater likelihood of encounters with law enforcement and behavioral symptoms associated with their disorders manifesting as resistant/hostile actions during encounters. However, studies to date have been small, relied on officer report of perceived mental status and use of force, and controlled for mediating factors (e.g., suspect resistance/behavior). We use a large population-based dataset to examine the relation of specific severe mental disorders with subsequent nonfatal legal intervention injury. We conducted a case-control study using statewide data on all California hospitalizations and emergency department visits, 2005-2014. Legal intervention injury cases (n=67,742) were frequency matched to four nonfatal traffic accident injury patient controls (n=270,968) on sex. Separate logistic regression models were used to estimate the relation of prior hospital visit for psychosis, mood disorder, and personality disorder with legal intervention injury, controlling for age, race/ethnicity, insurance type, urbanicity, and sex. Preliminary results indicate that each mental disorder studied was associated with substantially greater odds of legal intervention injury (psychosis: OR = 6.92, 95% CI: 6.63, 7.22; mood disorder: OR = 3.89, 95% CI: 3.76, 4.03; personality disorder: OR = 6.56, 95% CI: 6.08, 7.08). These findings support the importance of research on interventions to improve both severe mental disorder treatment and law enforcement response to individuals with severe mental disorders, as means of reducing legal intervention injury.
Background: On September 14, 2018, Hurricane Florence struck North Carolina bringing heavy rain and flooding. We evaluated reasons for hurricane-related emergency department (ED) visits before, during, and after Florence to identify opportunities to improve emergency preparedness. Methods: Chief complaints and triage notes for visits to all North Carolina EDs were queried for keywords in the state syndromic surveillance system to identify hurricane-related ED visits. ED visits during September 7–28, 2018, were reviewed by 3 independent reviewers and classified by consensus, into 1 of 4 health categories: injuries, illnesses, medication refills, or other. Percentages of ED visits for each category were compared for periods before (September 7–13), during (September 14–17) and after (September 18–28) Florence. Log-binomial models were used to estimate prevalence ratios (PR) and 95% CIs. Results: Hurricane-specific keywords identified 850 ED visits. Reviewers determined 443 were hurricane-related, including 73 before, 185 during, and 185 after Florence. Before Florence, 25% (18/73) of hurricane-related ED visits were injuries, 49% (36/73) were illnesses, and 14% (10/73) for medication refills. A similar pattern was observed for ED visits after Florence. However, during Florence, 31% (58/185) of ED visits were for medication refills. Medication refill ED visits were more prevalent during Florence, compared with before (PR: 2.29; CI: 1.24–4.23), whereas injury and illness ED visit prevalences were similar across all periods. After adjustment for age, sex, race, and insurance associations were similar. Based on chief complaint and triage notes, disruption of normal services (e.g. closed pharmacies) accounted for 76% of medication refill ED visits. Conclusions: Medication refill ED visits were more prevalent during the hurricane, compared with before. As hurricanes approach, public messaging should remind people to refill medications to last during the storm and aftermath.
FEAR OF CRIME, HAZARDOUS ALCOHOL DRINKING AND MARIJUANA USE AMONG UNIVERSITY STUDENTS: A TALE OF TWO SEXES. Marie-Claude Couture*, Marie-Claude Couture, Dellanira Garcia, Erin Grinshteyn, (University of San Francisco)

Background: Fear of crime has been associated with poorer physical and mental health outcomes. To date, few studies have examined the association between fear of crime and substance use. The goal of this study was to examine the associations between fear of crime, hazardous alcohol drinking and marijuana use. Methods: A cross-sectional study was conducted in 2017 among students at a university in an urban location (n=1,415). Participants were recruited via emails and data were collected using online surveys. Fear related to different types of violent and property crimes was measured. All fear types were summed in a total fear score and categorized into 3 groups: no/little fear, moderate fear, and high fear of crime. Chi-square test and multivariate logistic regression models were used to examine associations between fear of crime, hazardous alcohol drinking and marijuana use, by gender. Results: Women were more likely to report high fear of crime (37.9%; p<0.001) than men (17.7%; p<0.001). Fear of crime was higher among students reporting hazardous drinking (p<0.001) and those who used marijuana (p<0.001). In multivariate models, associations differed according to gender: moderate (AOR=1.69; 95%CI: 1.22-2.35) and high (AOR=1.48; 95%CI: 1.07-2.06) fear of crime were independently associated with hazardous alcohol drinking among women but not men. Fear of crime was also associated with marijuana use in women. However, only moderate fear of crime was significantly associated with marijuana use in men. Conclusions: Our findings suggest that fear of crime is associated with excessive alcohol consumption and marijuana use. Interestingly, the association between fear of crime and substance use was stronger among women than men. Public health and health care professionals should acknowledge fear of crime as a potential risk factor of substance use, particularly among women. Initiatives to decrease fear of crime on college campuses could help reduce substance use in students.
Risk for psychopathology increases with number of adverse childhood experiences. Summing number of experiences, however, assumes all adversity equitably confers risk and operates through complementary mechanisms. To disentangle neurobiological pathways between disparate events and mental health we examined how threat and deprivation—two common dimensions of adversity—relate to early childhood psychopathology. Threat, or presence of experiences involving harm or threat of harm, impacts emotional control. Deprivation, or absence of expected environmental inputs, impacts higher-order cognitive function. If threat and deprivation differentially affect brain development then they may differentially relate to psychopathology, especially among young children. To examine these patterns we used the Duke Preschool Anxiety Study, a cross-sectional study of 2–6 year olds enrolled through primary care from 2007–2011, weighted to reflect a screened population of 3433. Threat and deprivation were operationalized using questions from the Conflict Tactics Scale-2, Conflict Tactics Scale for Parent and Child, and Preschool Age Psychiatric Assessment. Threat measured physical or sexual abuse, domestic violence, and violent neighborhood. Deprivation measured neglect and lack of cognitive stimulation. Poisson regression with robust standard errors estimated adjusted prevalence ratios (PR) jointly for deprivation and threat in relation to counts for total symptoms and symptoms for specific disorders such as anxiety, depression, and ADHD in 760 children. Threat (47%) and deprivation (18%) were common. 36% of children had at least one disorder and total number of symptoms ranged from 0 to 46. Threat-exposed children had 40% more total symptoms (95% CI 1.2 – 1.6) than unexposed after adjusting for deprivation and demographic covariates. Deprivation was not meaningfully associated with total symptom count (PR 1.1, 95% CI 0.9 – 1.5) after adjusting for threat and demographic covariates.

*Adjusted Associations between Dimension of Early Childhood Adversity and Psychopathology Symptom Counts, Ages 2 - 6 Years
Duke Preschool Anxiety Study, Durham NC, 2007 - 2011 (n=760)

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Prevalence Ratio (95% CI)

*adjusted for deprivation or threat, age, sex, race/ethnicity, college-educated parent, 2-parent household

S/P indicates work done while a student/postdoc
SOCIAL NEEDS OF INDIVIDUALS WITH SERIOUS MENTAL ILLNESS IN A LARGE URBAN SETTING Christina Norman* Christina Norman, Rugile Tuskeviciute, Jennifer Hoenig, (NYC Department of Health and Mental Hygiene)

Background: Individuals with mental illness have needs beyond mental health treatment that affect their everyday lives and recovery. This study examined the social needs (e.g. housing, employment, financial needs, insurance adequacy and social support) of individuals with mental illness living in the community to inform service planning and policies that promote recovery. Methods: Data are from a population based telephone survey of community dwelling adults in New York City. For the current analysis we examined social needs among those who reported a lifetime diagnosis (LD) of bipolar disorder, mania, psychosis, schizophrenia, or schizoaffective disorder or met criteria of having a serious mental illness (SMI) in the past year based on a methodology developed by the Substance Abuse and Mental Health Services Administration (n=360). Racial disparities in needs is also examined. Results: Among individuals with LD or SMI, participants had needs related to housing (34%), employment (26%), finances (66%), food insecurity (37%), and low perceived social support (42%). More than half (57.4%) had inadequate insurance coverage for mental health services and 18% were uninsured. Compared to Whites, Blacks were more likely to have a housing related need (OR=3.33, p =.036). Participants were more likely to have financial needs if they were Black (OR = 9.52, p = 0.003) or Hispanic (OR = 4.89, p = .001) than if they were White. Compared with Whites, Black participants were less likely to have an insurance related need (OR = 0.24, p = 0.014). Conclusion: Individuals living in the community have needs across several domains separate from mental health treatment needs, with racial disparities in needs observed. Data from this study can inform the development and implementation of mental health initiatives to ensure access to housing, financial resources, and other supportive needs for people with significant mental health issues.
INFLUENCE OF NEIGHBORHOOD PERCEPTIONS ON SUICIDE IDEATION AMONG ADOLESCENTS Christyl T. Dawson* Christyl T. Dawson, Wensong Wu, Jeremy W. Pettit, Mary Jo Trepka, (Florida International University)

Background: Associations between adolescent suicide and the neighborhood structural environment have been reported. However, little is known about how the neighborhood social environment may influence suicide ideation among adolescents. This is important as it may have implications for the development of interventions.

Objective: The aim of the study was to examine the relationship between adolescent perceptions of neighborhood social cohesion, contentment, and safety; and suicidal thoughts.

Methods: Data were used from the National Longitudinal Study of Adolescent to Adult Health (Add Health). The study sample consisted of 12,105 adolescents enrolled in 9th–12th grades during the 1994–1995 school year in the United States (U.S.). Perceptions of the neighborhood social environment and suicidal thoughts were assessed using items from the in-home questionnaire. Mixed effects multilevel modeling was used to determine if perceived neighborhood social cohesion, safety, and contentment were associated with suicidal thoughts. Models were adjusted for neighborhood- and individual-level variables, including depression.

Results: Perceived neighborhood contentment and safety were associated with suicidal thoughts; whereas perceived social cohesion was not. A one unit increase in perceived neighborhood contentment was associated with a 17% decrease (OR=0.83, CI: 0.82-0.84) in the odds of suicidal thoughts; while adolescents who perceived their neighborhoods as being safe had a 13% decrease (OR=0.87, CI: 0.85-0.89) in the odds of suicidal thoughts compared to those who did not perceive their neighborhoods as being safe.

Conclusion: Findings suggest that aspects of the neighborhood social environment are associated with suicide ideation among adolescents. Future studies should investigate mechanisms of how the social environment impacts suicide among adolescents. Such information could be used in the development of structural and other interventions to prevent suicide.
Objective: To examine barriers to mental health (MH) care in youth visiting the emergency department (ED) with MH concerns, and develop and test a text message reminder system. Methods: Prospective study and randomized controlled trial of patients less than 18 years of age visiting the ED for MH concerns from April 2016 to December 2017. Parents of patients discharged with a referral for outpatient MH care were randomized to receive text message appointment reminders or usual care. Data was collected from patient’s electronic medical records and parent baseline and follow-up surveys. Association between text message intervention and appointment follow-up was examined using chi-square tests. Results: We enrolled 293 patients and parents in the prospective study, and 106 in the text message intervention. The majority of patients were female (57.3%), white (64.3%), and 12 years of age or older (61.8%). Most common diagnoses included behavior disorders (34.1%), suicide or self-injury (32.1%) and depressive disorders (28.0%). Top barriers to care included having to wait too long for an appointment (44.4%), not knowing where to go (37.5%) and lack of convenient appointment times (35.7%). One fifth of patients had never received MH care (20.1%). Parents identifying as food insecure (17.9%) were significantly more likely to report that their child was not able to get MH care when needed (p=0.05, Figure). We found no significant relationship between receiving text messages and follow-up with outpatient treatment, but 62.1% of parents felt that the reminders were very or somewhat helpful.

Conclusion: Parents reported multiple barriers to accessing MH care for their children, and our results suggest disparities in ability to access to care. We successfully piloted a text message appointment reminder process in a large, urban pediatric ED. While we found no significant relationship with follow-up appointment rates, parents were receptive to receiving text message reminders.
DEPRESSION STATUS AND MAJOR CHRONIC COMORBID DISEASES AMONG CANADIAN OLDER ADULTS – A CROSS-SECTIONAL ANALYSIS OF BASELINE DATA FROM THE CANADIAN LONGITUDINAL STUDY ON AGING Jian Liu*, Jian Liu, Surim Son, John McIntyre, Miya Narushima, (Brock University)

To examine how depression states are associated with chronic comorbid diseases (CCD), 50,968 subjects from the CLSA were included in this analysis. Four clinical states of depression were categorized: Group 1: no depression (reference); Group 2: currently depressed (CES-D10≥10 with negative history); Group 3: clinical depression but under-control (CES-D10<10 with positive history); and Group 4: clinical depression not under-control (CES-D10 ≥10 with positive history). 21 major CCD were examined, i.e., a) 6 circulatory system diseases; b) 4 leading cancers causing death; c) 8 nervous system diseases; d) 2 chronic respiratory diseases; and e) diabetes. Compared to the reference, individuals in different depression status showed an increased odds for most of the CCD except for cancer. However, among these major CCD that showed an increased risk, 7 of them reached statistically significance in Group 2, 8 in Group 3, and 13 in Group4. The significant OR (95% CI) varied from 1.15 (1.04, 1.26) to 2.60 (1.61, 4.20) in Group 2; from 1.32 (1.16, 1.49) to 3.00 (1.28, 7.08) in Group 3; and from 1.16 (1.05, 1.29) to 2.14 (1.57, 2.93) in Group 4. In conclusion, individuals with depression have an increased risk for most major CCD but, surprisingly, not for cancer.
PERCEIVED STRESS AND INFLAMMATORY ARTHRITIS: A PROSPECTIVE STUDY IN THE STUDIES OF THE ETIOLOGIES OF RHEUMATOID ARTHRITIS (SEMA) COHORT

Kristen Polinski*, Kristen Polinski, Jill Norris, Elizabeth Bemis, Jennifer Seifert, M. Kristen Demoreulle, Kevin Deane, V. Michael Holers, (Department of Epidemiology, Colorado School of Public Health, Aurora, CO)

The relationship between psychological stress and disease activity in those with classified rheumatoid arthritis (RA) has been established. Yet, the contribution of psychological stress to the risk of RA remains unclear. We conducted a prospective cohort study to determine the association of perceived stress with incident inflammatory arthritis (IA) defined as having at least 1 joint consistent with RA-like synovitis based on exam. Participants were recruited into the cohort if they were a first degree relative (FDR) of a RA proband or screened positive for anti-cyclic citrullinated peptide autoantibodies (ACPA), a biomarker indicating autoimmunity. We included 525 participants who were free of IA/RA at baseline. During follow-up 31 developed IA. Perceived stress was measured using the Perceived Stress Scale-14 (PSS) in which a higher score indicates greater perceived stress. The total PSS score as well as two sub-scores from the negatively and positively worded items were averaged across all study visits for each participant and analyzed as continuous variables. Hazard ratios (HRs) and 95% confidence intervals (CIs) of IA associated with average PSS scores were obtained using Cox proportional hazards models. The mean averaged total PSS score was 20.2. We found that a one point increase in the averaged negatively worded PSS score was significantly associated with an 11 percent increase in the risk of IA after adjustment for cohort (FDR or screened), autoantibody status at baseline (i.e. any ACPA or rheumatoid factor) and education (adjusted HR: 1.11; 95%CI: 1.02, 1.21). The averaged total PSS score and the positively worded PSS score were not significantly associated with IA risk (adjusted HR: 1.05 (95%CI: 0.99, 1.11) and 1.07 (95%CI: 0.95, 1.21), respectively. An association between perceived stress and IA risk may support the incorporation of stress-targeted therapy management. However, replication of these results in other preclinical RA populations is needed.
PSYCHOMETRIC PROPERTIES OF A BRIEF VERSION OF THE 2014 ONTARIO CHILD HEALTH STUDY EMOTIONAL BEHAVIOURAL SCALES (OCHS-EBS-B): A CHECKLIST FOR DIMENSIONAL AND CATEGORICAL MEASUREMENT OF INTERNALIZING, EXTERNALIZING AND ATTENTION PROBLEMS. Laura Duncan* Laura Duncan, Michael Boyle, Kathy Georgiades, Li Wang, (McMaster University)

Objectives. To describe the development and psychometric properties of a brief version of the 2014 Ontario Child Health Study Emotional Behavioural Scales (OCHS-EBS-B) for dimensional and categorical (present/absent) measurement of internalizing, externalizing and attention problems. Items from the recently developed 52-item OCHS-EBS served as the item pool and Item Response Theory was used to select items.

Methods. 23 items were selected within the 3 domains. Psychometric evaluation of the item properties and parent and youth scales came from a large general population study of 10,802 children and youth aged 4 to 17 years in 6,537 families. Test-retest reliability data were collected from a subsample of 280 children and their parents who independently completed the OCHS-EBS-B checklist on two occasions 7 to 14 days apart. Structural equation modelling was used to assess internal and external convergent and discriminant validity. Binary cut-offs were established an applied to OCHS-EBS-B scores and the psychometric adequacy of the scales for categorical measurement of internalizing, externalizing and attention problems was assessed.

Results. Confirmatory factor analyses exhibited adequate item-fit to all scales. Internal consistency (Cronbach’s alpha) for scale scores exceeded 0.70, and test-retest reliabilities (Pearson’s r) were 0.70 or above. Evidence of internal convergent and discriminant validity was demonstrated and external convergent and discriminant validity was demonstrated when comparing the OCHS-EBS-B to an independent measure of disorders—the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID). The scales were shown to be psychometrically adequate for use as a categorical measure of mental health problems.

Conclusions. The OCHS-EBS-B provide reliable and valid dimensional and categorical measurement of internalizing, externalizing and attention problems assessed by caregivers and youth in the general population.
BIDIRECTIONAL ASSOCIATION BETWEEN BULLYING PERPETRATION AND INTERNALIZING PROBLEMS AMONG YOUTH IN THE UNITED STATES: FINDINGS FROM THE PATH STUDY

Marine Azevedo Da Silva*, Marine Azevedo Da Silva, Jasmin C. Gonzalez, Gregory L. Person, Silvia S. Martins, (Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY, USA)

Bullying behaviors are a well-recognized global public health issue. In contrast to bullying victimization, prior research on causes and consequences of bullying perpetration are more scattered, mainly concerning their mental health problems. Identification of the temporal pattern of associations between bullying perpetration and mental health problems in youth is needed for the optimal targeting of intervention and prevention. We used data from the prospective cohort study of the Population Assessment of Tobacco and Health (PATH) to examine the bidirectional associations between bullying perpetration and internalizing problems, among youth in the United States. We analyzed the associations of bullying perpetration with internalizing problems using multinomial logistic regression (with internalizing problems as dependent variable) and binary logistic regression (with bullying perpetration as dependent variable). The 13,094 youths included in the analytic sample were 12-17 years old at baseline, 51.3% were male, 70.8% were white, and 48.9% were in high school. There was a cross-sectional association between bullying perpetration and moderate/high lifetime internalizing problems (OR moderate vs no/low = 3.12, 95% CI 2.67-3.66; OR high vs no/low = 8.73, 95% CI 7.49-10.18). In a prospective analysis, bullying perpetration was associated with increase likelihood of moderate/high internalizing problems at follow-up (OR moderate vs no/low = 1.45, 95% CI 1.10-1.91; OR high vs no/low = 1.62, 95% CI 1.16-2.27). In a converse analysis, youth with moderate/high internalizing problems had higher odds of bullying perpetration at follow-up (OR moderate = 1.97, 95% CI 1.66-2.33; OR high = 3.13, 95% CI 2.64-3.71). The association between bullying perpetration and internalizing problems appears to be bidirectional. Bullying behaviors prevention and intervention strategies among youths should consider how to take into account and handle negative feelings and mental health problems.
UNMET HEALTHCARE NEEDS AMONG MIDLIFE ADULTS WITH SEVERE PSYCHOLOGICAL DISTRESS (SPD) AND MULTIPLE CHRONIC CONDITIONS (MCC) Pamela Jo Johnson* Pamela Jo Johnson, Kari M. Mentzer, Judy Jou, Dawn L. Upchurch, (Division of Health Policy & Management, University of Minnesota)

Premature mortality in those with serious mental illness is a public health crisis. Adults with mental illness are more likely to have MCC and die, on average, 25 years earlier than the general population, mostly due to chronic conditions. About 25% of adults have current mental illness and 50% of midlife adults have 2+ chronic conditions. Yet, little is known about the association of mental illness and chronic conditions with unmet healthcare needs. Nationally representative data for midlife adults (n=26,156) from NHIS 2014-2016 were examined. Key measures: SPD = K6 to identify those with high likelihood of diagnosable mental illness. MCC = 2 or more of 10 chronic conditions. Health status = no MCC/SPD, MCC only, SPD only, or MCC/SPD. We used logistic regression to estimate ORs of delayed or foregone care by health status controlling for potential confounders. Nearly 40% of midlife adults had MCC, SPD, or SPD/MCC with significant differences by health status group. Notably, SPD with or without MCC had higher prevalence of social disadvantage, fair/poor health, functional limitations, and delayed/foregone healthcare. Compared to those with no SPD/MCC, adults with SPD/MCC were more likely to delay care due to limited office hours (AOR=4.7, 95% CI 3.3-6.9) or transportation (AOR=4.7, 95% CI 3.1-7.0) and had 2 to 4 times higher odds of delayed care for all other reasons. Those with SPD/MCC had higher odds of needing but not getting mental healthcare (AOR=6.1, 95% CI 3.9-9.4), prescriptions (AOR=5.1, 95% CI 4.0-6.5), or follow-up care (AOR=4.4, 95% CI 3.2-5.9), and had 3 to 4 times higher odds of all other types of foregone care. Midlife adults with SPD/MCC are severely debilitated and have substantial unmet care needs. Midlife is a critical time to identify and manage both chronic conditions and mental illness. Healthcare barriers for adults with SPD/MCC may represent a missed opportunity to address these issues before they lead to disability or premature death.

S/P indicates work done while a student/postdoc
Marital intimate partner violence (IPV) is both highly prevalent globally and associated with adverse mental health outcomes, like depression, among women. In IPV-endemic contexts, such as Bangladesh, however, previous research has found no association between low levels of IPV and depression. Although IPV and attitudes justifying IPV against women are highly prevalent in this context, nothing is known about how related group-level norms affect associations between individual-level IPV exposure and depression. The present study examines if village-level normativity of IPV, operationalized using village-level prevalences of a) IPV (physical, sexual, psychological, and any) and b) IPV-justifying attitudes, modifies associations between severity of recent IPV and major depressive episode (MDE) among women in rural Bangladesh. We hypothesize that a previously observed overall lack of association between highly prevalent, low levels of IPV exposure and MDE will be positive when examined in villages where IPV normativity is low. Data for this analysis were drawn from a nationally-representative sample consisting of 3356 women, aged 16-37, from 77 villages in 2013-14. We use multilevel models accounting for the complex survey design to test cross-level interactions between indicators of village-level IPV normativity and recently experienced individual-level IPV severity (subtypes and any) on the association with past 30-day MDE. The prevalence of any type of IPV was 82.5% (range: 30.3% to 100% across villages) and nearly 20% of women in this sample justified IPV against women in at least one scenario (range: 1.6% to 51.5% across villages). Preliminary results support the hypothesis. For example, the RR for the association between low-level any IPV severity and MDE changed from 1.04 (95% CI: 0.82, 1.32) overall to 1.41 (0.81, 2.46) in villages with the lowest levels of IPV-justifying attitudes and to 1.34 (1.23, 1.46) in villages with the lowest prevalence of any IPV.
MEASURING POST-DISCHARGE TREATMENT OUTCOMES OF CLIENTS IN COMMUNITY-BASED MENTAL HEALTH CARE: THE NEED FOR BENCHMARKS AND BEST PRACTICES
Rajeev Ramchand* Rajeev Ramchand, Aaditya Bhat, Crystal Shelton, Stephanie Renno, (Cohen Veterans Network)

Background: Providers, payors, and consumers are increasingly interested in post-discharge outcomes for clients in outpatient mental health treatment. This study sought to determine whether case managers could successfully re-contact clients receiving outpatient mental health treatment at 3-, 6-, and 12-months post-discharge, and to identify any available benchmarks to help gauge performance. Methods: Cohen Veterans Network (CVN) is a network of behavioral health clinics offering low or no-cost behavioral health care to veterans and their families. Beginning in January 2017, case managers at each of CVN's existing 10 clinics were instructed to attempt to contact clients by phone post-discharge. A concurrent literature review was conducted to identify relevant benchmarks to monitor performance. Results. Between January 2017 and November 2018, 2986 clients were eligible for either 3-, 6-, or 12-month follow-ups. Attempts were made for 27% of eligible discharged clients at 3- and 6-months, and 40% of eligible discharged clients at 12-months. Trends over time showed increased compliance, with monthly peaks of 40% for 3-month discharge follow-up contacts and 60% compliance of 6- and 12-month follow-ups. Of those attempted, between a third and 45% provided valid, outcome data with higher rates at the 3- than the 6- and 12-month assessments. We were not able to identify any benchmark data. We assumed the “gold standard” to be aggregated data from randomized control trials of Cognitive Processing Therapy for persons with military-related post-traumatic stress disorder, which achieved follow-up rates of 69% at 3-months (1 study), 69% at 6 months (1 study), and 50% at 12 months (1 study). Conclusion. Benchmarks are needed to help clinics gauge their performance and best practices for following-up, such as offering incentives or using multi-modal approaches, need to be tested for providers looking to improve.
IMPROVEMENT IN SOCIAL FUNCTIONING AND PSYCHOTIC SYMPTOMS IN PATIENTS WITH FIRST-EPISTEME PSYCHOSIS AT 6 MONTH FOLLOW-UP: A PROSPECTIVE COHORT STUDY IN TAIWAN

Shun-Chun Yu* Shun-Chun Yu, Tzung-Jeng Hwang, Chih-Min Liu, Hung-Yu Chan, Chian-Jue Kuo, Ya-Wen Shih, Wei J. Chen, (Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan)

Background: A substantial proportion of patients with first-episode psychosis (FEP) have poor long-term functional outcomes and quality of life despite improvement in clinical symptoms. Hence, the improvement in the outcomes of quality of life and psychosocial functioning are important goal of the treatment for these patients. To achieve treatment goals such as recovery and remission, it is essential to evaluate comprehensively in different outcome areas. The aim of this study is to investigate the relationship between wellness and symptoms in patients with FEP at 6-month follow-up. Methods: This study is a prospective cohort study of patients with FEP (N=77) from three northern hospitals in Taiwan. The Personal and Social Performance (PSP) scale and the Positive and Negative Syndrome Scale (PANSS) were used for assessing social functioning and psychotic symptoms, respectively, during the follow-up. The five-factor model of the PANSS, including Negative factor, Positive factor, Disorganized/concrete factor, Excited factor, and Depressed factor was used for subsequent analyses. Results: PSP total score showed a strong association with PANSS total score at both baseline (r=-0.79) and 6-month follow-up (r=-0.74). Among the PANSS five factors, the improvement in the PSP scale was significantly correlated with the decreasing Negative factor at 6-month follow-up (r=0.79, p=0.002). Regression analysis showed that a unit decrease in the Negative factor at 6-month follow-up corresponds to an increase of 2.28 points of PSP scale improvement (CI: 0.56-4.06, p=0.002). Conclusion: This study shows a significant correlation between the Negative factor of psychotic symptoms and social functioning improvement. It indicates that reducing negative symptoms is key to improve social functioning in patients with FEP.
ATHLETIC PARTICIPATION AND SELF-IDENTITY ARE ASSOCIATED WITH IMPROVED MENTAL HEALTH OUTCOMES IN UNDERGRADUATE STUDENTS Sofija E. Zagarins* Sofija E. Zagarins, Megan W. Harvey, Pamela S. Higgins, Brian Krylowicz, (Springfield College)

Mental health in college students is a growing public health concern. Recent studies suggest that 30% of college students experience anxiety and/or depression. Previously identified risk factors include gender, financial status, academic success, and extracurricular participation. Although extracurricular participation is generally protective, results for the association between athletic participation and anxiety/depression are conflicting and difficult to compare due to varying definitions of athlete status. Specifically, it is unclear if participation itself is the key risk factor, or whether self-identified perceptions of athlete status may be a more important determinant of mental health outcomes. We examined the association between measures of athletic participation/identity and anxiety and depression using data from n=527 undergraduate students at a small, private university in New England collected as part of the Healthy Minds Survey. Athlete status was defined based on participation in an intercollegiate varsity sport (yes/no), as well as based on the degree to which students endorsed the following questionnaire item: “I see myself as an athlete, and that is central to my sense of self”. Anxiety and depression were measured using validated questionnaires (Generalized Anxiety Disorder-7; Patient Health Questionnaire-9). In multivariable linear regression models adjusted for gender, race, financial status, and grade point average, participation in intercollegiate varsity athletics was associated with lower anxiety (β(SE)= -1.25 (0.49), P=0.01) and lower depression (β(SE)= -1.59 (0.50), P=0.001), while athlete self-identity was associated with lower depression (β(SE)= -1.76 (0.81), P=0.03) but was not associated with lower anxiety. Results suggest that further research into the association between different measures of athlete status and mental health in college students is warranted to determine whether athlete self-identity is a distinct protective factor.
Mental distress is associated with several chronic diseases, including diabetes, hypertension, and metabolic syndrome. A measure often used when utilizing the Behavioral Risk Factor Surveillance system is frequent mental distress, defined as reporting 14 or more days of poor mental health out of the past 30 days (about 50% of all days in the past month). Frequent mental distress correlates well with clinical depression (two or more weeks of symptoms of depression in the past month) but does not adequately represent individuals who report a higher percentage of poor mental health days. The purpose of this study is to examine historical patterns of chronic mental distress (reporting 21 or more days of poor mental out of the past 30) among adults in the United States.

Methods: Behavioral Risk Factor Surveillance data from 1993-2017 were used. A poor mental health continuum was constructed using logical cut points: 0 days, 1-6 days, 7-13 days, 14-20 days, and 21 or more days. The data were weighted and age-adjusted. The prevalence of chronic mental distress was examined by year and stratified by key demographic and chronic disease-related variables.

Results: Using 1993 as the baseline, the age-adjusted prevalence of chronic mental distress increased consistently and significantly from 4.4% to 7.2% (geometric mean increase 28.3%, relative increase 63.6%, trend p-value <0.05). The patterns of change varied by sex, age group, education level, and all examined health-related outcomes (examples: health insurance, access to care barrier, diabetes, obesity status). Conclusion: The magnitude of mental distress matters as it relates to many health and chronic disease-related outcomes. These data show that the prevalence of chronic mental distress has increased at an alarming rate since 1993. Examining mental distress as a continuum instead of dichotomous outcomes provides more detailed insight about the relationship between mental distress and health-related outcomes.
POSTTRAUMATIC STRESS DISORDER AND INCIDENT INFECTIONS: A NATIONWIDE COHORT STUDY Tammy Jiang* Tammy Jiang, Dóra K. Farkas, Thomas P. Ahern, Timothy L. Lash, Henrik T. Sørensen, Jaimie L. Gradus, (Boston University School of Public Health)

Background: It is unknown whether posttraumatic stress disorder (PTSD) is associated with incident infections. This study's objectives were to examine (1) the association between PTSD and 28 types of infections and (2) the interaction between PTSD and sex on the rate of infections. Methods: The study population consisted of a longitudinal nationwide cohort of all residents of Denmark who received a PTSD diagnosis between 1995 and 2011, and an age- and sex-matched general population comparison cohort. We fit Cox proportional hazards regression models to examine associations between PTSD and infections. To account for multiple estimation, we adjusted the hazard ratios using semi-Bayes shrinkage. We calculated interaction contrasts to assess the presence of interaction between PTSD and sex. Results: After semi-Bayes shrinkage, the hazard ratio (HR) for any type of infection was 1.8 [95% confidence interval (CI): 1.6, 2.0], adjusting for marital status, non-psychiatric comorbidity, and diagnoses of substance abuse, substance dependence, and depression. The association between PTSD and some infections (e.g., urinary tract infections) were stronger among females whereas other associations were stronger among males (e.g., skin infections). Conclusions: This study’s findings suggest that PTSD is a risk factor for numerous infection types and that the associations between PTSD and infections are modified by sex.
Depression is the most prevalent psychiatric disorder in older nursing home residents. Symptoms may vary by level of cognitive impairment (CI). We aimed to identify subgroups of nursing home residents with homogenous depression symptoms and evaluate if these subgroups differ by CI. Using the national nursing home 2013 Minimum Data Set 3.0, we identified 219,292 newly admitted residents with depression diagnosis. The Patient Health Questionnaire (self-reported PHQ-9/staff-assessed PHQ-9-OV) measured depression symptoms. CI was measured by the Cognitive Function Scale (intact, mild, moderate, severe CI). Latent class analysis (LCA) identified subgroups with depression symptoms as indicators and CI as grouping variable. Model selection was based on fit statistics, class prevalence and interpretability. Average age was 79.7 years (sd: 8.2) and 72% were women. Mild, moderate and severe CI was present in 24%, 19% and 3% of residents, respectively. The LCA model with 4 subgroups and partial measurement invariance across CI fit the data best. Subgroups differed by CI, mainly by number of symptoms, concentration, fatigue and mood (Figure 1). Subgroups common to all levels of CI were Fatigue Only (class prevalence range: 20% of those with moderate CI to 37% of those intact) and Minimal Symptoms (range: 33% mild CI to 41% moderate CI). In residents without severe CI, a Depressed Mood Only subgroup was seen (range: 12% intact to 27% moderate). Those with intact cognition also had a Multiple Symptoms Without Impaired Concentration subgroup (14% intact), whereas there was a Multiple Symptoms with Impaired Concentration subgroup in those with mild (17%) or moderate CI (13%). In residents with severe CI, other subgroups included Impaired Concentration Only (24%) and Multiple Symptoms with Impaired Concentration, Anhedonia and Psychomotor Changes (12%). Results provide a basis for improving depression management in nursing homes with treatment plans tailored to cognitive impairment.
Substance use disorders are one of the predictors of suicidal behavior, which often engage polysubstance use. However, few studies compared the use of multiple substances in suicide attempters and in those with ideation only, or disentangled the interrelationship between illicit drugs. We conducted a network analysis to investigate the associations among 14 substance types used in the past year among 42,554 adults (aged 18 years or above) from the 2017 National Survey on Drug Use and Health: 406 (1.0%) with past-year suicide attempt; 2,182 (5.1%) with past-year suicidal ideation but no attempt; 5,659 (13.3%) without suicide ideation but with either major depressive episode or substance use disorder (MDE/SUD) in the past year; and 34,307 (80.6%) controls with no aforementioned conditions. More types of substances were used by suicide attempters [Mean (SD): 3.26 (2.48)] compared with ideation only [2.50 (2.07)], MDE/SUD [2.82 (2.03)], and healthy controls [1.34 (1.21)] significantly (Bonferroni’s post hoc comparison p<0.008). Marijuana and prescription pain medications (opioids) were the most common illicit drugs among all groups (e.g. 51.5% and 24.6% in suicide attempters, respectively). Network analyses show a strong association between heroin and methamphetamine in suicide attempters after controlling for all other substances in the network; and weak associations between all other substances. However, more substances were linked to each other directly or indirectly with stronger associations in those with suicidal ideation and MDE/SUD. Our results suggest that the transition from suicidal ideation to attempt may be accompanied by a change in drug use patterns with a consistently strong association between heroin and methamphetamine. Future longitudinal studies need to examine the temporal sequence between different types of substances prior to imminent suicidal behavior to better identify people at highest risk for attempt and to develop targeted interventions.
DAILY CONTACTS AND NEGATIVE MOOD: EVIDENCE FROM A LARGE-SCALE REPRESENTATIVE SURVEY IN TAIWAN Yun-Hsuan Wu* Yun-Hsuan Wu, Yang-chih Fu, (Institute of Sociology, Academia Sinica)

Background: As key measures of social relationships, the number and types of social contacts have been closely linked to negative personal mood, which could contribute to mental health in a significant way. It is unclear, however, whether and how different types of negative mood vary by the number and the mode of social contacts in daily life. Methods: Drawing data from the 2017 Taiwan Social Change Survey (n=1,995), we analyzed how three measures for negative mood outcomes -- loneliness, depression, and stress -- vary by two indicators of social contacts: average number of daily contacts and the proportion of face-to-face contacts. Because the same set of individual characteristics could influence both social contacts and negative mood, we used treatment-effect models to take into consideration the potential bias caused by self-selection and to assess whether different types of negative mood could vary by the measures of social contacts individually. Results: Compared to the lowest contact level (level 1, 0-4 persons), all higher levels of daily contacts are associated with a lower level of loneliness (p<0.05). The degrees of depression (β=-0.32, SE=0.09, p<0.01) and stress (β=-0.27, SE=0.11, p=0.02), however, differ significantly only between level 1 and level 4 (20-49 persons). Furthermore, a higher proportion of face-to-face daily contacts is significantly associated with lower levels of depression (p=0.02) and stress (p<0.05), but not loneliness. Conclusion: Interpersonal contacts in daily life represent a core component of social interactions that help distinguish negative personal mood. When developing and designing relevant programs, one should consider using various forms of social interactions as a strategy for promoting better mental health.
An association between childhood mental health and health in adulthood has been noted but little is known of the long-term impact of adverse childhood mental health (MH) on cardiometabolic health in adulthood. We examined the association between child MH (ages 9-11) and cardiometabolic health in adulthood (age 50) among participants in the Child Health and Development Studies Disparities Study (N=380). Child MH (sadness, hyperactivity, oppositional, conduct disorder and anxiety symptoms) were based on mother’s report of a previously validated battery of child MH, and treated as continuous measures. A cardiometabolic health assessment was conducted at age 50. Each component was characterized based on clinical cutoffs: elevated waist circumference (≥88 cm for women and ≥102 cm for men) low HDL cholesterol (= 6.5% or use of diabetes medications. A high prevalence of hypertension 33%, obesity 41% and diabetes 35% was noted. In binomial regression analyses adjusting for socio-demographics, hyperactivity and sadness in childhood were associated with higher prevalence of 2 or more (PR 1.1 95%CI 1.0, 1.2) cardiometabolic factors in adulthood. Sadness, hyperactivity and oppositional symptoms were associated with higher prevalence of obesity (PR 1.2 95%CI 1.0, 1.3; PR 1.2 95%CI 1.1, 1.4; PR 1.1 95%CI 0.99, 1.3, respectively). Sadness and anxious symptoms were associated with higher prevalence of diabetes. Interactions between child MH and sex or race were not statistically significant. Findings suggest that child MH is associated with long term cardiometabolic health, which may be attributable to obesogenic behaviors or psychiatric disorders in adulthood. Disentangling pathways through which child mental health impact adult cardiometabolic health will be an important next step.
MULTIPLE IMPUTATION DATA ANALYSIS IS USEFUL FOR RELIABILITY STUDIES?

SAYCARE STUDY Augusto Cesar F. De Moraes* Augusto Cesar F. De Moraes, Vasile-Alexandru Suchar, Laura I González-Zapata, Carlos Delgado, Heraclito Barbosa Carvalho, Michelle M. Wiest, (1- Department of Epidemiology, School of Public Health, University of Sao Paulo. 2- YCARE (Youth/Child and Cardiovascular Risk and Environmental) Research Group, Faculdade de Medicina, Universidade de Sao Paulo.)

Background: Standard approaches for multiple imputation (MI) assume normality for continuous variables (conditionally on the other variables in the imputation model), however, non-normally distributed variables are very common. Further, literature on multiple imputation analysis for validation/reliability coefficients, especially for the subjective methods to assess moderate-to-vigorous physical activity (MVPA) levels, is scarce. Methods: Five MI methods were used to estimate the reliability coefficients of physical activity questionnaire from the SAYCARE study between 1st and 2nd measure [children (3-10 years old) n=161; adolescents (11-18 years old) n=177]. We applied five MI models in each questionnaires: 1) MICE with predictive mean matching (logistic and multinomial regression); 2) MICE with Classification and regression trees; 3) MICE with Random Forest; 4) Random Forest, and 5) Bayesian imputation. All the MI models we adjusted for Rubin’s rules to pool it the results. Results: Without imputation, the correlation coefficient (r) estimate between the 1st and 2nd measure MVPA minutes were 0.56 and 0.76. In children, r estimates ranged from 0.18 to 0.33 when excluding the values of 1st measure MVPA. Estimates of the r including 1st measure MVPA ranged from 0.25 to 0.42. In adolescents, r estimates ranged from 0.32 to 0.44 without 1st measure. With 1st measure MVPA included in the imputation model, the range of estimates was 0.46 to 0.62. Conclusion: As expected, including the first measurement of MVPA in the imputation model increased the estimated r. With MVPA included in the imputation models, correlation estimates were consistently lower than the estimates with the complete dataset, regardless of imputation approach. These findings suggest that multiple imputation is correcting a bias toward higher correlation with complete case analysis. Future simulations based on this dataset will evaluate the bias and coverage of the five imputation approaches.
When a valid instrument can be identified, instrumental variable (IV) analysis can be used in observational epidemiological studies to control for measured and unmeasured confounding. Three assumptions must be met for an IV to be valid. The IV must: 1) be strongly causally related to the exposure; 2) have no effect on the outcome except through the exposure; 3) have no common causes with the outcome. We investigated if bias occurs when ascertaining the exposure-outcome effect using a non-differentially misclassified IV. We first simulated a dataset of 10,000 observations with an exposure-outcome risk difference (RD) of 0.4 and IV-exposure RD of 0.5. We then misclassified the IV by varying sensitivity (Se) and specificity (Sp) combinations from 0.00 to 1.00 by 0.10, resulting in 119 scenarios. For each scenario, we estimated the exposure-outcome RD by dividing the observed IV-outcome RD by the observed IV-exposure RD. For each of the 119 scenarios, we repeated the analysis 10,000 times, calculated the mean RD and plotted histograms of RDs to investigate random error. We additionally assessed if varying sample size changed our results. With 10,000 observations, the exposure-outcome effect of 0.4 was recovered in all scenarios except those where Se and Sp summed to 100% (red cells, Figure). When the sum of the Se and Sp equaled 100%, the IV-exposure effect was close to 0, indicating a violation to the first IV assumption. Random error became more pronounced as the sum of Se and Sp approached 100% (cell insets, Figure). When we decreased the sample size to 1,000, bias from misclassification was more pronounced and the mean exposure-outcome effect of 0.4 could only be recovered in 75% of scenarios (not shown in Figure). Non-differential misclassification of an IV weakens the IV-exposure effect, violating the first assumption of IVs. Using a weak IV to recover an exposure-outcome effect results in larger standard errors and greater bias at small sample sizes.

Figure. Effect of exposure on outcome (exposure-outcome risk difference RD=0.4) using a misclassified instrument (instrument-exposure RD=0.5) simulated 10,000 times in a dataset of 10,000 observations for 119 sensitivity and specificity scenarios. Cell data are the mean RD of the 10,000 observed exposure-outcome RDs. Cell insets are the distribution of the 10,000 observed exposure-outcome RDs, as shown in (A).

Abbreviations: risk difference (RD)
AN APPROACH FOR DELINEATING THE CAUSAL FRAMEWORKS AND TOOLS USED IN EPIDEMIOLOGIC PRACTICE AND RESEARCH Devon Boyne* Devon Boyne, Darren Brenner, Christine Friedenreich, (University of Calgary)

Background: The identification and quantification of causal relations is one of the primary objectives of epidemiology. Several concepts have been developed to assist in such endeavours including the sufficient-component cause model, the potential outcomes framework, causal graphs, and the Bradford Hill criteria. Although such concepts are widely taught in epidemiology courses throughout the world, there is no overarching approach that can be used to delineate the role of each of these concepts. Methods: We build upon discussions emerging from a series of articles published in the International Journal of Epidemiology [Int J Epidemiol. 2016;45(6):1776-1886] and upon work done by Dr. Leen De Vreese [Med Health Care Philos. 2009;12(3):345-53] to create an approach that can be used to distinguish different epidemiologic frameworks and tools. Results: We describe four areas of causal inquiry: A1) the metaphysical definition of a cause of a health outcome; A2) the metaphysical definition of a causal effect of an intervention; A3) the practice of determining whether or not an exposure is a cause of a health outcome; and A4) the practice of quantifying the causal effect of an intervention. We argue that the sufficient-component cause framework primarily addresses A1; the potential-outcomes framework provides one solution to A2 and is the foundation for epidemiologic methods that address A4; causal graphs are tools that can assist with A3 and A4; and the Bradford Hill criteria is a tool that can help address A3. Conclusions: Herein we present an approach for distinguishing causal concepts and their application within epidemiology. Such an approach may help to facilitate the teaching of epidemiologic concepts within graduate programs worldwide and may help to further future discussions regarding their use in epidemiologic research and practice.
ESTIMATION AND INFERENCE FOR THE TIME-VARYING MEDIATION EFFECT OF A SMOKING CESSATION INTERVENTION

Donna L. Coffman*, Donna L. Coffman, Xizhen Cai, Runze Li, Megan E. Piper, (Temple University)

Traditionally, mediation analysis studies the relationship between an intervention, a time-invariant mediator, and a time-invariant outcome variable. The mediation effect from the treatment to the outcome through the mediator is usually assumed to be time-invariant. With the improvement of the technology, it is possible to make repeated assessments of subjects over time to obtain intensive longitudinal data. This calls for an extension of traditional mediation analysis to incorporate time-varying variables and effects. We consider a framework to build a time-varying mediation model, and focus on estimating and making inference regarding the time-varying mediation effect. We derive its asymptotic distribution at any fixed time point and construct the corresponding point-wise confidence band for the time-varying mediation effect. Simulation studies show good performance when comparing the confidence band and the true underlying model. We apply the model to a smoking cessation study. We conclude with a discussion of limitations and future extensions of the proposed method.
A propensity score is a conditional probability of assignment to a particular exposure given a vector of observed covariates. It is one of the coarsest balancing scores, where a balancing score is a function of the observed covariates such that the conditional distribution of the covariates given the balancing score is the same for the exposed and the unexposed groups. The following two theorems are crucial to properly control confounding by propensity score methods in epidemiologic research: a) exposure assignment and the observed covariates are conditionally independent given the propensity score; and b) if exposure assignment is strongly ignorable (i.e., both full exchangeability and positivity are satisfied) given the covariates, then the exposure assignment is strongly ignorable given the propensity score. Despite its importance, however, the latter theorem is not intuitively easy to understand because it includes potential outcomes. In this study, we aim to graphically illustrate both theorems by using recently developed single world intervention graphs, which explicitly connect the potential outcome framework with directed acyclic graphs. Epidemiologists often use directed acyclic graphs to visually summarize hypothetical relations among observed variables. Single world intervention graphs, however, allow us to show hypothetical relations between observed/unobserved factual random variables and potential (or counterfactual) outcomes. The potential outcome framework provides a clear and coherent framework to think about a variety of important concepts related to causation. This study exemplifies the usefulness of graphically illustrating the propensity score methods to control confounding by using single world intervention graphs.
HOW WELL DO HEALTHCARE WORKERS ESTIMATE THEIR TIME SPENT ON LATENT TUBERCULOSIS MANAGEMENT ACTIVITIES? ASSESSING THE AGREEMENT BETWEEN TWO DIFFERENT TIME MEASUREMENT APPROACHES

Hannah Alsdurf* Hannah Alsdurf, Olivia Oxlade, Dick Menzies, (McGill University)

Background: Time and motion (TAM) studies are considered the gold standard for precisely quantifying the time required for specific work activities, such as assembly line production workers. We have used TAMs in a novel way: to quantify the increase in healthcare worker (HCW) time spent on the management of latent tuberculosis infection (LTBI) following a pragmatic, randomized trial to strengthen LTBI programs in 6 countries (ACT4 trial). But TAMs can be a time-consuming approach and can encroach on confidentially in a clinical setting. The objective of this study is to assess the agreement between two approaches: 1) TAMs; and 2) a simplified time-estimation questionnaire (TEQ) for capturing HCW time spent on LTBI activities. Methods: HCW involved in TB clinical care working in the ACT4 trial were invited to participate in the study, and those who agreed participated in both a TAM and TEQ. For the TAM, each HCW was followed throughout a full work day, noting minutes spent on each of their daily activities into pre-determined categories: active TB (ATB); LTBI; Non-TB. For the TEQ, at the end of the TAM day, each HCW reported their estimated number of hours on ATB/LTBI activities. A two-way, mixed effects intra-class correlation coefficient (ICC) was used as a measure of agreement, as well as Bland-Altman plots. Results: Data for 88 HCW in 3 countries was analyzed to measure agreement between the TAM and TEQ methods. Benin showed good agreement (ICC: 0.76) while Canada showed moderate agreement (ICC: 0.41) and Indonesia showed poor agreement (ICC: 0.09) (see Table 1). Conclusions: Initial results suggest that the TEQ performs well as an approach for HCW to report their time on pre-specified categories of work activities. In countries like Indonesia where little time is spent on LTBI activities, HCW may have difficulty reporting minor changes in time. Since TAMs are time-consuming and costly, the TEQ may be a more efficient method of data gathering in some settings.

<table>
<thead>
<tr>
<th>Total HCW (N)</th>
<th>Mean hours (CI) per HCW on LTBI related activities - TAMs</th>
<th>Proportion (CI) of LTBI out of all TB activities - TAMs</th>
<th>Proportion (CI) of LTBI out of all TB activities - Self-reported TEQ</th>
<th>Intra-class correlation coefficient (95% CI) for HCW time spent on LTBI activities (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sites</td>
<td>88</td>
<td>0.49 (0.33, 0.65)</td>
<td>0.25 (0.18, 0.32)</td>
<td>0.26 (0.19, 0.33)</td>
</tr>
<tr>
<td>Benin</td>
<td>18</td>
<td>0.15 (-0.08, 0.39)</td>
<td>0.08 (-0.02, 0.19)</td>
<td>0.05 (-0.01, 0.11)</td>
</tr>
<tr>
<td>Canada*</td>
<td>40</td>
<td>1.00 (0.73, 1.26)</td>
<td>0.48 (0.38, 0.58)</td>
<td>0.38 (0.29, 0.48)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>30</td>
<td>0.02 (-0.01, 0.03)</td>
<td>0.05 (-0.02, 0.12)</td>
<td>0.21 (0.07, 0.35)</td>
</tr>
</tbody>
</table>

*Statistically significant agreement based on a two-way, mixed effects ICC, consistency (McGraw-Wong convention)
A CAUTIONARY NOTE ABOUT ASSESSING HETEROGENEITY OVER OUTCOME SCORES IN RANDOMIZED TRIALS Hongseok Kim* Hongseok Kim, Issa Dahabeh, (Brown University)

The move towards personalized medicine requires careful assessment of heterogeneity of treatment effects (HTE) over multiple patient characteristics. For example, in the context of randomized trials of point treatments, investigators are interested in assessing the variability of treatment effects among subgroups of patients defined on the basis of high dimensional baseline covariates. In this context, a number of investigators have strongly advocated for the use of “outcome score” procedures for the assessment of HTE. All variants of these procedures involve the following steps: (1) develop predictive models of the outcome in the absence of treatment (more generally, under the “control” treatment), conditional on baseline covariates, (2) stratify the trial sample using the predicted outcome values, and (3) examine HTE over the predicted outcome values (the “outcome score” values) or over strata based on the outcome score. Here, we show that under certain data laws, HTE assessment using outcome scores can lead to the misleading conclusion that heterogeneity is absent, even in very large randomized trials with highly heterogeneous treatment effects. We characterize the data laws under which score-based procedures have very low power to detect HTE. We examine the combined influence of the underlying data law and the choice of model specification on power to detect HTE in simulation studies. Furthermore, we show that conceptually simple and easy to implement methods that assess HTE over “effect scores” (i.e., predicted treatment effects) do not suffer from the same drawbacks. We conclude that “outcome score”-based procedures for the assessment of HTE can be highly misleading and in most cases should not be the primary approach to assessing HTE when analyzing randomized trial data.
Culture-independent diagnostic testing (CIDT) continues to increase because it provides rapid results to clinicians and can permit the detection of multiple pathogens from a single test. Increases in case detection and reported incidence for some pathogens is thought to be due in part to the increased uptake of CIDT, but it is unclear how much of the increase is due to changes in testing practices vs. an increase in the underlying population infection rate. Determining changes in incidence while accounting for systematic changes in detection is critical to monitoring disease and evaluating interventions. Severe illness outcomes, such as hospitalization and death, are assumed to be identified nearly always, and so are less likely to be affected by changes in testing practices. Similarly we make the assumption that testing practices did not change within demographic groups. Based on these assumptions, we can use these outcome and demographic variables as indicators of the incidence trend expected had testing methods not changed. Using U.S. Foodborne Diseases Active Surveillance Network (FoodNet) surveillance data on Shigella cases that occurred during 1996–2011 and mixed effects negative binomial regression, we estimated the expected incidence for the period 2012–2016, when CIDT results were routinely reported to FoodNet. We found that the number of female cases, hospitalizations, and deaths were each significant and highly predictive indicators of incidence. The estimated trend for 2012–2016 showed an increase in incidence even after accounting for changes in testing practices, but the estimated incidence was 20% lower than the observed incidence. These results show that demographic and severity of illness indicators may be useful in evaluating trends in systems that have undergone a systematic change. These methods can be applied to other pathogens or surveillance systems, and may aid in identifying true changes and trends in the population infection rate.
DIRECTED ACYCLIC GRAPHS AND CONFOUNDER MATRIX TO EVALUATE RESIDUAL CONFOUNDING IN SYSTEMATIC REVIEWS OF OBSERVATIONAL STUDIES

Julie M. Petersen*, Julie M. Petersen, Ludovic Trinquart, (Boston University School of Public Health, Department of Epidemiology)

In systematic reviews of observational etiologic studies, documenting confounding control in the selected studies is essential but there has been a lack of methodological guidance. We propose a new methodology to evaluate and summarize risk of bias due to confounding in systematic reviews of observational studies. A group of subject-matter and methodological experts first constructs directed acyclic graphs (DAG) depicting the causal structure of the exposure-outcome relationships. The group also specifies the hypothesized direction (harmful versus protective) and relative strength of each relationship. The consensus-based DAG are then used to identify minimally sufficient sets of covariates to control for confounding, as well as covariates which may not be appropriate for adjustment (e.g., those on the causal pathway, common effects). The group also agrees upon the gold standard for measurement, to identify susceptibility to measurement error. Information abstracted from selected studies is then summarized into a confounder matrix. For each study, the matrix shows which covariates are adequately or inadequately controlled for and which are subject to measurement error. We demonstrate the utility of this approach using a previous systematic review of interpregnancy interval and risk of preterm birth (Figure 1). Across all 6 studies, 21 covariates were considered as potential confounders. The number of covariates considered was not correlated to observed effect size. All 3 studies with smaller effect sizes considered race/ethnicity as a confounder and did not control for potential colliders and 2/3 controlled for proxies of pregnancy planning. Our novel approach offers a comprehensive and transparent method to assess and summarize confounding bias within studies. It also can serve as a means to incorporate confounding bias assessments into meta-analyses.
TRANSPORTING DIRECT AND INDIRECT EFFECTS TO NEW POPULATIONS Kara E Rudolph*
Kara E Rudolph, Jonathan Levy, Mark J. van der Laan, (University of California, Davis)

Often, an intervention that works in one place fails to replicate in another and can even have unintended harmful effects. In some cases, examining transportability of the total effect may shed light on reasons for lack of replication. However, in other cases, it may be beneficial to go further and examine transportability of the underlying mediation mechanisms. Although there has been work on identifying transported indirect effects, we are not aware of any previous work developing estimators for transporting mediation effects from a source to target population. Thus, we address this research gap by proposing several estimators of transported stochastic direct and indirect effects: an inverse probability of treatment-weighted (IPTW) estimator, an estimator that solves the efficient influence curve (EE), and a substitution estimator that also solves the EIC (TMLE). The EE and TMLE estimators are doubly robust and efficient. Using simulation, we demonstrate the finite sample properties of the estimators, including their relative efficiencies and a challenging scenario where nearly all of the IPTW and EE estimates are outside of the parameter space but the TMLE estimates stay within bounds. Lastly, we apply each estimator to longitudinal data from the Moving to Opportunity Study to estimate the extent to which mediation of the relationship between housing voucher receipt and adolescent substance use by several characteristics of the peer and school environments is common across cities. Thus, we demonstrate how the transported direct and indirect effect parameters enable the prediction of mediating effects in new populations based on data about the mediation mechanism in a source population and the differing distributions of compositional characteristics between the two populations. Ultimately, this work aims to contribute to understanding how and why interventions may work differently and/or have differing effects when applied to new populations.
An internal validation substudy compares measurement of a variable against a gold standard in a subset of the study population. The gold standard is usually too expensive to measure in all participants, but the validation data allow a bias-adjusted estimate expected to equal the estimate that would have been obtained had the gold standard been available for the entire study population. Methods for sampling the validation substudy rely on knowledge of the total sample size of the study. There are currently no methods to design and implement validation substudies as data accrue. Bayesian monitoring techniques have been used in clinical trials to estimate treatment response over time. In this study, we extend Bayesian monitoring methods to develop an adaptive approach to validation study design that informs sample size based on collection of sufficient validation data to stabilize the positive and negative predictive values (PPV and NPV) used to calculate a bias-adjusted estimate. We illustrate how the study can update the posterior distribution of the PPV and NPV within a given time interval of a study until additional information is unlikely to change the parameter values. To demonstrate the utility of this method, we use the Study of Transition, Outcomes and Gender (STRONG) cohort—a cohort of transgender health—which has extensively validated its study measures. We will demonstrate the utility of adaptive validation under two conditions: 1) to demonstrate efficacy, we will apply adaptive validation to reporting in medical records of sex assigned at birth among transgender youths and 2) to demonstrate the ability of the method to determine when further validation is futile, we will apply adaptive validation to reporting in medical records of sex assigned at birth among transgender adults. Furthermore, we will illustrate how bias-adjusted effect estimates stabilize. This proposed method is the first to use an adaptive design to calculate the validation parameters from a validation substudy.
CHILDHOOD POVERTY AND ADOLESCENT SMOKING: DEPENDENCY OF EFFECTS ON TIMING AND BACKGROUND Michael Green* Michael Green, , (University of Glasgow)

Lifecourse analyses aimed at determining the optimal timing of intervention over the lifecourse can be problematic because exposure effects may vary not just with the timing of exposure, but with background exposure and confounder histories. I propose a novel propensity weighting approach comparing average population effects of exposure (APE) at different time points with average effects among those who actually experience the exposure (AEE). Where these estimates diverge this indicates exposure effects are different for those with a background propensity to experience the exposure compared to the average population. Data from 7,177 adolescents in the UK Millennium Cohort Study are used to illustrate how poverty (<60% of the median household income) at 9 months and 3, 5, 7 and 11 years of age is related to having tried smoking at age 14. Both APE and AEE estimates were weighted to balance confounders, namely: ethnicity, maternal education, smoking in pregnancy, UK country, maternal age at birth, and all prior measures of poverty, maternal smoking and maternal mental health. APEs weight exposed and unexposed groups to resemble the average population, while AEEs weight the unexposed group to resemble those who actually experience poverty at that age. APE and AEE estimates were similar at 9 months (respectively OR: 1.75; 95% CI: 1.39-2.26 vs OR: 1.50; 95% CI: 1.15-1.94). Estimates at later ages were attenuated and similar (see figure), but at age 11 they diverged with the APE OR raising to 2.13 (1.44-3.15) while the AEE estimate remained low at 1.19 (0.78-1.81). In terms of reducing adolescent smoking, both estimates indicated potential benefits from intervening to reduce poverty at 9 months. At age 11 though, while the APE indicates risk for smoking could rise if poverty became more prevalent, effects were weak among those who actually experienced poverty and intervening here may have little impact over a disadvantaged background.

![Propensity weighted estimates of effects of poverty at different ages on smoking at age 14](image.png)
MISSING DATA IN THE PRESENCE OF CONFOUNDING Rachael K. Ross* Rachael K. Ross, Alex Breskin, Daniel Westreich, (University of North Carolina)

When estimating causal effects, careful handling of missing data is needed to reduce bias. Complete-case analysis (CCA) is a common method for handling missing data. Previous work has described using causal diagrams to determine whether CCA is biased, but some work has been ambiguous about the estimation of marginal causal effects when the exposure-outcome relationship is confounded. We aimed to determine when CCA is biased for the marginal effect when confounding is present. We examined mechanisms for missing data (R indicator) in a simple scenario of binary exposure E, binary outcome Y, and binary confounder L (figure). The causal structure does not dictate what data element is missing. For example, in scenario b, E causes R, but R may represent missing exposure, outcome, and/or confounder. For each scenario, we examined whether CCA (conditional on R=1) yields a biased estimate of the marginal effect (RD or RR). The marginal effect can be expressed as a function of 2 quantities: stratum-specific effect measures and prevalence of confounder. When data are missing completely at random (a), CCA is unbiased as the stratum-specific effects and prevalence of L are identifiable from the complete data. When data are not missing completely at random (b-h), the marginal effect is biased because, in general, the prevalence of L is not identified in the complete data. However, when the stratum-specific effects are homogeneous (no effect measure modification by L), the prevalence of L does not affect the estimate as the marginal effect equals the stratum-specific effects. Thus, when there is no EMM, CCA is unbiased when the stratum-specific effects are identifiable from the complete cases. This is the case when Y is not a cause of missing data (b,c,f); however when Y is a cause of missing data (d,e,g,h), CCA is biased. The strong assumptions required for CCA to remain unbiased should be considered when estimating a marginal effect from data with confounding and missing data.
A COMPARISON OF LOGISTIC REGRESSION VARIABLE SELECTION METHODS IN TOBACCO QUIT RATE MODELING: STEPWISE VS ENTER Samantha Friedrichsen* Samantha Friedrichsen, Sara Richter, (Professional Data Analysts, Inc.)

Background: Two common model selection methods in logistic regression are the enter method (EM) and stepwise methods (SMs). The results from these methods often differ and prior studies indicate that SMs may lead to biased results; however, they are still relatively popular. We explored the strengths and limitations of these methods by comparing regression results using EM and SMs in modeling tobacco cessation quit rates.

Methods: With survey data from a tobacco cessation program in Florida (2016 enrollees, n=3065), we ran four logistic regression model-selection methods (enter-method, stepwise, forward stepwise, and backward elimination) to test for associations between program type (i.e. web vs. phone) and self-reported 30-day abstinence from tobacco at 7-month follow-up, while adjusting for participant characteristics. The enter-method model was developed by a content expert and a statistician. Stepwise logistic regression models were run by entering all predictors considered for the enter-method model and forcing program type into the model. Model fit, clinical relevance, and collinearity among predictors were compared. Results: All three stepwise methods produced the same results. For the predictors in all models, statistical significance only differed meaningfully for time to first tobacco upon waking (EM: p=0.10, SM: p=0.04). Model fit was slightly better for EM than SM, and no significant collinearity issues were found in any model. EM produced more clinically relevant results and included important variables associated with quitting tobacco such as age and gender. Conclusion: These computer-generated stepwise models did not take into consideration the clinical importance of the predictors and looked quite different than the enter-method model. It is important to consider clinical relevance when building regression models so that the results will be useful for clinical and public health practice.

**Figure 1. Predictors in model results by model selection method**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Enter-Method</th>
<th>Stepwise Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program type</td>
<td>+</td>
<td>(forced)</td>
</tr>
<tr>
<td>Time to first tobacco upon waking</td>
<td>+</td>
<td>+*</td>
</tr>
<tr>
<td>Motivation to quit</td>
<td>+*</td>
<td>+*</td>
</tr>
<tr>
<td>Income</td>
<td>+*</td>
<td>+*</td>
</tr>
<tr>
<td>Race</td>
<td>+*</td>
<td>+*</td>
</tr>
<tr>
<td>Gender</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Health insurance</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Types of tobacco used</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Cigarettes per day</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

Notes. + included in final model, * p<0.05.
A SIMULATION BASED APPROACH TO CAUSAL MEDIATION ANALYSIS WITH ORDERED MULTIPLE MEDIATORS AND NON-LINEAR OUTCOME – INVESTIGATING THE VULNERABLE TIME WINDOW OF HBV ACTIVITY FOR THE MECHANISM OF HCV INDUCED HEPATOCELLULAR CARCINOMA Sheng-Hsuan Lin* Sheng-Hsuan Lin, , (National Chiao-Tung University, Institute of Statistics)

We developed a method based on the g-computation algorithm and Monte-Carlo simulation to conduct causal mediation analysis in a non-linear outcome and multiple ordered mediators. Unlike the regression-based approach, our simulation-based approach improves upon model choice flexibility and outcome scale range. We compared the operating characteristics of the proposed estimator in our simulation study with the traditional Structural Equation Model (SEM) estimator in the linear model. When the interaction between mediators increases, the estimates obtained using our method were still valid while the estimates in traditional SEM were not. Applying our proposed method on the Taiwanese Cohort Study dataset, we investigated the mechanism of HCV infection affecting hepatocellular carcinoma (HCC) mediated by early and late HBV viral load among HBV seropositive patients (n = 2878; HCV carrier n=123). Our results indicate that HCV decreased the incidence of HCC primarily through the decrease in HBV viral load in the early stage. In addition, the early exposure of low HBV viral load affected HCC by the lag effect on HCC incidence (OR = 0.873, 95% CI = (0.853, 0.893)), slightly more dominant than the persistent low viral load on HCC incidence (OR = 0.918, 95% CI = (0.896, 0.941)). This approach is powerful and versatile for mechanism investigation in settings with multiple mediators and non-linear outcome in which the traditional path-specific effect is not identified.

S/P indicates work done while a student/postdoc
BIAS FROM MISCLASSIFICATION IN RANDOM FORESTS Tammy Jiang* Tammy Jiang, Jaimie L. Gradus, Timothy L. Lash, Matthew P. Fox, (tjiang1@bu.edu)

Despite the growing use of machine learning, the impact of misclassification in machine learning remains unknown. Our study begins to address this gap by examining the effect of misclassification of predictors on random forests’ variable importance. The mean decrease in Gini index is an overall summary measure of the importance of each predictor to the discrimination of the outcome in random forests. We simulated data with five binary predictors and one binary outcome. In each simulated data set, we varied the effect of each predictor on the outcome (risk differences ranged from 0 to 0.2). The sensitivity and specificity ranged from 0.75 to 0.9. We ran random forests on the data sets for each misclassification scenario 10,000 times. We found that differential misclassification of predictors led to overestimation of the mean decrease in Gini index of the least prevalent predictor (X1) in the simulated data set where none of the predictors were associated with the outcome (see figure). This finding suggests that random forests can show a preference for uncommon and uninformative predictors when there is differential misclassification of predictors. We used quantitative bias analysis to attempt to reconstruct the data that would have been observed had the misclassified variables been correctly classified. We ran 10,000 iterations of the quantitative bias analysis and calculated the median values of variable importance for each predictor. We found that we can achieve bias-adjusted variable importance values using quantitative bias analysis. Future studies using machine learning should quantify and bias-adjust the impact of using misclassified data on variable importance.
Noncompliance, a ubiquitous problem in randomized clinical trials (RCTs), can produce bias in the estimation of treatment effect via the standard intention-to-treat analysis. The complier average causal effect (CACE) measures the effect of an intervention in the latent subpopulation that complies with its assigned treatment (the compliers). Though several methods have been developed to estimate CACE in the analysis of a single RCT, methods estimating CACE in meta-analysis of RCTs with noncompliance awaits further development. Here, we propose a generalized linear mixed model approach to estimate the CACE in a meta-analysis, which naturally accounts for the between-study heterogeneity. Methods are illustrated by application to a case study of a meta-analysis of 10 RCTs evaluating the effect of receiving epidural analgesia in labor on cesarean section. Furthermore, extensive simulation studies are conducted to evaluate the performance of our approach.
COMPARISON OF APPROACHES TO ESTIMATE RISK RATIOS FROM ODDS RATIOS IN META-ANALYSES OF RANDOMIZED CONTROLLED TRIALS WITH COMMON OUTCOMES

Tzu-Chun Chu* Tzu-Chun Chu, Rohit P. Ojha, (Center for Outcomes Research, JPS Health Network, Fort Worth, TX)

Background: Vanderweele recently proposed a simple square root transformation that could be an alternative to a flawed formula by Zhang and Yu (1998) for estimating RRs from ORs reported in published studies of common outcomes (e.g. in meta-analysis), but these approaches have not been compared using real-world data. We aimed to compare the real-world performance of these two approaches in meta-analyses of randomized controlled trials (RCTs) with common outcomes. Methods: We identified 3 published meta-analyses that included RCTs with common outcomes of varying frequency. We re-created 2 x 2 tables for the joint distribution of intervention and outcome for each study, which were used to estimate ORs and expected RRs. We applied the Zhang and Yu and Vanderweele approaches to estimate RRs (RRzy and RRv, respectively) from ORs for each study and subsequently used random-effects models to estimate meta-analytic summary estimates of the OR, expected RR, RRzy, and RRv. In addition, we computed the percent overestimation between the formula-based summary RRs and summary expected RRs, and the confidence limit ratio (CLR) for each summary estimate. Results: Summary RRzy overestimated the summary expected RRs by 7.3%, 1.2%, and 5.7% for the 3 meta-analyses. Summary RRv overestimated the summary expected RRs by 3.9%, 3.7%, and 3.2% for the 3 meta-analyses. CLRs were smaller for both summary RRzy and RRv compared with CLRs for the summary expected RRs, but CLRs for summary RRv were smaller than for summary RRzy. Conclusion: Our results suggest that the Vanderweele approach may lead to less overestimation of the RR in meta-analyses of RCTs. Nevertheless, neither the Vanderweele nor Zhang and Yu approaches provide accurate confidence limits, and thus neither approach may be reliable in meta-analyses of RCTs. Direct (i.e. model-based) estimation of RRs should be emphasized in original studies with common outcomes to avoid problematic post-hoc adjustments.

![Image](https://example.com/image.png)

NOTE: Weights are from random effects analysis

S/P indicates work done while a student/postdoc
LANGUAGE BIAS AMONG CHINESE-SPONSORED DRUG-RELATED RANDOMIZED CONTROLLED TRIALS

Yuanxi Jia, Doudou Huang, Jiajun Wen, Yanjun Duan, Joel Gagnier, Stephan Ehrhardt, David Celentano, (Bloomberg School of Public Health, the Johns Hopkins University)

Objective Our study aim is to evaluate the language bias among Chinese-sponsored drug-related randomized trials (CS-D-RCTs). We hypothesized that (1) CS-D-RCTs with positive results are more likely to be published in English journals than the ones with negative results; (2) CS-D-RCTs with positive results are more likely to be indexed in English bibliographic databases than the ones with negative results. Data collection We conducted a retrospective cohort study among CS-D-RCTs which were prospectively registered in three trial registries and published as journal articles. We collected eligible records of CS-D-RCTs conducted from January 1, 2008 to December 31, 2014. The eligible records were mapped to journal articles indexed in the seven bibliographic databases. Analysis plan A CS-D-RCT was considered positive if at least one of the primary outcomes was positive. Logistic regression models were used to adjust for covariates such as sponsor type (domestic vs. international), sample size (<100 or ≥100), number of recruitment centers (single-center vs. multi-center), and funding source (industry vs. non-industry). Result We found 1003 records of eligible CS-D-RCTs in the three trial registries, of which 79 (7.9%) were duplicates. Among the remaining 924 CS-D-RCTs, 417 (51%) were published, 297 (71.2%) were published in English, and 326 (78.2%) were indexed in English bibliographic databases. After adjusting for the covariates, the odds of being published in English among CS-D-RCTs with positive results were 11.25 (95%CI: 9.51-14.32) times the odds among CS-D-RCTs with negative results. The odds of being indexed in English bibliographic databases among CS-D-RCTs with positive results were 7.39 (95%CI: 5.34-9.01) times the odds among CS-D-RCTs with negative results. Conclusion Our study supports the existence of language bias among CS-D-RCTs included in trial registries. Systematic reviewers should search Chinese bibliographic databases to reduce the effect of language bias.
DNA methylation is the process of adding a methyl group to a DNA molecule, often changing how the molecule interacts with other cellular factors. Methylation mainly occurs at cytosines in humans, often in the context of a cytosine followed by a guanine (CpG). Epigenome-wide association studies (EWAS) seek to understand the link between DNA methylation patterns at thousands or millions of CpG sites across the genome to various traits and exposures. In recent years, the increase in availability of DNA methylation measures in population-based cohorts and case-control studies has resulted in a dramatic increase in the number of EWAS being performed and published. To make this rich source of molecular data more accessible, we have manually curated a database of CpG-trait associations (with $p<1\times10^{-4}$) from published EWAS, each assaying over 100,000 CpGs in at least 100 individuals. The database currently contains over 500,000 CpG associations for more than 150 EWAS. It is accompanied by a web-based tool and R package that allow these associations to be easily queried. In the near future, this database will be extended to include genome-wide EWAS summary statistics, including over 200 million associations from over 500 EWAS of the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort (N~900). This database will give researchers the opportunity to quickly and easily query EWAS associations to gain insight into the molecular underpinnings of disease as well as the impact of traits and exposures on the DNA methylome. The EWAS Catalog is available at: http://www.ewascatalog.org.
MIGRAINE HEADACHE AND RISK OF DEMENTIA AND MILD COGNITIVE IMPAIRMENT IN THE ATHEROSCLEROSIS RISK IN COMMUNITIES NEUROCOGNITIVE STUDY (ARIC-NCS)
Kristen M George* Kristen M George, Aaron R Folsom, A Richey Sharrett, Thomas H Mosley, Rebecca Gottesman, Pamela L Lutsey, (University of Minnesota School of Public Health)

Migraine headache is a common neurological disorder that may have long-term consequences for cognitive function. Studies have shown that brain abnormalities, such as white matter hyperintensities and volumetric changes, are related to cognitive decline and found in migraineurs. Our aim was to use the Atherosclerosis Risk in Communities Neurocognitive Study (1993-2017) to determine whether migraine is associated with incident dementia and mild cognitive impairment (MCI), particularly cerebrovascular disease etiology, and whether this association varies by sex. Lifetime history of migraine and severe non-migraine headache symptoms were ascertained via questionnaire. Adjudicated cases of dementia and MCI were identified using cognitive tests, neuropsychological examination, and clinician review of suspected cases. Cerebrovascular disease etiology was identified in brain imaging. Relative risk regression with inverse probability of attrition weighting was used to assess the risk of dementia and MCI in those with a history of migraine or severe non-migraine headache symptoms compared to those with no headache symptoms. Analysis included 10,869 white and African American participants ages 51-70, of whom 1,243 reported migraine symptoms and 1,105 reported severe non-migraine headache symptoms at baseline. No association was found between history of migraine or severe non-migraine headache symptoms and incidence of all-type dementia and MCI [Migraine RR (95% CI): 1.00 (0.89, 1.14)] nor did the lack of association differ by sex. Further, neither migraine nor severe non-migraine headache symptoms were associated with incident cerebrovascular disease-related dementia and MCI compared to no headache. Despite reported evidence of brain abnormalities in migraineurs that are associated with cognitive changes in older adult populations, there was no association between history of migraine symptoms and incident dementia and MCI in this prospective cohort followed for 25 years.
PARKINSON’S DISEASE INCIDENCE AND PESTICIDE USE IN THE AGRICULTURAL HEALTH STUDY

Srishti Shrestha, Christine G. Parks, David M. Umbach, Marie Richards-Barber, Jonathan N. Hofmann, Honglei Chen, Aaron Blair, Laura E. Beane Freeman, Caroline Tanner, Freya Kamel, Dale P. Sandler, (Epidemiology Branch, National Institute of Environmental Health Sciences)

Parkinson’s disease (PD) has been linked to pesticides, but few studies have examined specific chemicals. We used data from the Agricultural Health Study (AHS), a prospective cohort of farmers and their spouses from North Carolina and Iowa enrolled between 1993-1997, to evaluate associations between 50 specific pesticides reported at enrollment and incident PD diagnosed through 2016. Participants were 27,831 farmers and 38,259 spouses who completed at least one AHS follow-up survey and provided information on PD. Ever use of specific pesticides was ascertained for all participants. Farmers also provided detailed information on lifetime use (up to enrollment) for each pesticide and on pesticide use practices that were used to derive intensity-weighted lifetime days (IWLD) of use. We included 481 self-reported PD cases of whom 346 cases have thus far been confirmed by neurological evaluation or records. We estimated hazard ratios using Cox proportional hazards models with age as the time-scale, adjusting for sex, smoking, education, and state and used multiple imputation to impute missing covariates. We observed higher PD risk for ever use of the insecticide terbufos but lower risk for the insecticide diazinon and the herbicide 2,4,5-TP. We observed heterogeneity in associations by use of chemical resistant gloves (p-interaction ≤0.05), with elevated PD risk among non-glove users for the herbicides imazethapyr, metolachlor, trifluralin, and metribuzin, but not among glove users. We saw exposure-response trends (p ≤0.05) with increasing IWLD of use: risk increased for trifluralin but decreased for metalaxyl. PD risk was also elevated for the highest tertile of IWLD for benomyl. Adjusting for correlated pesticides did not change results. Our results suggest associations between some pesticides and PD vary by protective glove use. Future analyses will address exposures occurring after enrollment and impact of loss to follow-up.
GENDER DIFFERENCES IN THE ASSOCIATION OF DIFFERING SCREEN TIMES AND OBESITY IN U.S. ADOLESCENTS Courtney Johns-Rejano* Courtney Johns-Rejano, Chighaf Bakour, Michelle Nash, Ronee Wilson, Acadia Buro, William Sappenfield, (University of South Florida College of Public Health)

Obesity prevalence in U.S. adolescents has been increasing for decades, leading to numerous adverse outcomes. Recent studies have linked overall screen time with weight gain in adolescents, but few have examined the relationship with specific types of screen activity or differences by gender. This study examines the relationship between time spent watching TV, playing video games, using a computer or handheld device and BMI in U.S. adolescents, and gender differences in these associations. Methods: A secondary data analysis of 10-17 year-old participants in the 2016 National Survey of Children’s Health was conducted using SAS 9.4. Odds-ratios (ORs) and 95% confidence intervals (95% CIs) adjusted for potential confounders were calculated using logistic regression for the association between BMI and screen time (watching TV or playing video games, using computer; cellphone; or handheld device). Effect modification by sex was examined by stratified analysis. Results: The study included 50,212 participants (50.2% male), with 31% being overweight or obese. Overall, adolescents with ≥4 hours/day of TV/video games were more likely to be overweight or obese (aOR=1.65, 95% CI 1.06, 2.56) compared to no TV/video games. Females with ≥4 hours of TV/video games were more likely to be overweight or obese, aOR= 2.56 (1.40, 4.67), while the association was non-significant in males, aOR=0.98 (0.525, 1.87). By contrast, using computers/handheld devices was not associated with obesity in females aOR=1.09 (0.34, 3.43) or in males aOR= 0.810 (0.39, 1.70). Conclusion: Watching TV or playing video games for ≥4 hours per day is associated with increased risk of obesity in adolescent females but not in males. Using computers or handheld devices does not seem to have the same relationship as watching TV or playing video games. Future research is needed to understand the mechanisms of these associations and the underlying factors that drive the different impact on males and females.
MENDELIAN RANDOMIZATION ANALYSIS ON THE ASSOCIATION OF OBESITY WITH METABOLIC TRAITS AND VITAMIN D: GUANGZHOU BIOBANK COHORT STUDY

Lin Xu*, Lin Xu, Chao Qiang Jiang, Tai Hing Lam, Kar Keung Cheng. (School of Public Health, Sun Yat-sen University, Guangzhou, China)

Background Obesity is considered causally associated with metabolic disorders and vitamin D deficiency in Mendelian randomization (MR) analysis of data from the West. As Asian populations are prone to metabolic disorders at a lower BMI, whether these associations remained in Asian is unclear. We explored the causality of the association between BMI and metabolic traits as well as vitamin D using MR analysis in Chinese. Methods We used data from the Guangzhou Biobank Cohort study with seven BMI related single-nucleotide polymorphism (SNPs), combined in a genetic score (n=15,204), to produce an instrumental variable (IV) for BMI. Metabolic traits including SBP and DBP, LDL-c and HDL-c, triglycerides, and fasting and 2-hour post-load glucose were measured in 15,204 participants, HbA1c was measured in 6,085 participants, and 25-hydroxyvitamin D (25(OH)D) was measured in 2,031 participants. Two-stage least square regression was used to estimate causal association of BMI with metabolic traits and 25(OH)D. Results Proportion of variation explained by the genetic score that we used as IV for BMI was 0.7% and the first stage F-statistic for MR analysis was 108. MR analyses showed that each 1 kg/m^2 higher BMI was associated with lower HDL-c by 0.04 mmol/l (95% CI 0.02-0.06) and 25(OH)D by 2.49 nmol/l (95% CI 0.17-4.82), but with higher triglycerides by 0.08 mmol/l (95% CI 0.0001-0.15) and post-load glucose by 0.18 mmol/l (95% CI 0.004-0.36). No significant association of genetically determined BMI with SBP (β=-0.10 mmHg, 95% CI -2.21-2.00), DBP (-0.12 mmHg, 95% CI -0.85-0.60), LDL-c (-0.03 mmol/l, 95% CI -0.08-0.01), fasting glucose (0.08 mmol/l, 95% CI -0.002-0.16) and HbA1c (-0.02 %, 95% CI -0.09-0.05) was found. In conventional multivariable regression, BMI was associated with all metabolic traits and 25(OH)D as expected (all P<0.01). Conclusions Our study shows that higher BMI is causally related to lower HDL-c and 25(OH)D, and higher triglycerides and post-load glucose.
ADIPOSITY AND MORTALITY IN CHINESE: AN 11-YEAR FOLLOW-UP OF THE GUANGZHOU BIOBANK Cohort Study Lin Xu* Lin Xu, (Sun Yat-sen University)

Background Previous studies on Chinese showed mixed results on the relationship between obesity and mortality. The recommended optimum levels of body mass index (BMI) are inconsistent and those for waist circumference (WC) may not be appropriate. Methods The Guangzhou Biobank Cohort Study enrolled 21,636 female and 8,265 male Chinese aged 50+ years from 2003 to 2008 and followed them until 2017. We studied the relationship of BMI and WC with causes of deaths ascertained by record linkage. Results During an average follow-up of 11.5 (standard deviation=2.3) years, 3,969 deaths (women 2,143 (9.9%) and men 1,826 (22.1%)) were recorded. All-cause mortality showed a J-shaped association with BMI, with the lowest mortality risks at 22.5 kg/m² for both men and women. After excluding smokers and participants with poor health, in those with BMI ≥ 22.5 kg/m², an increase of 5 kg/m² was associated with 29% higher all-cause mortality (hazard ratio (HR)=1.29, 95% confidence interval (CI)1.15-1.46), 30% higher cancer mortality (1.30, 95% CI 1.08-1.57), and 37% higher cardiovascular disease (CVD) mortality (1.37, 95% CI 1.13-1.67) with adjustment for age, sex, occupation, personal income, physical activity, drinking, smoking and self-rated health. WC of 78 cm in men and 72 cm in women showed the lowest mortality risk. Of those with WC higher than these cut-offs, each 10 cm increase was associated with 18% higher all-cause mortality (adjusted HR=1.18, 95% CI 1.10-1.27), 15% higher cancer mortality (1.17, 95% CI 1.04-1.32) and 16% higher CVD mortality (1.16, 95% CI 1.03-1.30).

Conclusions In Chinese, higher BMI or WC was associated with increased risk of all-cause, CVD and cancer mortality after excluding smokers and people with poor health. The lowest all-cause mortality was observed for a BMI of 22.5 kg/m² in all participants, and a WC of 78 cm in men and 72 cm in women.
GENDER AND RACIAL DIFFERENCES IN UNHEALTHY WEIGHT CONTROL BEHAVIOR PREVALENCE AND SEVERITY TRAJECTORIES OVER 15 YEARS Melissa Simone* Melissa Simone, Susan E Telke, Marla Eisenberg, Dianne Neumark-Sztainer, (University of Minnesota)

Background: The high prevalence of unhealthy weight control behaviors (UWCB; e.g., laxative use or self-induced vomiting) has become a growing public health concern, as these behaviors often persist into adulthood and result in negative health outcomes, such as eating disorders and obesity. One notable challenge in developing wide-reaching programs to prevent UWCBs is the substantial gender and racial differences in UWCB, which points to the need to examine UWCB by race and gender. Purpose: The current study aims identify differences in developmental prevalence and severity trajectories of UWCBs by gender and race from adolescence to young adulthood in a large, population-based sample. Methods: UWCB prevalence and severity (# of behaviors) trajectories were examined from adolescence into young adulthood using data from males and females (n = 1,455) participating in a longitudinal, population-based study, Project EAT (Eating and Activity in Teens and Young Adults). Nine UWCB behaviors were assessed over four times across 15 years at 5-year time intervals. Longitudinal models were used to examine UWCB prevalence and severity trajectories among males and females by race. Results: In general, UWCBs were more common among females (52.4–61.4%) than males (22.2–37.9%) across all waves. Preliminary analyses revealed differences in UWCB trajectories by gender and race. For example, prevalence of UWCBs decreased over time among Hispanic and Asian females but increased among their male counterparts. Additional analyses will further examine differences in UWCB trajectories. Conclusion: This study builds upon previous research by examining the interaction of race and gender on UWCBs developmental trajectories. The findings from the current study suggest that developmental prevalence and severity trajectories of UWCBs may vary by race and gender, and thus preventive interventions should consider these differences when determining the critical time points for intervention.

S/P indicates work done while a student/postdoc
ADULT OBESITY AND MID-LIFE PHYSICAL FUNCTIONING IN TWO BRITISH BIRTH COHORTS: INVESTIGATING THE MEDIATING ROLE OF PHYSICAL INACTIVITY

Snehal M Pinto Pereira* Snehal M Pinto Pereira, Bianca L De Stavola, Nina T Rogers, Rebecca Hardy, Rachel Cooper, Chris Power, (UCL Research Department of Epidemiology & Public Health)

Background: Associations between obesity and physical inactivity are bi-directional. Both are associated with physical functioning (ability to perform physical tasks of daily living) but whether obesity influences functioning via inactivity is unknown. We investigated whether mid-adult obesity trajectories were associated with subsequent physical functioning and mediated by inactivity (Fig 1). Methods: BMI (kg/m²), inactivity and confounding factors were recorded at 36y, 43y, 53y and 60–64y in the 1946 MRC National Survey of Health and Development (1946-NSHD; N=2427); and at 33y, 42y and 50y in the 1958 National Child Development Study (1958-NCDS; N=8674). Physical functioning was measured using the Short-form 36 sub-scale at 60-64y (1946-NSHD) and 50y (1958-NCDS); the lowest (gender and cohort specific) 10% were classified as poor functioning. Randomised-interventional-analogue natural direct (rNDE) and indirect effects (rNIE) of obesity trajectories on physical functioning, via inactivity, were estimated using parametric mediational g-formula and, expressed on the risk ratio scale (rNDE times rNIE giving the overall total effect (rTE)). Results: Most individuals (~68%) were never obese in adulthood, 16% to 30% became obese, ≤11% were always obese during the study period. Obesity at all ages was associated with poor functioning. In 1946-NSHD, rTE of becoming obese at 43y (vs never) on poor functioning was 2.32(1.13,3.51); for becoming obese at 53y it was 1.53(0.91,2.15). Respectively, rNIEs via inactivity were 1.02(0.97,1.07) and 1.02(0.99,1.04). Estimated rTE of always obese was 2.91(1.14,4.69), with rNIE of 1.03(0.96,1.10). In 1958-NCDS, patterns of association were similar but weaker. Conclusions: Associations with poor physical functioning were more detrimental the longer the duration of obesity, with inactivity playing a small mediating role. Findings reinforce the importance of preventing and delaying obesity onset to protect against poor physical functioning.

Figure 1: Simplified conceptual model representing a life-course pathway from obesity and inactivity to physical functioning at 50y.

![Simplified conceptual model representing a life-course pathway from obesity and inactivity to physical functioning at 50y.](image)

Bi-directional associations between adult obesity and inactivity are represented in (a), in this study obesity is the exposure of interest and physical inactivity is the mediator of interest. Obesity trajectories in mid-adulthood could influence physical functioning either directly (as indicated by (b)) and/or indirectly, through obesity’s influence on subsequent inactivity (as indicated by (c)). Potential confounding factors of the obesity-physical functioning association are represented as emanating from earlier life-stages as well as contemporaneously in adulthood.

S/P indicates work done while a student/postdoc
Oxylipins, derived from the endogenous oxidation of omega-3 (n3) and omega-6 (n6) fatty acids (FA), have potent anti- and pro-inflammatory actions. Previous studies of dietary predictors of oxylipins have either been dosing studies or conducted in specific disease states. Our goal was to assess the association between dietary intakes of parent n3 and n6 FA with oxylipin levels in a healthy pediatric population at increased risk for type 1 diabetes (T1D). DAISY is a longitudinal cohort of children with either a family history of T1D or with a T1D-risk HLA genotype. Plasma levels of 26 n6-related and 14 n3-related oxylipins were quantified using ultra high performance liquid chromatography in up to 4 visits in 111 DAISY children age 9 months to 17 years without diabetes-related autoimmunity or T1D. Dietary intake of parent n6 FA (arachidonic acid, linoleic acid) and n3 FA (alpha-linolenic acid (ALA), docosahexaenoic acid (DHA), docosapentaenoic acid and eicosapentaenoic acid (EPA)) was measured through longitudinal food frequency questionnaires. Mixed models adjusting for age, sex, and ethnicity (when appropriate) were used to assess the association between oxylipin levels and dietary intake of the parent FA and the dietary n6:n3 FA ratio. None of the n6-related oxylipins were associated with dietary intake of the parent FA. Dietary intake of EPA was associated with 15-HEPE (β: 111.3, p=0.0004). The ratio of dietary n6:n3 FA intake was inversely associated with levels of 12-13-DiHODE (Parent FA: ALA) (β: -0.035, p=0.0117), 14-HDoHE (DHA) (β: -0.051, p=0.037), and 17,18-DihETE (EPA) (β: -0.029, p=0.012). In a healthy pediatric population, dietary intake is associated with n3 oxylipin levels, but not n6 oxylipin levels. n3 and n6 FA are known to compete for the same enzymes, with preferential action for n3 FA, which may lead to a closer relationship between dietary intake and oxylipin production for n3 oxylipins compared to n6 oxylipins.
RATE OF GESTATIONAL WEIGHT GAIN AND ADVERSE PREGNANCY OUTCOMES IN NULLIPAROUS WOMEN: A PROSPECTIVE COHORT ANALYSIS

Yubo Zhou, Hongtian Li, Yali Zhang, Le Zhang, Jufen Liu, Jianmeng Liu, (Institute of Reproductive and Child Health, Peking University)

Background: Both inadequate and excessive gestational weight gain (GWG) have been shown to increase the risk of adverse pregnancy outcomes in Caucasian women, but the risk profiles for non-Caucasian women are unclear. Objective: This study was performed to examine the associations between rate of GWG in the second/third trimester and a spectrum of adverse pregnancy outcomes. Methods: The prospective cohort consisted of 14,223 Chinese nulliparous women who participated in a randomized controlled trial of prenatal micronutrient supplementation during 2006–2009. The outcomes included stillbirth, neonatal and infant death, preterm birth, macrosomia, low birth weight (LBW), and large and small for gestational age (LGA and SGA, respectively). GWG rate in the second/third trimester was divided into quintiles within each body mass index (BMI) category. Results: Compared with women in the middle quintile, those in the lowest (adjusted odds ratio [OR], 2.25; 95% confidence interval [CI], 1.01–5.01) and lower quintiles (adjusted OR, 2.34; 95% CI, 1.06–5.16) had a higher risk of neonatal death; those in the lowest quintile also had a higher risk of early preterm (adjusted OR, 3.16; 95% CI, 1.33–7.53) and LBW (adjusted OR, 1.67; 95% CI, 1.13–2.48); and those in the highest quintile had higher risks of preterm birth (adjusted OR, 1.28; 95% CI, 1.03–1.60), macrosomia (adjusted OR, 1.63; 95% CI, 1.27–2.10), LGA (adjusted OR, 1.40; 95% CI, 1.18–1.66), and LBW (adjusted OR, 1.85; 95% CI, 1.26–2.71). Conclusions: Both very low and very high GWG rates in the second/third trimester are associated with increased risks of adverse pregnancy outcomes among Chinese nulliparous women, indicating that an appropriate GWG rate during pregnancy is necessary for neonatal health.
EXTREME OBESITY AMONG ADULTS IN THE UNITED STATES, 2012: INCORPORATING SMALL AREA ESTIMATION AND SPATIAL CLUSTERING TECHNIQUES Carrie W. Mills*, Carrie W. Mills, Glen Johnson, Deborah Balk, Terry Huang, Katarzyna Wyka, (CUNY Graduate School of Public Health and Health Policy)

As national estimates of obesity continue to indicate increasing prevalence it is important to incorporate a graded classification of obesity into ongoing research for effective public health interventions. Although county-level estimates of obesity have been estimated, studies have not yet explored prevalence disaggregated by class of obesity. This study is the first to use a small area estimation to create county-level estimates of extreme obesity in the U.S. and spatial methods to identify clusters of high and low prevalence. Data were obtained from the 2012 Behavioral Risk Factor Surveillance System and the Census Bureau. A multilevel predictive logistic model estimated the probability of extreme obesity based on individual predictors including sex, age, race/ethnicity, and area-level education, while accounting for county and state as random effects. Census counts for corresponding sex-age-race subgroups in the county were used to obtain population proportion of each subgroup, which were multiplied by probabilities from the model and then summed over the county, creating a county-level prevalence estimate. Global and local Moran’s I values were calculated to assess spatial autocorrelation and to identify spatial clusters. Estimates of moderate obesity were obtained for comparison. County-level prevalence of extreme obesity ranged from 1.3% to 15.7%, showing more variability than evident from state-level analysis. The correlation coefficient comparing model-predicted estimates with direct estimates was 0.81 (p<.0001). Moran’s I score was 0.35 (pseudo p-value 0.001), indicating spatial clustering. Significant clusters of high and low prevalence were identified. County-level prevalence estimates of extreme obesity indicate substantial variation across the United States as well as within states. Geographical prevalence patterns were similar for moderate and extreme obesity though many individual counties had an uneven distribution of prevalence by obesity group.
RISK FACTORS FOR HEAT-RELATED ILLNESS AMONG WORKERS — CALIFORNIA, 2000–2017

Amy Heinzerling, Amy Heinzerling, Rebecca Laws, Matt Frederick, Rebecca Jackson, Gayle Windham, Barbara Materna, Robert Harrison, (Epidemic Intelligence Service, Centers for Disease Control and Prevention; California Department of Public Health)

Background: Workers who perform exertional tasks or work in non-climate-controlled environments are particularly susceptible to heat-related illness (HRI). California is 1 of 3 states with an occupational standard to prevent HRI, requiring employers to provide employees with training and access to water, shade, and rest. We assessed occupational HRI patterns in California during 2000–2017 to identify workers at highest risk and guide prevention strategies. Methods: We identified HRI claims in California’s Workers’ Compensation Information System (WCIS) during 2000–2017, using International Classification of Diseases codes, WCIS nature and cause of injury codes, and HRI keywords. We assigned census industry and occupation codes using NIOSH’s Industry and Occupation Computerized Coding System. We calculated average annual HRI rates/100,000 workers during 2000–2017, by sex, age group, year, county, and industry and occupation, using employment denominator data from NIOSH’s Employed Labor Force and California’s Employment Development Department. Results: We identified 15,996 cases of HRI during 2000–2017 (average 6.0 cases/100,000 workers/year). Among age groups, those aged 16–24 years had the highest HRI rate (7.6); men (8.1) had a higher rate than women (3.5). Geographically, rates were highest in southern California, including Imperial (36.6), San Diego (32.7), and Los Angeles (31.8) Counties. Occupational groups with the highest HRI rates were protective service (56.6), farming, fishing, and forestry (36.6), and material moving occupations (12.3). Among individual occupations, firefighters had the highest rate (389.6). Conclusions: Young workers, male workers, workers in southern California, and workers in firefighting, agriculture, and material moving occupations are particularly susceptible to occupational HRI in California. Collaboration with these workers and their employers to develop prevention strategies, such as education and training, may help reduce HRI in the workplace.
Background: Studies have shown that poor sleep quality including difficulty initiating and maintaining sleep, and short and long sleep durations are associated with metabolic syndrome, a cluster of conditions that increase risk of cardiovascular disease. However, research is limited among workers in protective services occupations. This study examined associations between objective sleep parameters and metabolic syndrome severity scores (MSSS) among police officers. Methods: Participants were 277 police officers (71% men) from the Buffalo Cardio-Metabolic Occupational Police Stress study (2004-2009). Objective sleep parameters including sleep duration and efficiency, latency to persistent sleep, wake after sleep onset, restlessness, and number of awakenings were obtained using actigraphy. Sex- and race/ethnicity-specific metabolic syndrome severity Z-scores were calculated using traditional risk factors (increased waist circumference, elevated blood pressure, elevated triglycerides, low HDL cholesterol, and increased fasting glucose). Correlation analyses were used to assess the associations of sleep parameters with MSSS. Analyses were adjusted for age, marital status, and rank, and also stratified by gender. Results: Among men, sleep duration (r=-0.16, p=0.025) and efficiency (r=-0.21, p=0.003) were negatively associated with MSSS while latency to persistent sleep (r=0.16, p=0.027), wake after sleep onset (r=0.16, p=0.028), and restlessness (r=0.18, p=0.015) were positively associated. Among women, only wake after sleep onset (r=0.24, p=0.036) was significantly associated with MSSS. The number of awakenings (r=0.13, p=0.028) was positively associated with MSSS in the overall sample but not within sex. Conclusion: Shorter sleep duration, longer sleep latency and awake minutes after sleep onset, lower sleep efficiency, and restlessness were associated with greater severity of metabolic syndrome in men. Gender differences in these associations need further investigation.
HAVING NO HEALTH INSURANCE AND THE RISK OF BACK PAIN IN HIRED US FARMWORKERS: RESULTS FROM THE NATIONAL AGRICULTURAL WORKERS SURVEY
Vahe Khachadourian* Vahe Khachadourian, Onyebuchi A. Arah, (UCLA Fielding School of Public Health, Los Angeles, CA)

Despite the high burden of health problems among farmworkers, a majority of them faces barriers accessing care. We used the National Agricultural Workers Survey (an annual survey of a nationally representative sample of hired farmworkers in the US) data from 2000-4, 2008-10, and 2014 to investigate the associations of health insurance and access to care with the risk of back pain in farmworkers. Work-related back pain was defined as a back pain developed when performing farm work in the 12 months prior to the interview causing pain or discomfort for at least five consecutive days. The exposure of interest was farmworkers reporting of health insurance status as none, self-paid, employer-provided (reference category) or other. The associations of health insurance status with back pain were adjusted for age, gender, race, birthplace, education, marital status, work authorization, and below-poverty income using a mixed-effect logistic regression model with random intercepts for the sampling areas and fixed effects for the 12 regions and 27 interview cycles. In the total sample of 25500 hired farmworkers, 69% did not have any health insurance and only 10% had a health insurance that was totally paid by their employer. Farmworkers without a health insurance had 53% higher odds of back pain compared to those with employer-provided health insurance (OR=1.53; 95%CL: 1.24, 1.89). Similarly, farmworkers who paid for their health insurance had higher odds of back pain relative to those with employer-paid health insurance (OR=1.54; 95%CL: 1.12, 2.12). The study highlights the existing disparities in access to care in vulnerable populations. The findings, if confirmed, can be used to support evidence-based policy-making aimed at improving access to care and decreasing the burden of back pain in hired farmworkers in the US.
Review of studies on workplace violence has been conducted, but rarely has been systematically organized. In this study, we summarized the definition and classification of workplace violence and investigate Korean and international research. Using the academic search engine PubMed and DBpia, the literature containing "Workplace Violence" in the title was found 537 in Pubmed and 15 in DBpia. Among them, 142 papers were examined systematically, which were published from 2006 to July 2018. The selected papers were classified by country, job category, the criteria for classifying workplace violence, and research topics. Workplace violence can be classified according to three criteria: classification by person involved in the violence, classification by the offender, and classification by type of violence. By country, the number of articles in the United States was the most with 22 (15.5%) followed by 20 (14.1%) in China, 14 (9.9%) in Korea, in Iran and Taiwan 10 (7.0%) each. By job category, healthcare workers accounted for 81.7% of the total and most of them was a nurse. Other occupations were fishers, sex workers, manufacturing, toll collectors, police call centers, bankers, substitute drivers, and wage workers. Among the classification methods of workplace violence, 109 articles (68.1%) were classified as type and there was a difference in the type of violence defined for each article. Most of them included physical violence, mental violence, sexual harassment and threats, as well as other forms of cultural violence in Iran and organized healthcare disturbance in China. We also found that there are a variety of survey tools to measure workplace violence. The research topic is biased toward the field of healthcare, so it is necessary to expand to include various occupations, or to deal with the other specified occupations. It is also necessary to prepare appropriate measures against workplace violence.
EPIDEMIOLOGY IN THE NEWS: A CASE STUDY OF THE MEDIA REPRESENTATION OF A FRENCH PARTICIPATORY HEALTH STUDY

Catherine Duarte*, Catherine Duarte, Alison Cohen, Barbara Allen, (University of California, Berkeley, Division of Epidemiology)

Introduction. News media play a key role in disseminating science, influencing public opinion, and shaping policy. Particularly in the presence of novel scientific approaches, evaluating how the media cover study findings may prove crucial to the scientific enterprise. This study assessed how the media covered an epidemiologic study (Fos EPSEAL) that used a community-based participatory research (CBPR) approach to estimate the prevalence of adverse health in two French port towns serving as an industrial hub with nearly 50 Seveso high-hazard threshold facilities.

Methods. Using French news articles published in the year after findings were released, we analyzed how the media communicated the CBPR approach and presented data generated in the study. We qualitatively analyzed 44 articles using codes reflecting major CBPR principles, followed by thematic analysis to extract prevailing themes. A stratified analysis explored how a March 2017 press event impacted reporting.

Results. Most (73%) of the articles emphasized the salience of the research topic to residents. Half (N=23) focused primarily on findings, with remaining alluding to action steps. Fewer than half of the articles mentioned a CBPR approach was used in the study (N=19), most of which were published after the press event. A majority of articles commented on methodological rigor, prioritizing study design characteristics that supported internal validity when drawing inference from sample to target population.

Conclusions. This analysis is the first to explore how an epidemiologic study using a CBPR approach is understood and framed by the news media. It suggests that there are gaps in media characterization of CBPR but that CBPR may nonetheless facilitate study rigor and subsequent media uptake of findings. Given the power of the media to shape public perception, further research on the public understanding of scientific findings through media portrayal is warranted.
USE OF ANGIOTENSIN CONVERTING ENZYME INHIBITORS (ACE-I) OR ANGIOTENSIN RECEPTOR BLOCKERS (ARB) AFTER ACUTE KIDNEY INJURY (AKI) Sandeep Brar*, Sandeep Brar, Kathleen Liu, Alan S. Go, Raymond Hsu, Chi-yuan Hsu, ASsessment, Serial Evaluation, and Subsequent Sequelae in Acute Kidney Injury (ASSESS-AKI) study investigators, (University of California, San Francisco)

Hospitalized AKI is associated with high rates of short- and longer-term adverse outcomes. However, the optimal approach to treating patients after surviving an AKI episode is unclear. While ACE-I/ARB therapy is beneficial in certain high-risk populations, the risk-benefit ratio may be different after AKI since use of ACE-I/ARB may increase the risk of recurrent AKI. We studied participants enrolled in the prospective ASSESS-AKI study who had at least one episode of hospitalized AKI and were followed through November 2018. We used multivariable Cox regression with adjustment for demographics, cardiovascular disease, diabetes mellitus, heart failure, blood pressure, urine protein to creatinine ratio, and estimated glomerular filtration rate (eGFR) to examine the association between self-reported ACE-I/ARB use and all cause-death, recurrent AKI (≥50% difference between peak and nadir inpatient serum creatinine) and end-stage renal disease (ESRD) (receipt of chronic outpatient dialysis, kidney transplant or inpatient dialysis followed by death within 28 days). Among 838 eligible participants, mean age was 64 years; 33.5% were women, 16.4% were black, mean eGFR was 64.4 ml/min/1.73m2, and 46% were receiving ACE-I/ARB therapy. During mean follow-up of 4 years, there were 226 deaths, 321 episodes of recurrent AKI and 59 cases of ESRD. ACE-I/ARB use was associated with a decreased risk of death (HR: 0.68, 95% CI: 0.51, 0.91) and recurrent AKI (HR: 0.65, 95% CI: 0.50, 0.84). There was a favorable association with ESRD but it was not statistically significant (HR: 0.63, 95% CI: 0.35, 1.19). These data suggest that use of ACE-I/ARB in survivors of hospitalized AKI may be safe and potentially beneficial.
LOW-LEVEL CIGARETTE CONSUMPTION DURING PRECONCEPTION AND EARLY PREGNANCY IN RELATION TO RISK OF BIRTH DEFECTS: A LARGE POPULATION-BASED STUDY WITH 23 MILLION MOTHER-INFANT PAIRS Buyun Liu* Buyun Liu, Guifeng Xu, Yangbo Sun, Yongfu Yu, Linda Snetselaar, Wei Bao, (University of Iowa)

Background: Prenatal exposure to high dose of tobacco smoke is teratogenic to developing fetuses. However, findings about the associations between low-level cigarette smoking and birth defects are inconsistent and controversial, especially for specific birth defects. This study aimed to examine the dose-response association of maternal periconceptional exposure to cigarette smoking with birth defects. Methods: We used US nationwide birth certificate data from the National Vital Statistics System 2011-2017. Birth defects included anencephaly, meningomyelocele/spina bifida, cyanotic congenital heart disease, congenital diaphragmatic hernia, omphalocele, gastroschisis, limb reduction defect, cleft lip with or without cleft palate, cleft palate alone, Down syndrome, suspected chromosomal disorder, or hypospadias. We performed logistic regression analyses to estimate odds ratios (OR) of birth defects according to maternal smoking during preconception and the first trimester, adjusting for maternal age, race/ethnicity, parity, education, marital status, pre-pregnancy BMI, infant sex, and timing for initiation of prenatal care. Results: This study included 23,583,372 live births, containing 72,838 with birth defects. Compared with women who never smoked, women who smoked, either before or during pregnancy, were at a higher risk of having a baby with birth defect. The OR (95% confidence interval [CI]) of birth defect was 1.11 (1.02-1.21), 1.20 (1.13-1.27), 1.07 (0.98-1.16), 1.18 (1.12-1.24), and 1.23 (1.17-1.30) for those who smoked 1-2, 3-5, 6-9, 10-19, and ≥20 cigarettes per day before pregnancy, respectively. The corresponding ORs for those who smoked during the first trimester were 1.04 (0.99-1.10), 1.07 (1.01-1.12), 1.04 (0.93-1.16), 1.09 (1.02-1.16), and 1.22 (1.08-1.39). Significant and positive associations were found for some types of birth defects. Conclusion: Periconceptional smoking, even as low as 1-2 cigarettes per day, may increase the risk of birth defects.
GESTATIONAL AGE, KINDERGARTEN READINESS, AND EFFECT MODERATION BY MATERNAL SOCIODEMOGRAPHIC FACTORS

David Mallinson*  David Mallinson, Eric Grodsky, Lawrence Berger, Deborah Ehrenthal, (University of Wisconsin-Madison)

Background: Gestational age at birth is associated with children's academic performance, but whether sociodemographic factors modify this relation is uncertain. We examined the association of gestational age with kindergarten readiness and its moderation by maternal sociodemographic characteristics. Methods: Data came from a cohort of all Wisconsin birth records linked to Medicaid claims and public education data. Our analytic sample included 151,592 singletons (born 2007-2010; 71% of all eligible births) that matched to Phonological Awareness Literacy Screening–Kindergarten (PALS-K) scores (2012-2016 school years). The exposure was gestational age in weeks. The two outcomes were the PALS-K standardized score (mean 0, standard deviation 1) and meeting the PALS-K school readiness benchmark (≥28 points; range 0-102 points). Adjusted linear regressions tested gestational age's association with PALS-K performance and interactions by five maternal sociodemographic variables at delivery: Medicaid coverage for delivery, education, age, race/ethnicity, and marital status. Results: Each completed gestational week was associated with a 0.5 percentage point increase in the probability of meeting the readiness benchmark (95% confidence interval [CI] 0.4-0.6 percentage points). Insurance status was the strongest observed modifier. For each completed gestational week, the probability of meeting the PALS-K benchmark was stronger for children of Medicaid-insured mothers by 0.5 percentage points (95% CI 0.3-0.7 percentage points) relative to children whose mothers were not Medicaid covered. This moderation persisted after excluding very preterm births (<32 weeks gestation). We observed a similar relation with the PALS-K standardized score, although moderation by Medicaid coverage was not significant without very preterm births. Conclusions: The consequences of preterm birth on school readiness at entry to Kindergarten may be greatest for children whose birth was Medicaid-covered.

S/P indicates work done while a student/postdoc
POSTNATAL GROWTH IN HIV-EXPOSED UNINFECTED CHILDREN IN THE US BY PRETERM STATUS: RESULTS FROM PHACS SMARTT


Background: Pregnant women living with HIV (WLHIV) have elevated rates of preterm birth (PTB) worldwide, with an estimated US rate of 19%. Few studies evaluated long-term growth patterns in preterm HIV-exposed uninfected (HEU) children. Methods: We compared growth trajectories by preterm status from birth to age 7 years (yr) in HEU children born to WLHIV in the Surveillance Monitoring for ART Toxicities (SMARTT) study, a US-based multisite cohort study enrolling mother-infant pairs since April 2007. Z-scores were calculated using US growth references for weight (WTZ) and length/height (HTZ) appropriately adjusted for gestational age (GA). Infants were preterm if birth occurred <37 wk GA. Mixed effects models were fit, stratified by race and sex, to assess growth patterns by PTB and using inverse probability weights to account for administrative censoring. Results: We evaluated 1912 HEU children with weight and length/height measured from birth (328 preterm, 1584 term). Women with PTB were similar to those with term birth by age (median 29 yr) and race (67% black), but more likely to have income <$20,000/yr (80% vs 72%). Birth WTZ differences were small between preterm and term infants in all race-sex strata, except black preterm males who had a higher mean birth WTZ (0.36 [95% CI: 0.20, 0.53]) (Figure 1). Preterm infants had significantly slower weight gain from 0-3 yr in all race-sex strata, but differences were attenuated after age 3 yr. Differences in birth HTZ were small in all race-sex strata. By age 7 yr, WTZ and HTZ were similar by preterm status, except in non-black preterm females who had persistently lower values for both. Conclusion: In general, preterm HEU children compared to term HEU had delayed weight gain, but similar length/height gain through early childhood; differences were attenuated by age 7 yr. However, non-black female preterm children may be at increased risk of persistent low weight and height.

Figure 1: Weight Z-scores (WTZ) over time by preterm status among (A) black male, (B) black female, (C) non-black male, and (D) non-black female children born preterm vs term. Vertical dotted line represents mean differences between preterm and term children at birth, age 1, and age 5.
BIRTH CHARACTERISTICS AND RISK OF HEPATOBLASTOMA AMONG LOW BIRTH WEIGHT INFANTS Erin Marcotte* Erin Marcotte, Logan Spector, Beth Mueller, Peggy Reynolds, Susan Carozza, Colleen McLaughlin, Julie VonBehren, (University of Minnesota)

Background. Hepatoblastoma (HB) is a rare embryonal liver tumor which occurs most commonly in children under five years of age. The incidence rates for HB in the U.S. rose by about 4% per year between 1992 and 2004. HB is among the least treatable classes of childhood cancers, with approximately 65% overall survival. Due to its rarity, the etiology of HB is mostly obscure, with no outstanding environmental risk factors having appeared. Risk of HB in children born 2500g, and that in children born 1500-2500g is doubled. Methods. We evaluated the relationship between birth characteristics and HB in a case-control study using registry data from New York, Minnesota, California, Texas and Washington. Records from 273 cases and 52,098 controls born during 1981-2004 were analyzed. Odds ratios (ORs) and 95% confidence intervals (CI) were calculated by logistic regression. All estimates were adjusted for sex, birth year category, state, and additional adjustments were made for birth weight, maternal race, maternal age, and maternal education where appropriate. We conducted separate analyses among LBW (<2500g) cases and controls. Results. Children with the youngest mothers (age < 20 years) had increased risk of HB compared to those with mothers age 25-29 (OR and 95% CI: 1.89 [1.16, 3.05]). Among children born with LBW, we observed increased risk of HB among mothers with 17+ years of education compared to those with 12 years of education (OR and 95% CI: 5.49 [1.87, 16.15]) and an increased point estimate for mothers with less than high school education (OR and 95% CI: 2.08 [0.96, 4.75]). Conclusion. These findings suggest that maternal age may be associated with risk of HB. Additionally, markers of socioeconomic status such as maternal education may be associated with HB among LBW cases.

S/P indicates work done while a student/postdoc
MODELLING THE ASSOCIATION BETWEEN MODE OF DELIVERY AND THE RISK OF INFECTION-RELATED HOSPITALIZATION IN CHILDHOOD: A MULTI-COUNTRY DATA LINKAGE STUDY

Jessica Eden Miller* Jessica Eden Miller, Natasha Nassar, Justin Zeltzer, Raph Goldacre, Marian Knight, Rachael Wood, Carole Morris, Sian Nowell, Hannah Moore, Parveen Fathima, Kim Carter, Nicholas de Klerk, Tobias Strunk, Jiong Li, Lars Henning Pedersen, David Burgner, (Murdoch Children’s Research Institute)

Background
Known risk factors only partly explain the great variation in susceptibility and severity of childhood infection following exposure to pathogens. Cesarean section (CS) may be associated with increased risk of infection-related hospitalization (IRH). We investigated the relationship between mode of delivery and hospitalization with infection. As IRHs may be intrinsically correlated recurrent events, our analysis considered time-to-first and subsequent events.

Methods
We used national linked registry data (birth, hospital, maternal) from 1996-2015 to conduct a multi-county population-based cohort study of all singleton births in Australia (NSW and WA), England, Scotland and Denmark. Mode of delivery was categorized as vaginal or CS (emergency/elective). IRH was defined by relevant hospital ICD-10 diagnosis code. Covariates included maternal factors, birth parameters and socio-economic status. Children were followed from birth-related hospital discharge date until an IRH admission (either 1st or up to the first three admissions), death, emigration, 5th birthday, or end of study period, whichever occurred first. Hazard ratios (HRs) and 95% confidence intervals were estimated by Cox regression models for time-to-first event, and by Prentice, Williams, and Peterson (PWP) models for recurrent events data. Results were pooled using meta-analysis models for fixed and random effects.

Results
Our analysis included 7.29 million children. Of the 1.55 million of children (21.3% of total) who had an IRH, ~450,000 had two or more IRHs during follow-up. On average, 18-29% of deliveries were by CS, of which 39-57% were elective. Delivery by CS was associated with increased risk for IRH compared to vaginal delivery, and was consistently higher following elective CS. Results were comparable for Cox and PWP models.

Conclusions
Mode of delivery is associated with increased risk of IRH in young children. The increased risks persisted with adjustments for within-individual correlation.
CHILD MARRIAGE AND PERINATAL HEALTH IN THE UNITED STATES Marcelo L. Urquia*
Marcelo L. Urquia, Kathleen Kenny, (University of Manitoba, Canada)

Background. Marriage has been linked with favorable reproductive health outcomes. Child marriage (<18 years) is a notorious exception observed in low and middle-income countries but understudied in high-income countries. We assessed the association between marital status and perinatal health among minors in the United States, and if it differs by Foreign-born (FB) status and race/ethnicity. Methods. We used the Natality Public Use Files 2014-2017 of the National Center for Health Statistics to extract singleton births with complete information on maternal age, marital status, nativity and race/ethnicity. We used logistic regression to assess associations with adverse outcomes. Results. There were 14.4 million singleton births. The proportion of births to married mothers was 59.7% overall, 11.1% among teenagers and 3.9% among minors (US-born = 3.3% and FB = 8.1%). In analyses restricted to mothers <18 years, marriage rates varied substantially according to nativity and race/ethnicity, from 0.4% among US-born Non-Hispanic Blacks to 34% among FB Non-Hispanic Whites. Married girls had lower odds of late entry to prenatal care, pregnancy smoking, low Apgar and sexually transmitted infections but higher odds of a repeat birth or pregnancy termination. Preterm birth (PTB) (<37 weeks gestation) rates were slightly lower among married (8.6%) than among unmarried minors (9.6%). Marriage was associated with lower PTB rates among FB girls [adjusted odds ratio (AOR): 0.70; 95% confidence interval (CI): 0.59, 0.83] but not among the US-born [AOR: 0.96; 95% CI: 0.88, 1.04] (p-value for interaction <0.001). Lower odds were observed across all FB ethnoracial groups, particularly among Non-Hispanic Whites [AOR: 0.56; 95% CI: 0.35, 0.90]. Discussion. Immigrants to the United States have higher child marriage rates than their US-born counterparts but more favorable perinatal outcomes. Yet, all minors, irrespective of marital status, have less favorable outcomes than older mothers.
FETAL WEIGHT DISCORDANCE ACROSS GESTATION AND ASSOCIATIONS WITH BIRTHWEIGHT DISCORDANCE IN DICHORIONIC TWINS


Defining inter-twin discordance (sonographic estimated fetal weight [EFW]; birth weight [BW]) as ([(Weightlarger-Weightsmaller)/Weightlarger]*100% and clinically significant discordance as ≥18% (based on an empirical cut-point), we evaluated impact of a fixed cut-point to define discordance across gestation and the relationship between discordance and size for gestational age (GA; per small for GA [SGA] using Duryea reference). Twin pairs were categorized: both twins SGA, one twin SGA, neither twin SGA, and further categorized into combined BW/SGA groups: BW discordance ≥18% yes/no (Y/N) + both SGA, one SGA, or neither SGA. 140 dichorionic twin pairs (13.1% with ≥18% BW discordance) underwent up to 6 study ultrasound visits at 15.1-37.9 weeks GA. EFW discordance percentiles were estimated across gestation using linear mixed models; Fishers’ exact test assessed the relationship between BW discordance ≥18% (Y/N) and SGA. Linear mixed models compared EFW discordance at 15 weeks (intercept) and changes in EFW across gestation (slope) between combined BW/SGA categories. At 27, 34 and 38 weeks, 10%, 15%, and 20% of twins were discordant. BW discordance and SGA classifications differed (p=0.002); for BW discordance ≥18% yes vs no: 44.4% vs 71.1% had neither twin SGA; 55.6% vs 17.5% had 1 twin SGA; 0.0% vs 11.4% had both twins SGA, respectively. EFW discordance varied across gestation by BW discordance and SGA classification (p=0.040). EFW discordance over gestation increased when BW discordance was ≥18% (neither SGA: 0.46%/week [95% CI 0.08, 0.84]; 1 SGA: 0.57%/week [95% CI 0.25, 0.90]), but modestly with BW discordance <18% (neither SGA: 0.17%/week [95% CI 0.06, 0.28]; 1 SGA: 0.03%/week [95% CI -0.17, 0.24]); both SGA 0.10%/week [-0.15, 0.36]). The proportion of dichorionic pregnancies exceeding a fixed cut-point for discordance increased as gestation advanced. SGA and BW discordance measure different aspects of aberrant twin growth.

S/P indicates work done while a student/postdoc
Maternal pregestational diabetes and obesity (body mass index $\geq$ 30 kg/m$^2$) are risk factors for several specific birth defects. Diabetes and obesity often occur together, and their pathophysiology overlaps in part. However, it is not clear to what extent their co-occurrence in pregnancy compounds birth defect risk. We used 1997-2011 data from the National Birth Defects Prevention Study, a multisite case-control study of selected structural birth defects, to assess for 39 defect categories, the independent and joint associations between pregestational obesity and diabetes (types 1 and 2), and the relative excess risk due to interaction (RERI, which is a measure of greater than additive effects). Pregestational diabetes, with or without obesity, was strongly associated with most birth defect categories (odds ratios [OR] range: 2.0 to 75.9), with the exception of spina bifida (association observed only among women with obesity). Among mothers with pregestational obesity but without diabetes, modest increased odds (OR range: 1.1 to 1.5) were observed for neural tube defects, anorectal atresia, renal agenesis/hypoplasia, omphalocele, and several congenital heart defects (CHDs). For most birth defect categories, the RERI was not elevated, with the exception of holoprosencephaly (18.3, 95% confidence interval [CI]: -3.7, 40.2), heterotaxia with CHD(s) (10.2; 95% CI: -2.4, 22.8), and double outlet right ventricle with transposition of the great arteries (12.3, 95%: -2.9, 27.5). We are planning additional analyses to further assess risk by different categorizations of body mass index. It is important to better understand these relationships because diabetes and elevated body mass index are common and potentially modifiable risk factors for many birth defects.
MATERNAL POLYCYSTIC OVARY SYNDROME AND HIRSUTISM ARE ASSOCIATED WITH BEHAVIOR PROBLEMS IN OFFSPRING Sonia L. Robinson* Sonia L. Robinson, Akhgar Ghassabian, Rajeshwari Sundaram, Tzu-Chun Lin, Mai-Han Trinh, Erin M. Bell, Pauline Mendola, Edwina Yeung, (Epidemiology Branch, Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bethesda, MD)

Maternal polycystic ovary syndrome (PCOS) and hirsutism are marked by hyperandronemia which may influence fetal brain development. Previous studies have found a positive association between maternal PCOS and offspring attention deficit hyperactivity disorder (ADHD). The associations of maternal hirsutism with offspring behavior problems are unknown. We aimed to determine the association between maternal PCOS and/or hirsutism with behavioral problems in offspring in Upstate KIDS, a birth cohort in upstate New York. Mothers reported a history of PCOS or hirsutism diagnosis at 4 months postpartum. When children were 7 or 8 years old, mothers indicated any ADHD, anxiety, or conduct disorder diagnoses (n=1909). In addition, they rated their child’s behavior with the Strengths and Difficulties Questionnaire (SDQ) at 7 years (n=1386). We classified children with borderline behavioral problems using the SDQ scores. Adjusted risk ratios (aRR) and 95% confidence intervals (CI) were estimated using multivariable Poisson regression with inverse probability weights to account for non-response to follow-up and multiple imputation for missing exposure and covariates. The prevalence of PCOS and hirsutism was 12% and 4%, respectively; 84% of women with hirsutism had PCOS. After adjustment for sociodemographic covariates, pre-pregnancy BMI, and parental history of mood disorder, children born to mothers with PCOS had higher risk of anxiety (aRR 1.62; 95% CI 1.02-2.57) and borderline emotional problems (aRR 1.66; 1.18-2.33) compared with children born to mothers without PCOS (Figure 1A). Hirsutism was related to higher risk of children’s ADHD (aRR 2.33; 1.28, 4.24) and conduct disorder (aRR 2.54; 1.18, 5.47) and borderline total, emotional, peer, and conduct problems (aRRs 2.40 (1.33, 4.32), 2.61 (1.69, 4.05), 1.92 (1.16, 3.79), and 2.22 (1.30, 3.79), respectively) (Figure 1B). We report a novel association between maternal hirsutism and offspring behavioral problems.
Although prenatal use of supplements and medications is common, little is known about specific patterns of use and maternal characteristics associated with use. We assessed supplement and medication use in a low risk, non-obese pregnancy cohort with no chronic disease and determined if use varied by race/ethnicity. The analysis included 2164 (571 non-Hispanic white (NHW), 568 non-Hispanic black (NHB), 611 Hispanic, and 414 Asian) women from the NICHD Fetal Growth studies -Singleton cohort, enrolled at 8-13 gestational weeks with medication use data. Free text medication data on supplement and medication use was self-reported at up to 6 prenatal visits and abstracted from medical records. Data were mapped to active ingredients and classes using the Slone Drug Dictionary. Overall, trimester, and racial differences in the quantity and types of medications were tested. Almost all women (98%) took at least 1 supplement during pregnancy. Overall 31% of women took no medication, 23% took 1, 18% took 2, and 28% took 3+. Medication intake varied significantly by race/ethnicity: Proportion of those taking at least 1 medication was highest among NHW and lowest among Asians (84% vs. 55%, p<0.001). Medication use increased from 1st (43%) to the 3rd trimester (53%) and was observed in all race/ethnic groups (p<0.001). All race/ethnic groups reported taking the same top 3 medication classes at different proportions: 1) central nervous system agents including pain killers, opioids, narcotics, and antidepressants (58% NHW, 51% NHB, 31% Hispanic, 28% Asian); 2) gastrointestinal drugs (59% NHW, 36% NHB, 27% Hispanic, 26% Asian); and 3) anti-infective agents (18% NHW, 28% NHB, 18% Hispanic, and 12% Asian). Even among low risk, non-obese women, the majority took medications prenatally, with significant racial differences. Our findings are important given the knowledge gap in understanding how prenatal medication use and differences by race/ethnicity may be related to pregnancy outcomes.
MATERNAL HEALTHY LIFESTYLE FACTORS AND RISK OF PRETERM BIRTH: A PROSPECTIVE MULTIRACIAL PREGNANCY COHORT STUDY

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Objective: Preterm birth (PTB) remains the leading cause of neonatal mortality and survivors are at higher risk of long-term morbidity. Emerging evidence links individual maternal lifestyle factors to PTB, yet the combined impact of multiple lifestyle factors on PTB remains unknown. We examined the association of a combination of healthy lifestyle factors before and during early pregnancy with risk of PTB.

Methods: In a prospective cohort of 2,449 singleton pregnancies in the Pregnancy Environment and Lifestyle Study, diet, physical activity, stress, and sleep were assessed in first trimester. Electronic medical records provided pre-pregnancy body mass index (BMI) and gestational age (GA) based on ultrasound data. Logistic regression analyses adjusted for race/ethnicity and sociodemographic, medical, and other lifestyle factors.

Results: 160 (6.5%) deliveries were preterm (GA< 37 wk). PTB risk was lower among women aged <35 y (adjusted odds ratio 0.65, 95% CI 0.44-0.97) and who had the following healthy lifestyle factors: healthy weight with a pre-pregnancy BMI of 18.5-24.9 kg/m² (0.57, 0.39-0.83), good diet quality with a Healthy Eating Index-2015 score ≥80 (0.60, 0.36-1.01), and low-to-moderate stress with a Perceived Stress Scale score <75th percentile (0.62, 0.44-0.89). Women with three, two, or one healthy lifestyle factor(s) compared to none had an 83% (0.17, 0.06-0.50), 63% (0.37, 0.22-0.61), or 47% (0.53, 0.34-0.81) lower risk of PTB, respectively. Similarly, women with all three factors and age at childbirth <35 y had an 88% (0.12, 0.03-0.48) lower risk of PTB. Associations were more pronounced among White vs. non-White participants and persisted among women with no previous PTB or no pregnancy complications.

Conclusions: Women with an overall healthy lifestyle (healthy weight, good diet, and low-to-moderate stress) before and during pregnancy were associated with lower risk of PTB. Our findings may inform prevention strategies to mitigate PTB risk.
Background Osteoporosis is a significant problem among kidney transplant recipients (KTRs). Proton pump inhibitors (PPIs) are among the most commonly prescribed drugs in KTRs. There has been concern about the effect of PPI on bone mineral metabolism and hip fracture in the general population. We evaluated the association between use of PPI and H2 receptor antagonist (H2RA) and change in bone mineral density (BMD) in KTRs. Method A total of 626 adult KTRs from the Wisconsin Allograft Recipient Database (WisARD) had an initial hip and spine dual-energy X-ray absorptiometry (DEXA) scan within 6 months after transplantation and a repeat scan performed more than 6 months after the initial scan. The mean follow-up time between scans was 33.9 ±20.1 months. Association between use of PPI and H2RA during follow-up and annualized hip and spine T-score change was assessed in proportional odds regression models using propensity scores with inverse probability of treatment weighting. Results 79.4% of participants used a PPI and 18.7% of participants used a H2RA during the follow-up period. 252 participants (47.4%) had a decrease of T-score in hip, and 190 (38.0%) had a decrease of T-score in spine. Use of PPI was associated with higher risk of hip T-score decrease (OR 2.24, 95% CI: 1.65-3.03 for any decrease; OR 1.44, 95% CI: 1.02-2.07 for moderate decrease). Use of a PPI ≥ 80% duration of follow up was associated with higher risk of spine T-score decrease (OR 1.36, 95% CI: 1.02-1.81). Higher dosage of PPI use and H2RA use were also associated with higher risk of T-score decrease. Conclusion PPI and H2RA use may moderately increase the risk of bone mineral loss, especially at hip, in kidney transplant recipients. Clinicians should carefully evaluate the risk factors for osteoporosis in patients before prescribing PPI/H2RA.
PREVALENCE AND PREDICTORS OF INAPPROPRIATE EMPIRIC ANTIMICROBIAL THERAPY FOR COMPLICATED INFECTIONS IN URBAN HOSPITALS IN MANITOBA, CANADA

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Background: Information on the prevalence and predictors of inappropriate empiric antimicrobial therapy (ET) in Canadian hospitals is scarce. We studied this in Manitoba for complicated urinary tract infections (cUTIs), complicated intra-abdominal infections (cIAIs), hospital-acquired bacterial pneumonia (HAP), and ventilator-associated bacterial pneumonia (VAP) using several administrative and clinical databases covering the entire Manitoba population. Methods: All Manitobans 18 years of age and over who were admitted to a hospital in Winnipeg with a disease of interest from January 2006 to December 2014 were eligible for inclusion in the cohort study. Inappropriate ET was defined as a mismatch between in vitro susceptibility of culture-isolated pathogen(s) and the antimicrobial therapy initiated in the hospital before the result of the tests were known. We used logistic regression to estimate the adjusted odds ratio (OR) of the association between socio-economic and clinical characteristics and inappropriate ET. Results: We included 3,041 patients (1,462 cUTIs, 738 cIAIs, and 841 HAP/VAP) in the disease cohorts. Among persons with known ET status, the prevalence of inappropriate ET was 11% for cUTI patients and 9% for cIAI and HAP/VAP patients. Women were equally likely to receive inappropriate ET as men (OR = 0.9; 95% confidence interval 0.6-1.3). The risk of receiving inappropriate ET was higher for older patients (patients 76 or older had > 2-fold increased risk compared to those in the 18-40 age group) and those hospitalized in the previous year, odds ratio 1.6 (1.1-2.3). Discussion: Inappropriate ET puts a significant burden on the patient and the health care system. More (local) knowledge about predictors remains important in reducing the prevalence of inappropriate ET.
THE ROLE OF CARDIOVASCULAR DRUGS FOR MORTALITY RISK IN ELDERLY USERS OF CONVENTIONAL VS. ATYPICAL ANTIPSYCHOTIC MEDICATIONS – A PHARMACOEPIDEMIOLOGICAL STUDY FROM POLAND
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Introduction: Mortality risks reported in various publications still vary considerably and lack consistency in comparison between typical and atypical antipsychotics in elderly patients. The aim of this study was to determine mortality risk in elderly patients treated with atypical and typical antipsychotics. Methods: We conducted a retrospective cohort study involving 26,639 patients 65 years of age or older who had drug insurance benefits in Gdansk voivodship and who began receiving a conventional or atypical antipsychotic medication between 2008 and 2012. Cox proportional-hazards models were used to compare the risk of death with different groups of antipsychotic medication and to control for potential confounding variables (age, sex, concomitant treatment with cardiovascular drugs and antilipemic and antidiabetic medications). Results: Between 2008 and 2012, atypical antipsychotic medications were not associated with a higher adjusted risk of death than were conventional antipsychotic medications (hazard ratio [HR], 1.01; 95 percent confidence interval [% CI], 0.97 to 1.06). When compared to clozapine, both atypical and typical neuroleptics were associated with significantly reduced mortality risk (HR 0.89; 95% CI 0.79 – 0.99 and 0.89; 95% CI 0.8 – 0.99 respectively). The use of cardiac medications and antilipemic drugs was associated with significantly reduced risk of death in this population (HR 0.88; 95 % CI 0.83 to 0.92 and HR 0.66; 95 % CI 0.57 to 0.74, respectively) but not antidiabetic drugs (HR 1.1; 95 % CI 0.97 to 1.25). Conclusions: These results suggest that there is no difference in risk of death between atypical and typical antipsychotic medications in elderly population in Poland. Although the study was based on administrative record linkage and therefore could not be adjusted for all potential confounders, its results suggest that attention should be paid to patients with antipsychotics with regard to proper therapy of cardiovascular diseases.
Cigarette smoking is associated with lower fecundability. E-cigarettes are a potentially effective cessation aid for cigarette smokers, but there are no studies on the effect of e-cigarette use on fecundability. We assessed the association between e-cigarette use and fecundability and the extent to which the association varied by cigarette smoking history in a cohort of 2,598 female pregnancy planners enrolled in Pregnancy Study Online (PRESTO), a prospective preconception study. Participants were aged 21-45 years, residents of the U.S. or Canada, not using fertility treatments, and trying to conceive for ≤6 cycles at study entry. At baseline, women reported demographics, medical history and lifestyle/behavioral factors, including current and former e-cigarette use. Current e-cigarette use was defined as currently vaping >0 mL liquid/day or using a device containing nicotine. Women completed bimonthly follow-up surveys, contributing data until pregnancy, initiation of fertility treatment, loss to follow-up, or 12 cycles of attempt time. Fecundability ratios (FRs) and 95% CIs were calculated using proportional probabilities models, controlling for potential confounders. Overall, 17% of women had ever used e-cigarettes and 4% were current users. Among current cigarette smokers, FRs were 1.17 (95% CI: 0.63-2.17) for current e-cigarette users and 0.94 (95% CI: 0.60-1.47) for former e-cigarette users. Among former cigarette smokers, FRs were 0.82 (95% CI: 0.47-1.43) for current e-cigarette users and 0.71 (95% CI: 0.46-1.09) for former e-cigarette users. Among never cigarette smokers, FRs were 0.69 (95% CI: 0.26-1.84) for current e-cigarette users and 0.95 (95% CI: 0.71-1.28) for former e-cigarette users. Though e-cigarette use was associated with slightly reduced fecundability among former and never cigarette smokers, and slightly improved fecundability among current cigarette smokers, the results are consistent with a range of possible effects, including no association.
URINARY TRACT INFECTION IN PREGNANCY: RISK FACTORS AND PREVALENCE IN THE NATIONAL BIRTH DEFECTS PREVENTION STUDY Candice Y. Johnson* Candice Johnson, Carissa M. Rocheleau, Meredith M. Howley, Elizabeth C. Ailes, (Centers for Disease Control and Prevention)

Background: Urinary tract infection (UTI) is the most common medical complication of pregnancy. Because it can result in kidney infection and preterm birth, women are screened for UTI early in pregnancy and treated with antibiotics if UTI is found. Prevention of UTI in pregnancy is an opportunity to reduce both maternal morbidity and antibiotic use in pregnancy; unfortunately, prevention is currently infeasible because so little is known about UTI epidemiology. Our objective was to identify risk factors for UTI in pregnancy in a large, population-based study. Methods. We included control mothers participating in the National Birth Defects Prevention Study — a case-control study of birth defects in 10 U.S. states — who had live births during 1997–2011. Mothers self-reported UTI, sociodemographics, and health behaviors. We estimated prevalence ratios (PRs) and 95% confidence intervals (CIs) for associations between maternal characteristics and UTI in pregnancy. Log-binomial models were adjusted for study design variables and sociodemographic characteristics. Results: Among 11,655 participating mothers, 17% reported UTI in pregnancy. However, there were marked geographic differences, with 9% of Massachusetts mothers reporting UTI compared to 25% in Arkansas. Maternal age was strongly associated with prevalence (Figure). In adjusted analyses, a wide variety of additional maternal characteristics was associated with higher UTI prevalence. These characteristics included race/ethnicity (PR 3.19, CI: 2.15–4.71 for Hispanic vs. Asian/Pacific Islander mothers), low income (PR 1.47, CI: 1.23–1.76 for <$10,000 vs. ≥$50,000), and high caffeine intake (p-trend <0.001), among others. Conclusions: One in six women reported UTI in pregnancy. Geographic and socioeconomic gradients in risk suggest the existence of modifiable risk factors that could lead to interventions to prevent UTI and decrease antibiotic use in pregnancy.
ASSOCIATION OF OVARIAN VOLUME AND ESTRADIOL CONCENTRATIONS DURING INFANCY Helen Chin* Helen Chin, Donna Baird, Margaret Adgent, David Umbach, Walter Rogan, (National Institute of Environmental Health Sciences)

Estradiol production during early childhood is important for healthy brain and reproductive organ development. Estradiol is produced by maturing ovarian follicles; in infant girls, these growing follicles contribute to total ovarian volume. Using data from the Infant Feeding and Early Development Study, a longitudinal cohort study of estrogen-responsive outcomes in healthy term infants, we assessed whether total ovarian volume was predictive of estradiol concentrations at 4 (n=109), 8 (n=46), 16 (n=126), 24 (n=131), and 32 (n=120) weeks of age. We measured serum 17-beta estradiol (E2) using an isotope-dilution liquid-chromatography coupled with mass spectrometry method (limit of detection (LOD): 2.99 pg/ml). We used pelvic ultrasound to measure the dimensions of the ovary and identify visible follicles. The proportion of infants with detectable E2 concentrations peaked at 16 weeks (88%) and declined to a minimum of 60% at 32 weeks; values below the LOD were included as LOD/square root of 2. Median E2 concentration was highest at 16 weeks (6.9 pg/ml [interquartile range (IQR): 5.1, 10.1]). Median ovarian volume was highest at 8 (0.9 cm³; IQR: 0.5, 1.5) and 16 (0.9 cm³; IQR: 0.6, 1.2) weeks. Consistent with the peak in E2 and ovarian volume, the most follicles were visualized at 16 weeks with 43% of girls having greater than 3 follicles visible on both ovaries. We fit separate linear models that regressed log2-transformed E2 on ovarian volume at each age and found a significant positive association for each. At 16 weeks, a 1 cm³ increase in ovarian volume corresponded to a 1.3-fold increase in E2 (p<0.01). This association did not change after adjustment for gestational age. Our results show that ovarian volume is predictive of E2 concentrations during infancy, suggesting ovarian volume may be an important predictor of estrogen-mediated neurologic and reproductive development. Studies that investigate determinants of ovarian growth during infancy may be warranted.
Asthma is a chronic inflammatory disease of the lungs. It has been associated with irregular menses and infertility in some studies, but there are limited data on the relation between asthma medication use and fecundability. We used data from Pregnancy Study Online (PRESTO), a North American preconception cohort study, to examine the association between asthma diagnosis and medication use with fecundability. During 2013-2018, we enrolled 6,868 female pregnancy planners who had been trying to conceive for ≤6 cycles at entry. Participants completed a baseline questionnaire and bimonthly follow-up questionnaires for up to 12 months or until pregnant. At baseline, participants reported if they had ever been diagnosed with asthma and their asthma medication use in the past four weeks. We used proportional probabilities models adjusted for factors such as socio-demographics and comorbidities to estimate fecundability ratios (FR) and 95% CIs. The referent for all comparisons was women without an asthma diagnosis. Overall, 1,149 women (17%) reported an asthma diagnosis, of whom 395 (34%) reported use of asthma medication in the past four weeks. Of those who used asthma medication, 60% reported use when having symptoms, 22% reported daily use, and 18% reported daily use plus more when having symptoms. Overall, an asthma diagnosis had little association with fecundability (FR=0.98, 95% CI: 0.90-1.06). For women with asthma who reported medication use only when having symptoms, daily asthma medication use, daily asthma medication use with additional dosing for symptoms, or no medication use, FRs were 1.08 (95% CI: 0.91-1.28), 0.98 (95% CI 0.78-1.29), 0.79 (95% CI: 0.59-1.07), and 0.97 (95% CI 0.89-1.07), respectively. Despite the near-null findings overall, we found slightly reduced fecundability for the heaviest users of asthma medication, which might be a chance departure, confounding by asthma severity, or an effect of greater asthma medication use.

Objective: Vascular endothelial growth factor (VEGF) and its receptor, sFLT-1, are angiogenic factors involved in endometrial remodeling and implantation and are implicated in development of preeclampsia and fetal growth restriction. However, it is unknown whether VEGF and sFLT-1 change over the menstrual cycle, which may have implications for understanding the pathogenesis of maternal-fetal complications. Our aim was to identify if changes in VEGF and sFLT-1 occur during the menstrual cycle. Methods: We measured VEGF and sFLT-1 in plasma, serum, and urine, and reproductive hormones 8 times during the cycle in healthy women (n=100 with ovulatory cycles) ages 18-44 enrolled in the BioCycle Study. Pearson correlation coefficients were used to compare concentrations in different specimens at each visit, and median concentrations were compared at each point. Harmonic models evaluated differences in the mean, amplitude, and phase shift of estradiol, progesterone, LH, and FSH by tertile of baseline VEGF and sFLT-1, adjusting for age and BMI. Results: Median (25th percentile, 75th percentile) concentrations of VEGF during the menstrual cycle were 32.2 pg/mL (24.1, 56.9) in plasma, 194.1 pg/mL (125.4, 350.2) in serum, and 101.7 pg/mL (64.2, 165.8) in urine. No variation in VEGF was detected over the menstrual cycle. Measurements in plasma and serum were correlated at each visit (range: 0.3 to 0.8), though measurements in urine with those in plasma/serum were not correlated (range: -0.2 to 0.1). VEGF was not associated with hormone concentrations, though higher plasma sFLT-1 was associated with higher estradiol amplitude (beta 0.16, 95% CI 0.03, 0.29; third versus first tertile). Conclusions: Lack of change in circulating and urine VEGF and sFLT-1 across the menstrual cycle makes it unlikely that they will be useful as peripheral biomarkers of endometrial remodeling. However, the receptor sFLT-1 may be positively associated with the degree of estradiol variation.

S/P indicates work done while a student/postdoc
EFFECT OF DAILY PRENATAL ASPIRIN THERAPY ON CORD BLOOD INFLAMMATORY BIOMARKERS
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Objective: Aspirin is used increasingly in pregnancy to reduce risk of adverse pregnancy outcomes such as preeclampsia and preterm birth, among others. The Effects of Aspirin in Gestation and Reproduction (EAGeR) trial noted that preconception-initiated low-dose aspirin (LDA) therapy lowered excessive high sensitivity C-reactive protein (hsCRP) concentrations across pregnancy among women with elevated preconception hsCRP. However, it is unknown whether daily maternal aspirin use modifies the neonatal inflammatory profile. Thus, we investigated the effect of maternal LDA on an array of inflammatory biomarkers in cord blood in the EAGeR trial. Methods: Women trying to become pregnant were randomized to 81 mg aspirin (LDA) or placebo daily, initiated prior to conception. Study drugs were taken while attempting pregnancy and, for those who conceived, through 36 weeks’ gestation. Inflammatory biomarkers (i.e., interferon-gamma (IFNγ), interleukin (IL)-1α, IL-2, IL-4, IL-5, IL-10, IL-15, IL-23, TNFα, and hsCRP) were measured in cord blood plasma from 377 live births using a multiplex ELISA immunoassay. An intent-to-treat approach evaluated the effect of LDA versus placebo on cord blood inflammatory biomarker concentrations using Wilcoxon rank sum tests, both overall and stratified by tertile of maternal hsCRP at enrollment. Results: Cord blood inflammatory biomarkers were similar between treatment groups (p-values ranged 0.14 to 0.88). When comparisons were stratified by maternal baseline hsCRP tertiles, results remained null within all maternal inflammation levels, with the exception of IL-15 being higher in the LDA group compared to placebo among women in the middle hsCRP tertile. Conclusions: Daily LDA use in women trying to become pregnant and during pregnancy does not impact cord blood inflammatory biomarkers. Thus, maternal LDA through 36 weeks’ gestation does not appear to have effects on peripheral markers of neonatal immune function.

S/P indicates work done while a student/postdoc
Background: Several autoimmune diseases have been associated with an increased risk of adverse pregnancy outcomes. Data on pregnancy outcomes in women with psoriasis are limited and conflicting. Objective: We examined whether a history of maternal psoriasis affects reproductive patterns and the risk of adverse maternal and pregnancy outcomes. Methods: We used data from Swedish population-based registers to identify two study populations encompassing 1,666,583 women and 1,464,517 births, respectively. Reproductive patterns (parity, age at first birth and pregnancy interval) in women with and without psoriasis were compared. Odds ratios (OR) with 95% confidence intervals (CI) for adverse outcomes were estimated with adjustments for age at birth, calendar period of birth, maternal smoking and pre-pregnancy body mass index (BMI). Results: Compared to women without psoriasis, women with psoriasis were younger at first birth and had longer inter-pregnancy intervals, but did not differ in final parity. In adjusted analyses, risk estimates in women with psoriasis were elevated for pregnancy hypertension (OR=1.37; 95% CI: 1.19-1.58), premature rupture of membranes (OR=1.15; CI 1.04-1.27), large for gestational age infants (OR=1.11; CI 1.01-1.21), cleft palate (OR=1.69; CI 1.07-2.66) and unspecified malformations in the offspring (OR=1.08; CI 1.01-1.16). Limitations: No individual level information was available on lifestyle, disease severity or treatment. Small numbers hampered the assessment of rare outcomes. Conclusion: While there was no evidence that fertility is negatively affected, women with psoriasis were at an increased risk of several adverse maternal and pregnancy outcomes, including cleft palate in the offspring. Our findings add to a growing body of evidence that pregnancies in women with psoriasis need special monitoring.
METABOLIC PREDICTION OF PREGNANCY-RELATED DISORDERS  Nancy McBride*, Nancy McBride, Paul Yousefi, Matthew Suderman, Caroline Relton, Deborah Lawlor, (MRC Integrative Epidemiology Unit, University of Bristol, UK)

Pregnancy disorders such as gestational diabetes (GD), hypertensive disorders of pregnancy (HDP), pregnancy loss and small/large for gestational age (S/LGA) are common and associated with perinatal morbidity and mortality. Earlier, more accurate identification of women at high risk of these disorders will enable better management and distribution of maternal care resources. Levels of antenatal risk are currently assessed using risk factors such as antenatal history, age, smoking, BMI and parity. However, these have poor sensitivity and specificity. We look to improve upon existing predictors using metabolite measures for a wide range of pregnancy disorders. We used 227 NMR-derived metabolite measures from Pakistani and white British mothers from the Born in Bradford (BiB) longitudinal birth cohort to generate prediction models for pregnancy-related disorders. All analyses were stratified by ethnicity (Pakistani or white British). Penalised regression was used to create predictive models for HDP (Pakistani case/control 463/3261; white British 822/2711) and GD (Pakistani 398/3326; white British 172/3361) from 90% of the cohort. Out-of-sample performance was conducted in a random subset of 10% of observations for both ethnicities withheld during training using receiver operating characteristic curves. We found that the metabolites had good discrimination for GD in both ethnic groups, particularly Pakistani women (AUC 0.810 and 0.711 in Pakistani and white British, respectively). Discrimination was poorer for HDP (AUC 0.694 and 0.648). We found the NMR metabolites had better discrimination when compared to a model of existing predictors (BMI, age, smoking and parity) for GD (AUC 0.741 and 0.709) and HDP (AUC 0.6603 and 0.6705). Next, we will assess whether certain metabolites were driving these associations and evaluate the predictive accuracy of this platform for other pregnancy-related disorders. We aim to replicate these findings in independent cohorts.
INFLUENZA VACCINATION AND TIME TO PREGNANCY Lauren A. Wise* Olivia R. Orta, Ellen M. Mikkelsen, Kenneth J. Rothman, Sydney K. Willis, Amelia K. Wesselink, Shruthi Mahalingaiah, Elizabeth E. Hatch, Lauren A. Wise, (Boston University School of Public Health)

Although influenza (flu) vaccination is recommended for all adults, pregnancy planners may opt out over concerns of potential effects on fecundability. However, to our knowledge, there are no studies on the association between flu vaccination and fecundability. We analyzed data from Pregnancy Study Online (PRESTO), an ongoing preconception cohort study of pregnancy planners in the U.S. and Canada. During 2013-2018, 6,864 females and 1,741 of their male partners were followed until reported pregnancy, fertility treatment initiation, loss to follow-up, or 12 menstrual cycles of attempt time, whichever came first. At baseline, participants reported whether they received a flu vaccination in the past year, and all participants had attempt times of ≤6 cycles at study entry. We used proportional probabilities regression models to estimate fecundability ratios (FR) and 95% confidence intervals (CI) comparing those who did and did not report flu vaccination at baseline. Models were adjusted for age, education, income, race/ethnicity, marital status, relationship duration, body mass index, smoking history, parity, history of contraceptive use, intercourse frequency, season, and infertility history. The prevalence of flu vaccination was higher among females than males (47% vs. 38%) and highest in the fall/winter months (>80% among those who were vaccinated). Among vaccinated males, 75% of their female partners were also vaccinated. Vaccination was positively associated with never smoking and education. FRs were 1.08 (95% CI: 1.01-1.14) for female flu vaccination and 1.00 (95% CI: 0.89-1.12) for male flu vaccination. Compared with couples where neither was vaccinated, FRs were 1.16 when only the female partner was vaccinated (95% CI: 1.00-1.33), 0.97 when only the male partner was vaccinated (95% CI: 0.79-1.19), and 1.08 when both partners were vaccinated (95% CI: 0.94-1.24). Our data were consistent with no adverse effect of flu vaccination in the past year on fecundability.
EXTREME HEAT EPISODES, WILDFIRES AND RISK OF PRETERM DELIVERY IN CALIFORNIA, 2005-2013 Sindana Ilango*, Sindana Ilango, Tarik Benmarhnia, (silango@ucsd.edu)

Background: The effect of acute exposure to extreme heat episodes and other extreme weather events on adverse birth outcomes is not well understood. Understanding these relationships is becoming an important priority, especially as these environmental conditions are expected to increase in the context of climate change. We examined the association between many definitions of extreme heat episodes and preterm birth in a large, population-based cohort in California. We also investigated the potential interaction with wildfire smoke events.

Methods: We created a population-based cohort comprised of 2,030,407 mothers who had singleton live births in California, from May through September, 2005-2013. Daily temperature data was used to create 12 definitions of extreme heat episodes of varying threshold temperatures and frequencies and assigned to residential zip codes. We estimated risk of preterm (<37 gestational weeks) delivery among mothers who experienced a heatwave during their last week of gestation using Cox proportional hazard regression models, adjusting for seasonality and socioeconomic factors. The interaction between extreme heat episodes and wildfire smoke was additionally assessed.

Results: Approximately 8% of the cohort experienced a preterm delivery. The risk of preterm birth was consistently higher among mothers who experienced an extreme heat episode during their last week of gestation. Hazard ratios ranged from 1.01 (95% CI: 1.00, 1.02) to 1.11 (95% CI: 1.05, 1.18).

Conclusion: Results from this study suggest acute exposure to high ambient temperatures during the gestational period may trigger an earlier delivery. Extreme heat episode warnings targeted toward pregnant women may be beneficial in improving birth outcomes.
DOES MARRYING AS A VERY YOUNG ADOLESCENT THREATEN REPRODUCTIVE AUTONOMY? FINDINGS FROM DOSSO AREA, NIGER  Stephanie M. DeLong* Stephanie M. DeLong, Mohamad Brooks, Sani Aliou, Nicole Johns, Sneha Challa, Nicole Carter, Abdoul Nouhou, Jay Glen Silverman, (University of California, San Diego, Center on Gender Equity and Health)

Background: Niger has a low median age at marriage and the world’s highest fertility rate. Married very young adolescent girls (MVYAG) experience pressure from husbands to bear children, which may threaten their reproductive autonomy. We examine the role of marrying as a very young adolescent (early marriage) on 3 outcomes related to reproductive autonomy: intimate partner violence (IPV), reproductive coercion (RC) (contraceptive sabotage or pregnancy coercion), and lack of contraception use. Methods: We analyzed control arm data from 24-month follow-up of the longitudinal Reaching Married Adolescents cluster-randomized controlled trial among 13-19 year-old married girls in Dosso area, Niger. Our binary exposure was early marriage (14); outcomes were past-year reports of IPV (physical, sexual), RC, and lack of contraception use. We used log-binomial regression to estimate associations between early marriage and each outcome, adjusting for age; we explored effect measure modification, by parity, for lack of contraception use. We report risk ratios (RRs) and 95% confidence intervals (CI). Results: Of 266 married girls at baseline, 147(56%) reported early marriage (range: 8-14 years). At 24 months, 16 (7%) reported physical IPV, 14(6%) sexual IPV, 11(5%) RC and 125(63%) lack of contraception use in the past year. We did not observe a past-year risk of physical IPV (1.17(CI: 0.42, 3.25)), sexual IPV (0.77(CI: 0.27, 2.19)), or RC (1.05(CI: 0.30, 3.73)) when comparing those who married early versus not. We observed an increased risk of lack of contraception use (1.21(CI: 0.96, 1.53)). In stratifying, among parous girls, we found elevated risk of lack of contraception (1.29(CI: 0.98, 1.69)), while among nulliparous girls, we did not find this association (1.09(CI: 0.79, 1.50)). Discussion: Interventionists in Niger may want to consider age at marriage and related parity in designing family planning programs for adolescent girls.
VALIDATION OF QUESTIONNAIRE-BASED CASE DEFINITIONS FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE Jesse Wilkerson* Lydia Feinstein, Jesse Wilkerson, Paivi M Salo, Matthew F Bridge, Michael B Fessler, Peter S Thorne, Angelico Mendy, Matthew D Curry, Darryl C Zeldin, (Social & Scientific Systems)

Background: Various questionnaire-based definitions of chronic obstructive pulmonary disease (COPD) have been applied using the US-representative National Health and Nutrition Examination Survey (NHANES), but few have been validated against objective lung function data. We conducted a validation study of three COPD definitions from the literature that were based on self-reported physician diagnosis, respiratory symptoms, and smoking pack-years. We also validated a new definition that we developed empirically using machine learning.

Methods: Data came from 7996 individuals 40-79 years of age who participated in NHANES 2007-2012 and underwent spirometry. Participants were considered “true” COPD cases if their ratio of post-bronchodilator forced expiratory volume in 1 second to forced vital capacity was below 0.7 or the lower limit of normal for their age, sex, and race/ethnicity. We used gradient boosting to develop the empirically derived case definition; predictors considered included sociodemographics, body mass index, inhalant exposures, medical history variables, and respiratory symptoms. Analyses were stratified by smoking history. Results: The spirometry-based COPD prevalence was 26% for smokers and 8% for non-smokers. Among smokers, using questionnaire-based definitions resulted in a COPD prevalence ranging from 11-69%, sensitivity ranging from 18-81%, specificity ranging from 36-92%, and accuracy ranging from 48-73%. The new algorithm ultimately defined COPD status based on age, smoking pack-years, and BMI and resulted in the most balanced tradeoff between sensitivity (55%) and specificity (75%) compared to the previously applied definitions. Among non-smokers, the COPD prevalence ranged from 5-8%, and specificity was maximized (range: 92-96%) at the expense of sensitivity (range: 9-11%). Conclusions: Our study results may help guide the selection of COPD definitions and assess potential misclassification when pulmonary function data are unavailable.
RACIAL/ETHNIC INEQUALITIES IN CERVICAL CANCER SCREENING IN THE UNITED STATES: AN OUTCOME RECLASSIFICATION TO BETTER INFORM INTERVENTIONS
Geetanjali Datta* Geetanjali Datta, Magnoudewa Pana, Marie-Helene Mayrand, Beth A Glenn, (University of Montreal/CHUM Research Center)

Background: In the U.S., prevailing understanding suggests significant racial/ethnic inequalities in up-to-date cervical cancer screening exist. However, recent findings elsewhere in North America suggest these inequalities may be pronounced among women who have never been screened and absent among women who have been screened in their lifetime, but not according to guidelines. A better understanding of the nature of inequalities is necessary to reduce their impact across the cancer continuum. Objectives: To assess racial/ethnic inequalities in 1) never screening and 2) not being up-to-date with screening among women who have been screened at least once in their lifetime. Methods: Three years (2014-2016) of the Behavioral Risk Factor Surveillance Survey were utilized to estimate cervical cancer screening rate ratios via Poisson regression (N=119,603). The sample was limited to women aged 21 and 65 years, and excluded women who had a hysterectomy. Women who reported having never been screened were considered never screened and women who had been screened in their lifetime, but not in the 3-years prior to survey administration were considered not up-to-date with screening. Women who reported having health care coverage were considered to have access to care. Results: Non-white women were at greater risk of never having been screened in comparison to white women, particularly Asian women (Prevalence Ratio (PR) = 3.85, 95% CI= 3.4-4.4). However, among women who had been screened at least once in their life, non-white race/ethnicity was not associated with increased risk of not being up-to-date with screening (PRAsian vs white=0.88, 95% CI=0.7-1.1). Access to health care was associated with both outcomes. Conclusion: Interventions to address lifetime never screening are necessary to mitigate racial/ethnic inequalities in the U.S. Future studies should explore the potential impact of interventions, like HPV self-sampling, which do not require primary care access.
SCREENING TEST FOR ASSESSMENT OF HEALTH STATE AT RISK IN SUSCEPTIBILITY PHASE AMONG UNIVERSITY STUDENTS Hideo Yamazaki* Hideo Yamazaki, Soichi Sakabe, Xiao Qing, Minako Danbara, Hikaru Yamazaki, (Tokoha University)

Introduction: Both lifestyle and behavior factors predispose individuals to lifestyle-related diseases (LSRDs). In a practical community health activity based on health promotion, a primary prevention is one of the most effective ways to prevent LSRDs. In general, although university students have a low incidence rate at LSRDs, the cumulative exposure to behavioral disadvantage across the life course may be strongly associated with predispose LSRDs. However, an appraisal way for health conditions in a phase of susceptibility based on the theory of natural history of diseases has not been established yet. The purpose of the present study was to examine the validity of a screening test of health state at risk in susceptibility phase on the natural history of disease among university students in Japan. Methods: A self-report questionnaire consisted of 54 items was administered to university students in Japan between 2016 and 2018. As analyzed data without defect values, 2,919 samples derived from university students. A principal component analysis (PCA) was applied to valid data. Results: The PCA was applied to the sample in order to extract a semihealth index. Then the index score was calculated by the norm eigenvectors of the first principal component. Furthermore, a distribution of university students with the semihealth conditions was determined by using the score. As a result, the prevalence, sensitivity, specificity, positive predictive value, and negative predictive value showed 20.6%, 84.6%, 83.5%, 57.1%, and 95.4%, respectively. Conclusions: This method has shown to be useful for the assessment of the semihealth state among university students from a light of health promotion activities.
ETHNIC ENCLAVES AND OBSTETRIC OUTCOMES AMONG ASIAN/PACIFIC ISLANDERS IN THE UNITED STATES

Andrew D Williams* Andrew D Williams, Lynne Messer, Jenna Kanner, Sandie Ha, Pauline Mendola, (Eunice Kennedy Shriver National Institute of Child Health and Human Development)

Ethnic enclaves are ethnically, spatially and socially distinct communities that may promote health through access to culturally-appropriate resources, and reduced exposure to discrimination. Evidence regarding obstetric outcomes among Asian/Pacific Islander (API) women in ethnic enclaves is sparse. We examined 9,206 API births from 19 hospitals the Consortium on Safe Labor (2002-2008). API ethnic enclaves were areas with high percentage of API residents, high dissimilarity index (how API and white residents are distributed in an area), and high isolation index (degree of interaction between API and white residents in an area). Gestational diabetes mellitus (GDM), preterm birth (PTB), small for gestational age (SGA), smoking during pregnancy, and alcohol use during pregnancy were reported in medical records supplemented with ICD-9 codes. Hierarchical logistic regression models estimated associations between ethnic enclaves and obstetric outcomes, adjusted for demographic and clinical factors, area-level poverty and air pollution. We examined mean percent foreign born API residents and mean percent of homes speaking an API language in enclave and non-enclave areas. On average, in ethnic enclaves, 10.5% of homes speak an API language, compared to 6.0% in non-enclaves (p<.05). Mean percent foreign born API populations was 67.4% in ethnic enclaves and 68.8% in non-enclaves (p<.05). Women residing in ethnic enclaves had lower odds of GDM(OR: 0.61, 95%CI: 0.45, 0.82), PTB(OR: 0.74, 95%CI: 0.56, 0.99), and SGA(OR: 0.68, 95%CI: 0.52, 0.89), compared to women in non-enclaves (Figure 1). Ethnic enclaves may be protective against prenatal smoking and alcohol use, but confidence intervals were wide. API women residing in ethnic enclaves had better obstetric outcomes than API women residing in non-enclave areas. Access to culturally-appropriate social supports and resources may be an important factor for health promotion among API populations.
PRE-DIAGNOSIS SOCIAL SUPPORT, SOCIAL TIES, AND COLORECTAL CANCER MORTALITY IN POSTMENOPAUSAL WOMEN FROM THE WOMEN'S HEALTH INITIATIVE Candyce H. Kroenke* Candyce H. Kroenke, Electra D. Paskett, Bette J Caan, Crystal W. Cené, Juhua Luo, Aladdin H. Shadyab, Jamaica R.M. Robinson, Rami Nassir, Dorothy S. Lane, Garnet L. Anderson, (Kaiser Permanente Northern California, Division of Research, Oakland, CA)

Purpose: We evaluated associations between perceived social support, social ties, living alone, and colorectal cancer (CRC) outcomes in postmenopausal women. Methods: This study included 1,429 women from the Women's Health Initiative diagnosed from 1993-2000 with stages I-IV CRC and who responded to the Medical Outcomes Study Social Support survey prior to their CRC diagnosis. We used proportional hazards regression to evaluate associations of social support (tertiles) and types of support, assessed up to six years prior to diagnosis, with overall and CRC-specific mortality. We also examined associations of social integration and living alone with outcomes in a subset of 1,141 women with information on social ties (marital/partner status, community and religious participation) and living situation. Results: In multivariable analyses, women with low (hazard ratio (HR)=1.57, 95% confidence interval (CI): 1.27-1.95) and moderate (HR=1.23, 95% CI: 0.99-1.53) perceived social support had significantly higher overall mortality than those with high support (p-continuous<0.001). Additionally, women with low (HR=1.47, 95% CI: 1.11-1.93) and moderate (HR=1.23, 95% CI: 0.93-1.62) support had higher CRC mortality than those with high social support (p-continuous<0.001). Emotional, informational, and tangible support and positive interaction were each significantly associated with outcomes while affection was not. Level of social integration was related to overall (p-trend=0.02) but not CRC (p-trend=0.34) mortality; living alone was not associated with mortality outcomes. Conclusions: Women with low perceived social support prior to diagnosis had higher overall and CRC-specific mortality. Social support is critical to prognosis in women with CRC.
IMPACT OF INDIVIDUAL AND NEIGHBORHOOD SOCIOECONOMIC STATUS ON SURVIVAL AFTER A COLORECTAL CANCER DIAGNOSIS. Jamaica R Robinson*, Jamaica R Robinson, Amanda I Phipps, Philip Hurvitz, Polly A Newcomb, (Department of Epidemiology, University of Washington)

Background. Previous evidence suggests that individual- and neighborhood-level socioeconomic status (SES) are linked to cancer outcomes. However, little is known about the effects of SES on survival after a diagnosis of colorectal cancer (CRC). We sought to evaluate the independent and joint effects of individual- and neighborhood-level SES on CRC survival.

Methods. Our study included prospective follow-up of 2,596 incident invasive CRC cases diagnosed between 1997-2007 and identified via the Seattle-Puget Sound Surveillance, Epidemiology, and End Results (SEER) registry. We used educational attainment from a baseline questionnaire as an indicator of individual SES. Residential address at diagnosis was linked to Census block group-level data from the 2000 US Census; we used the percentage of persons living in poverty in a block group as an indicator of neighborhood SES. Extended Cox models were used to estimate HRs for the cumulative effects of SES indicators on overall and disease-specific survival. All model estimates were adjusted for individual-level age at diagnosis, sex, and race, were stratified by tumor stage at diagnosis, and included robust standard errors to account for within-neighborhood dependence.

Results. When considering SES attributes alone, HRs for the cumulative effects of educational attainment and poverty ranged from .98-1.01 for both overall and disease-specific survival; joint effects were similar.

Conclusion. Our findings suggest that specific individual- and neighborhood-level SES indicators are not associated with overall or disease-specific survival following a CRC diagnosis. Individual-level educational attainment and neighborhood poverty, which reflect the accessibility of neighborhood resources, have been previously linked to breast and prostate cancer survival; we assumed these indicators would be salient in CRC survivors as well. It may be that the most meaningful SES factors for this population have yet to be identified.
BLACK-WHITE DIFFERENCES IN THE ASSOCIATION BETWEEN MATERNAL ADVERSE CHILDHOOD EXPERIENCES AND CHILD ASTHMA OUTCOMES FROM THE ADD HEALTH STUDY

Jennifer Seamans* Jennifer Seamans, Sarah Andrea, Kara Gallemore, Janne Boone-Heinonen, (OHSU-PSU School of Public Health)

Background: Maternal adverse childhood experiences (ACEs) are associated with greater risk of poor health outcomes to children of exposed mothers, particularly female children. Social structures such as race and childhood socioeconomic status (SES) confer differential exposure and vulnerability to ACEs. While Black children experience a higher burden of asthma, race differences in the association between maternal ACEs and child asthma are underexplored. The objective of this study was to test the hypothesis that the association between maternal ACEs and child asthma is stronger in Black compared to White mothers. Methods: This study examined data on 2,442 mother-child dyads from the National Longitudinal Study of Adolescent to Adult Health. Using race-stratified log-binomial regression, maternal self-report of child asthma diagnosis in a firstborn child was modeled as a function of high maternal ACEs (binary variable using an adjusted clinical relevance threshold: 3+ ACEs). Analyses included interaction with child sex and maternal race, were adjusted for mother’s caregivers’ SES (income, education) and smoking, and accounted for complex survey design. Results: The association between maternal ACEs and child asthma was strongest for Black mothers of female children (3-way interaction between ACEs, child sex, and race: p = 0.018); mothers in this category with high ACEs were 5.3 times as likely to report an asthma diagnosis in their children relative to similar mothers with low ACEs (95% CI 2.22, 12.69). Associations for male children born to Black mothers and all children of White mothers were weak or absent. Conclusions: Study findings suggest that maternal exposure to adverse childhood experiences may incur elevated risk of asthma in the next generation in female children of Black mothers. Greater understanding of structural and psychosocial factors that contribute to race and sex differences is needed to mitigate intergenerational propagation of inequities.
PERCEIVED EVERYDAY DISCRIMINATION AND PREVALENCE OF TYPE 2 DIABETES AMONG US LATINO MEN AND WOMEN

Joelle Atere-Roberts* Joelle Atere-Roberts, Anissa Vines, (University of North Carolina- Chapel Hill)

Background: Perceived everyday discrimination, the frequency of subtle, day-to-day experiences of unfair treatment, has been shown to affect health through both physiological and behavioral pathways. Literature on the deleterious effects of discrimination on type 2 diabetes among US Latinos is limited. Objective: To describe discrimination overall and by type of unfair treatment and examine their association with type 2 diabetes by gender. Methods: 670 adult Latino participants in the NINOS Lifestyle and Diabetes Study completed the 9-item Everyday Discrimination scale. To assess each item on the scale and an overall composite measure, discrimination was defined as never or ever perceiving discrimination. Type 2 diabetes status was determined by self-report, use of a diabetic medication, or fasting glucose of 126 mg/dL or greater. Gender specific models using Poisson regression with a robust variance estimator to estimate prevalence ratios and 95% confidence intervals were obtained, adjusting for age in the crude model. Results: The prevalence of type 2 diabetes among men and women was 28.6% and 21.3%, respectively. The mean discrimination score was higher for men (6.0) compared to women (4.6). Compared to women, men reported a higher frequency of ‘at least some of the time’ on 6 of the 9 items. Albeit not significant, men who ever perceived discrimination had a higher prevalence of type 2 diabetes compared to those who reported never perceiving discrimination 1.48 (CI: 0.84-2.59). Women who perceived the everyday insult, “acting as if you are not smart,” had a lower prevalence of type 2 diabetes compared to those who reported never (PR= 0.62, CI: 0.41-0.94). Conclusions: In this population-based study of Latinos, there was no association between discrimination and type 2 diabetes among women. However, the higher prevalence of diabetes among men who ever perceived discrimination and the elevated frequency of discriminatory events reported warrant further research.
Background: Housing is a fundamental social determinant of health yet housing affordability has diminished over much of the twenty-first century. Research on housing affordability as a determinant of health is limited, but early studies have shown possible correlations with mental health. However, few studies have examined the relationship between housing affordability and risk factors for cardiovascular disease, the leading cause of morbidity and mortality among Americans. Methods: Using a nationally-representative sample of middle-aged adults from the National Longitudinal Survey of Youths 1979 (NLSY79) and exploiting quasi-experimental variation before and after the Great Recession, we estimated the associations between the change in median county-level percentage of household income spent on housing (rent/mortgage) from 2000 to 2008 and incident hypertension, obesity, diabetes, and depression from 2008 to 2014. We employed conditional fixed effects logistic regression models to reduce bias due to time-invariant confounding. Results: Each percentage point increase in county-level median percentage of household income spent on housing was associated with a 17% higher odds of incident hypertension (OR=1.17, 95% CI=1.001 to 1.39; p=0.047), a 37% higher odds of obesity (OR=1.37, 95% CI=1.001-1.87; p=0.049), and a 15% higher odds of depression (OR=1.15, 95% CI=1.01-1.31; p=0.03), controlling for individual- and area-level factors. These associations were stronger among renters than homeowners, and among men than women. Conclusions: Our findings suggest that lower levels of housing affordability contribute to worse risk profiles for cardiovascular disease. Policies that make housing more affordable may help reduce the population burden of cardiovascular disease.
LONGITUDINAL EFFECTS OF NEIGHBORHOOD-LEVEL SOCIAL FRAGMENTATION ON TRAJECTORIES OF MENTAL HEALTH-RELATED QUALITY OF LIFE

Peter Lekkas*, Peter Lekkas, Natasha Howard, Ivana Stankov, Mark Daniel, Catherine Paquet, (University of South Australia)

Purpose: Social fragmentation (SF) -a multidimensional trait- has been associated with mental health-related quality of life (MHQoL). However, no study has examined the time-varying effects of exposure to SF on the development of MHQoL; this study addressed this gap. Methods: To account for the developmental profile of SF at the neighborhood-level, a latent transition analysis was conducted across 3-time points (10-years), with 9 conceptually related census-based indicators. A four class, nominal-level latent status model of SF was identified: class-A=low SF (referent); class-B=mixed-level, inner urban; class-C=mixed-level, peri-urban; and class-D=high SF. Latent growth models were then applied to examine the conditional time-varying effects of SF-classes on 10-year individual-level trajectories of MHQoL (n=4016 at baseline), while accounting for time-invariant (age, age-squared, sex, education, recruitment zone/time), and -varying covariates (health transition status). A negative control outcome analysis was also enacted, as were sensitivity analyses. Results: Relative to class-A, exposure to class-B and class-C neighborhood SF-classes were estimated to have a direct negative effect on time-1 MHQoL ((class-b: \(b = -2.246; 95\% CI: -4.091, -0.402; p < 0.017\); (class-c: \(b = -2.187; 95\% CI: -3.792, -0.582; p < 0.008\))). These effects were not evident at time-2, and were partially attenuated at time-3 ((class-b: \(b = -1.497; 95\% CI: -3.215, 0.222; p < 0.088\)); (class-c: \(b = -1.241; 95\% CI: -2.735, 0.254; p < 0.104\))). The effects of SF on the negative control outcome were attenuated relative to those observed for MHQoL, providing some evidence against residual confounding. Moreover, these differential effects added weight to the specificity of hypothesised relationship. Conclusion: Inference supports the notion that SF affects the development of MHQoL. However, the support offered is variegated, as analyses demonstrated a complex patterning of conditional effects on MHQoL.
IS PERCEIVED NEIGHBORHOOD DISORDER ASSOCIATED WITH MUSCLE STRENGTH?
FINDINGS FROM THE HEALTH AND RETIREMENT STUDY Kate A. Duchowny* Kate A. Duchowny, M. Maria Glymour, Peggy Cawthon, (Department of Epidemiology and Biostatistics, University of California, San Francisco)

Background: Muscle weakness, as measured by handgrip strength (HGS), is strongly associated with disability and mortality. Social and structural determinants of health, including neighborhoods, have received little attention in relation to muscle weakness. Neighborhoods have been extensively evaluated as social determinants of health, particularly for older adults who depend on local resources to maintain quality of life, but this work has primarily focused on general outcomes such as disability. Neighborhood associations with disability may reflect differences in multiple alternative mechanisms, including physical impairments, environmental demands, or resources for accommodations. Evaluating neighborhood effects on physical impairments such as muscle weakness may offer greater insight into physiologic mechanisms. Objective: To examine the association between perceived neighborhood disorder and muscle strength in a nationally-representative sample of U.S. adults aged 50+. Methods: In gender-stratified linear regression models, we investigated whether self-reported neighborhood physical disorder (1-7 scale, mean= 2.61, SD= 1.45) ; presence of vandalism/graffiti, litter, deserted houses, feeling safe walking alone) was associated with mean HGS using complete data from 11,379 participants (57% women; Mean Age: 66.6 years) from the Health and Retirement Study (2012-2014). Results: In models adjusted for age, education, physical activity, smoking, BMI, chronic conditions and race/ethnicity, each additional point on the physical neighborhood disorder scale was associated with lower HGS for men (β=-.52 kg; 95% CI=-.69,-.34) and women (β=-.14 kg; 95% CI=-.24,-.05). Discussion: This is the first study to demonstrate a relationship between perceived neighborhood disorder and muscle strength. Future studies should more rigorously evaluate causality and evaluate whether interventions that improve the neighborhood environment also affect muscle strength in middle and older age.
Background. More than 2 million people suffer from opioid use disorder (OUD) in the United States (U.S.). Polysubstance use (i.e., concurrent use of two or more substances) (PSU), commonly co-occurs with OUD, yet there is a lack of information regarding the effectiveness of OUD treatment in the presence of PSU. This systematic review aimed to determine the impact of PSU on OUD treatment effectiveness - defined as opioid abstinence and/or retention - by OUD treatment type, including pharmacological, behavioral, and combination (pharmacological and behavioral) treatments. Methods. We searched MEDLINE/PubMED, EMBASE, PsychINFO, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) to select relevant publications up to November 2018. We included observational studies and randomized control trials of adult OUD patients reporting odds ratios (OR) or hazard ratios (HR) predicting treatment effectiveness, defined as retention in treatment or the proportion of OUD abstinent patients at follow-up. Four evaluators independently reviewed and selected eligible studies based on predetermined selection criteria. Quality assessment was performed using the ROBINS-I tool. Results. We included a total of 112 eligible studies, 67 randomized control trials and 45 observational studies. The co-occurring use of cocaine, alcohol, and marijuana were most often used to predict the effectiveness of OUD treatment. Co-occurring cocaine and alcohol use were associated with decreased retention and decreased opioid abstinence in all three types of OUD treatment. The impact of co-occurring marijuana use was inconsistent by OUD treatment type; marijuana use increased opioid abstinence in few pharmacological studies, but demonstrated no significant association with retention in most behavioral and combined treatment studies. Conclusion. This review revealed the impact of PSU on OUD treatment, and highlights the importance of accounting for PSU when treating patients with OUD.
PREVALENCE AND CORRELATES OF OPIOID PAIN RELIEVER SHARING AMONG PUBLIC PRIMARY CARE PATIENTS RECEIVING LONG-TERM OPIOID THERAPY

Elizabeth N. Kinnard*
Elizabeth N. Kinnard, Christopher L. Rowe, Glenn-Milo Santos, Natalie Oman, Rita A. Bagnulo, Phillip O. Coffin, (San Francisco Department of Public Health; University of California Berkeley School of Public Health)

A major aim of opioid prescribing reforms is to reduce sharing of opioid pain relievers (OPRs) with individuals lacking legitimate medical indications, and thus reduce the number of individuals at risk of developing an opioid use disorder. However, little research has examined patient characteristics that may predict provision of OPRs to others, or characteristics of their recipients, limiting our ability to understand the nature of this practice or guide clinical care decisions. We conducted bivariate and multivariate log-binomial regression analyses to determine predictors of having provided OPRs to others in the past year among 603 patients prescribed long-term OPRs for chronic pain at primary care safety net clinics in San Francisco. Our sample was 58% male and 88% unemployed; lifetime use of heroin (39%), methamphetamine (47%), cocaine (74%), and cannabis (89%) were high. Fourteen percent provided OPRs to at least one other person in the past year; overall, only 2% of subjects provided their OPRs to individuals who were not known to already be using opioids. In multivariate analyses, current heroin use vs. never use was independently associated with having provided OPRs to others (RR = 3.44, 95% CI 1.96 – 6.03), controlling for demographics, ever use of other substances, and mental health variables significant in bivariate analyses. Relative to no use, former use of heroin, and any lifetime use of methamphetamine, cocaine, and cannabis were not independently associated with having shared OPRs. These results suggest that, in a population considered at high risk for sharing OPRs, this practice was only reported among a minority of participants and almost entirely restricted to opioid-experienced recipients. The only independent predictor of sharing OPRs was current use of heroin, suggesting that a history of prior heroin use alone need not preclude OPR treatment based on concerns of OPR sharing. Further research is needed to determine the motivations behind and patterns of OPR sharing.

S/P indicates work done while a student/postdoc
TOBACCO USE PROFILES BY ASTHMA STATUS, ADULTS AND YOUTH IN THE PATH STUDY
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Background: The adult smoking prevalence has reached an historic low (14.1%), yet about 25% of U.S. adults with asthma are current cigarette smokers and may also use other tobacco products at a higher proportion than the general population. Smoking triggers asthma symptoms and exacerbates asthma-related morbidity. Methods: Population Assessment of Tobacco and Health (PATH) study data from waves 1, 2, and 3 were combined. Separate analyses of adult and youth tobacco use by asthma status were conducted. Current tobacco use was determined by past 30-day use of at least one product at wave 3 (cigarettes, ENDS, hookah, smokeless tobacco, snus, cigars, cigarillos, or pipes). Current use groups were divided into exclusive combustible cigarette, exclusive ENDS, dual combustible cigarette and ENDS, other combustible, and combinations of poly-tobacco use. Results: Among 27,121 adults, 26.3% reported current use of any tobacco product at wave 3 and 13.6% reported an asthma diagnosis at any wave. Among asthmatic adults, 28.4% reported current tobacco use compared to 25.9% without asthma. Among asthmatic adults who reported current tobacco use, 57.8% were exclusive combustible cigarette users, 5.2% were exclusive ENDS users, 9.1% were dual cigarette and ENDS users, 13.4% were poly-tobacco users, and 12.3% were other combustible tobacco product users. Among 11,440 youth (ages 12-17), 7.3% reported current use of any tobacco product and 19.1% reported a current asthma diagnosis. Compared to non-asthmatic youth, a higher proportion of asthmatic youth were dual combustible cigarette and ENDS users (14.4% vs. 12.3%), poly-tobacco users (14.8% vs. 9.8%), and other combustible users (14.9% vs. 9.0%). Conclusions: Adults and youth with asthma reported greater tobacco product use than the general non-asthmatic population and most of that use involved combustible tobacco products. It is important for health care providers to discuss tobacco use with their asthmatic patients as part of their asthma care.
NONMEDICAL PRESCRIPTION OPIOIDS USE, HEROIN USE, AND CARDIOVASCULAR DISEASE  

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Aims: To estimate the association between cardiovascular disease with nonmedical use of prescription opioids (NMUPO) and heroin use among U.S. adults aged 18 and older. Methods: Pooled 2005–2014 National Survey on Drug Use and Health data were used (n=557,742 individuals ≥18). Our outcome was self-reported past-year cardiovascular disease (stroke and/or heart disease in the past year.) We fitted three weighted prevalence ratio regressions comparing effects of: past-year NMUPO vs non-users, past-year prescription opioid use frequency categories (“100–365 days”, “30–99 days”, and “1-29 days”) vs non-users, and past-year use of prescription opioid only, heroin only, and both vs non-users. Models were adjusted by demographics (age, sex, race, year, poverty level, and insurance status) and cardiovascular disease risk factors (past-month cigarettes per day, heavy drinking, self-reported diabetes, and high blood pressure). Results: After adjusting for demographics and cardiovascular risk factors, the prevalence of cardiovascular disease among past-year NMUPO was 25% less than non-users (Prevalence Ratio=0.75 [0.62, 0.92]). Compared to non-users, frequent NMUPO users (“100-365” days) had lower cardiovascular disease prevalence (PR=0.66 [0.52, 0.84]). Nonmedical users of prescription opioids only, heroin only, and users of both had lower cardiovascular disease prevalence than non-users (PR=0.76 [0.62, 0.92], PR=0.51 [0.18, 1.46], and PR=0.83 [0.33, 2.05], respectively). Conclusions: Previous evidence supports divergent protective and harmful effects of opioids on cardiovascular disease. Our results are supported by previous research indicating potential cardioprotective effects of opioid medications, suggesting possible unintended consequences of the opioid epidemic. Additional work exploring potential unmeasured confounding or measurement error, particularly of the outcome, is warranted.
RURAL RISK ENVIRONMENTS, OPIOID-RELATED OVERDOSE, AND INFECTIOUS DISEASES: A MULTIDIMENSIONAL, SPATIAL PERSPECTIVE
Marynia Kolak* Marynia Kolak, Yen-Tyng Chen, Sam Joyce, Kali Defever, Colleen McLuckie, Samuel R. Friedman, Mai T. Pho, (Center for Spatial Data Science, University of Chicago)

‘Risk environment’ frameworks model aspects of drug-related harm based on empirical and theoretical work about social, political and epidemiologic interactions between individuals (or groups) and places. Investigations of urban populations have uncovered racialized risk environments among vulnerable subpopulations that may drive and/or magnify disparities in people who inject drugs (PWID). Much remains unknown in rural risk environments, despite a growing crisis in these areas, including how complex geographic patterns of sparse job opportunities, dangerous conditions in existing jobs, housing, physical landscape, population density, and other factors impact vulnerability. We adapt a risk environment framework to characterize rural southern Illinois and describe the relations of risk environments, opioid-related overdose, HIV, Hepatitis C, and sexually transmitted infection rates between 2012 and 2016. We study social, economic, policy, and physical aspects of the risk environment. Over two dozen variables are summarized by mean across zip-code (n=128) or county levels (n=16) based on availability and theoretical relevance. For example, we include isolation, high-risk employment (e.g. mining, construction), extreme poverty, land-use, housing, and residential areal characteristics. We calculate access metrics using mean distance to nearest primary care providers, pharmacies, harm reduction programs, urgent care facilities, and ambulatory response time. We use Exploratory Spatial Data Analysis (ESDA) approaches to characterize both data attributes and geographic dimensions of the rural risk environment. Finally, we compare exposures to risk environment and health outcomes across regional clusters. Both risk environment vulnerabilities and health outcomes are multifaceted and spatially heterogeneous in rural southern Illinois. Health outcome clusters vary across space, despite similarities in several dimensions of the risk environment. Opioid-related deaths have increased over time and shift

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Electronic cigarettes (e-cigarettes) are dramatically increasing among youth in the United States (US). We aim to assess e-cigarette susceptibility and curiosity among U.S. middle and high school students who are not susceptible to use cigarettes. We analyzed self-report data of adolescents who were not susceptible to smoke cigarettes (n=10,278) aged from 9 to 18 years old using the 2017 National Youth Tobacco Survey (NYTS). The analysis was conducted to determine the prevalence of the e-cigarette susceptibility and curiosity among adolescents who are not susceptible to use cigarette by gender, race/ethnicity, school level, exposure to a variety of e-cigarette advertising, second hand exposure, and harm perception and test how these factors are associated with higher levels of e-cigarette susceptibility and curiosity. Our study identified that about 9% of middle school students (695,223) and 19% of high school students (1,551,192) who were not susceptible to use cigarette reported susceptibility to use e-cigarettes. Greater odds of susceptibility to use e-cigarette was observed among those with exposure to e-cigarette vapor at public places, ads and promotions on the internet, low harm perceptions, and lower comparative addictiveness to cigarettes. More than 13% of middle school students (1,008,153) and 23% of high school students (1,886,246) who were not susceptible to use cigarette reported being curious about e-cigarette. We found that exposure to the e-cigarette ads and promotion on the internet and lower harm perceptions were associated with greater odds of being curious about e-cigarette. Among all students (middle and high school) who were susceptible to use e-cigarette (n= 1437), 60.7% also reported being curious about E-cigarette at the same time. The findings of this study will aid future public health prevention programs aimed at curbing the increasing rates of e-cigarette use among naïve adolescents and lower the risk of nicotine addiction fueled by smoking initiation.
COST-EFFECTIVENESS OF OPIOID ADDICTION TREATMENT SCALE-UP STRATEGIES: DYNAMIC MODELING ANALYSIS Olga Morozova* Olga Morozova, Forrest W. Crawford, Ted Cohen, A. David Paltiel, Frederick L. Altice, (Biostatistics, Yale School of Public Health)

Background: Opioid use disorder (OUD) is a chronic relapsing condition. Effective medication-assisted therapies, such as opioid agonists and extended-release naltrexone, are available. Public health decisions about how to set treatment capacity are often based on the internationally recommended coverage levels among people with OUD, rather than treatment demand. Beyond individual patients, OUD treatment can provide benefits to the general public, but these benefits are often ignored in the evaluation of treatment scale-up strategies.

Methods: To evaluate OUD treatment scale-up strategies, we develop a novel dynamic model of the opioid epidemic that incorporates potential peer effects in drug use initiation and demand for treatment. The Figure illustrates the model structure with red arrows showing transition rates that increase with the number of active drug users, and blue arrows showing rates that increase with treatment capacity. We apply this model to evaluate the opioid agonist therapy (OAT) capacity increase strategies in Ukraine – a country that suffers from dual epidemics of HIV and opioid addiction. Findings: Even under the most ambitious plausible capacity increase, OAT coverage (i.e., the proportion of persons with OUD receiving OAT) would be lower than 20%, owing to limited demand. The World Health Organization recommends a coverage of 40%. Our model predicts that increasing OAT capacity to this level would result in a waste of resources unless specific efforts to increase treatment demand are implemented. At the same time, moderate OAT capacity increase is highly cost-effective, even when some of the treatment slots remain unoccupied for most of the modeling horizon. Conclusions: Evaluation of the OUD treatment scale-up strategies may benefit by better capturing of the population dynamics of opioid addiction, such as potential peer effects in drug use initiation and dynamic nature of the waiting lists.

\[\text{Population aged out of at risk (E)}\]
\[\text{Population at risk (S)}\]
\[\text{Opiate users, no Tx Hx (O_s)}\]
\[\text{Q_s}\]
\[\text{Q_f}\]
\[\text{Tx wait list (Q)}\]
\[\text{In Tx (B)}\]
\[\text{Abstinent (A)}\]
\[\text{A_f}\]
\[\text{Opiate users, with Tx Hx (O_f)}\]

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SEVERE MATERNAL USE OF OPIOIDS OR CANNABINOIDS AND THE RISK OF CONGENITAL MALFORMATIONS IN OFFSPRING: A RETROSPECTIVE POPULATION-BASED STUDY

Shiliang Liu* Shiliang, Mihaela Gheorghe, Nathalie Auger, Julian Little, (Public Health Agency of Canada)

OBJECTIVE: There is growing concern that maternal drug use may impact the risk of having a baby with birth defects. This study aimed to assess the association between severe maternal use of opioids or cannabinoids and risk of congenital malformations in the offspring.

METHODS: We conducted a population-based study of mother-newborn dyads, comprising 3,812,597 live births and stillbirths (including terminated fetuses) in hospitals in Canada from 2004 to 2017. A total of 13,112 mothers with severe use of opioids or cannabinoids, and 45,254 newborns with congenital malformations were identified using ICD-10 codes. Maternal age, parity, chronic condition or illness, and use of alcohol or tobacco or other drugs were considered as covariates. Poisson regression analysis was used to assess the association between maternal use of opioids or cannabinoids and the risk of a number of malformations.

RESULTS: The absolute prevalence of any selected malformation was higher for newborns of women who used either drug compared with women who did not (26.5 vs. 11.8 per 1000 total births). Young women (i.e., <25 years) had a higher rate of severe drug use than older women. Use of opioids was significantly associated with the risk of congenital microcephaly (risk ratio (RR), 6.6; 95% confidence interval (CI) 4.5-9.7), cleft palate (RR, 4.3; 2.7-6.9), atrial septal defect (RR, 3.2; 95% CI 2.4-4.2), ventricular septal defect (RR, 2.6; 95% CI 1.9-3.6) or cystic kidney disease (RR 2.5; 95% CI 1.5-4.3). Use of cannabinoids was significantly associated with gastroschisis (RR 3.1; 95% CI 2.2-4.4), spina bifida (RR 2.6; 95% CI 1.1-6.2), transverse limb deficiency (RR 2.2; 95% CI 1.2-4.5) and critical congenital heart defects (RR 1.6; 95% CI 1.0–2.6) compared with non-users.

CONCLUSION: This study suggests that severe maternal use of opioids or cannabinoids is associated with several congenital malformations in the offspring.
The United States is experiencing an epidemic of opioid overdose. Although the proximal causes of and individual factors associated with overdose death are well-studied, the risk of fatal overdose may be additionally influenced by supra-individual factors. The role of the natural environment in modifying the risk of fatal overdose death has received little attention. To investigate the association between ambient temperature with fatal opioid overdose, we conducted a case-crossover analysis of opioid overdose deaths recorded in Connecticut and Rhode Island in 2014–2017. We compared the mean temperature on the day of death, as well as average temperature up to fourteen days prior to death, to referent dates matched on year, month, and day of week using conditional logistic regression. There were 3,275 opioid overdose deaths in Connecticut (n = 2,417) and Rhode Island (n = 858) during the study period. Most deaths occurred among males (72.9%) and nearly half involved fentanyl (47.3%). The association between temperature and mortality was non-linear. Low temperatures averaged over periods of three to seven days prior to death were associated with higher odds of death. For example, an average temperature of 0ºC over the seven days prior to death was associated with 25% higher odds of death (OR: 1.25; 95% CI: 1.05–1.49) relative to 11ºC. This study provides initial evidence that opioid overdose deaths may be more common after periods of cold weather. Further research is required to confirm or refute this finding and identify the potential pathways by which “cold snaps” may alter the risk of overdose death.
RACIAL/ETHNIC DIFFERENCES IN AGE AT MENARCHE AND LIFETIME NONMEDICAL MARIJUANA USE: RESULTS FROM THE NHANES 2005-2016 Hui Hu* Yun Shen, Hong Xiao, Hui Hu, (Department of Pharmaceutical Outcomes and Policy, College of Pharmacy, University of Florida)

Background: Early age at menarche has been linked to many adverse health outcomes among women, including substance use. However, little is known on the association between age at menarche and nonmedical use of marijuana, and no study has assessed the potential racial/ethnic differences. Methods: In this study, the 2005-2016 National Health and Nutrition Examination Survey data were used to investigate the association between age at menarche and the risk of lifetime nonmedical use of marijuana. Logistic regression models were used to examine such association adjusting for sociodemographic factors. Interactions between age at menarche and race/ethnicity were also assessed. Results: Among the 10,302 women included, 53.9% had lifetime nonmedical use of marijuana. The regression model shows that women with early menarche had 1.25 (95% CI: 1.09, 1.45) times the odds of having lifetime nonmedical use of marijuana compared with women with normal age at menarche. When assessing the association by race/ethnicity, marginally positive associations were observed for both the early and late menarche groups among non-Hispanic White women. However, among women with race/ethnicity other than non-Hispanic White, early menarche is significantly associated with increased risks of lifetime nonmedical use of marijuana, while late menarche is significantly associated with decreased risks. Conclusions: This study suggests that early menarche may be a risk factor of lifetime nonmedical use of marijuana, and racial/ethnic differences may exist in the association. Future studies are warranted to examine and confirm these findings.
Previous research has found that greater income inequality across a variety of geographical areas is related to problematic alcohol use in the U.S. and NYC; these studies used self-reported data to assess alcohol use. The current study builds upon previous research by examining the relationship between within-neighborhood income inequality and alcohol-related emergency department (ED) visits. The study outcome was alcohol-related ED visit rate per 10,000 persons during 2010-2014 from the New York Statewide Planning and Research Cooperative System. The main predictor of interest was income inequality measured using the Gini coefficient from the American Community Survey (2010-2014) at the Public Use Microdata Area (PUMA)-level in NYC. Variables associated with alcohol-related ED visits in bivariate analyses were considered for inclusion in a multivariable model. There were 420,568 alcohol-related ED visits with a valid NYC address between 2010-2014. The overall annualized NYC alcohol-related ED visit rate was 100.7 per 10,000 persons. The median alcohol ED visit rate for NYC PUMAs was 88.0 per 10,000 persons (IQR: 64.5, 133.5) and the median Gini coefficient was 0.48 (IQR: 0.45, 0.51). In the multivariable model, neighborhood higher Gini coefficient (beta =479.6, SD=131.0, p<0.001), lower median age (beta =-6.5, SD=1.5, p<0.001), and lower percentage male residents (beta=-6.7, SD=3.0, p=0.03) were independently associated with alcohol-related ED visits. This study found that higher neighborhood income inequality was associated with higher neighborhood alcohol visit rates. The precise mechanism for this relationship is not understood and further investigation is warranted to determine temporality and if results are generalizable to other locales.
PRACTICES AND POLICIES OF MARIJUANA RETAIL STORES IN THE FIRST TWO STATES TO LEGALIZE RECREATIONAL MARIJUANA Kathleen Lenk* Kathleen Lenk, Darin Erickson, Terra Wiens, Lindsey Fabian, (University of Minnesota)

Objective. With the advent of recreational marijuana legalization in a number of states in the U.S., many marijuana retail stores are now in operation. Because little is known about these stores particularly with respect to public health issues, we assessed store practices/policies in the first two states to legalize recreational marijuana, Colorado and Washington. Method. We surveyed a random sample of store managers/owners (25 per state) regarding store policies/practices. We conducted in-person store observations of store practices in the largest city in each state (22 stores in Denver; 24 in Seattle). Surveys and observations focused on but were not limited to access to marijuana among persons under the legal age (<21). We computed bivariate associations across states (p<0.05). Results. All 25 stores in Colorado reported that they check age identification “always, regardless of age” compared to 15 (60%) in Washington (p=0.0006). Stores in Washington were more likely than those in Colorado to report that underage persons were allowed in their stores (44% vs. 16%; p=0.03). In our observations, 100% of Denver stores checked age identification at least once compared to 83% of Seattle stores (p=0.002). All stores in both cities sold a variety of products including candy, pre-rolled cigarettes, concentrates, and vaping pens. Conclusions. Stores in both states appear to have strict underage access policies although Colorado appears to be stricter than Washington. A large variety of products were available in both states including those likely to be attractive to youth such as candy and vaping pens. Our results can help guide jurisdictions in adopting responsible recreational marijuana retail policies/practices.
Adolescence is a risk period for the incidence of depression, which is increasing, especially among girls, and a risk period for incidence of substance use, which is associated with marked impairment. The link between adolescent depression and substance use is established, yet few studies have assessed time trends and gender differences in these associations. This analysis examines effect modification of the relation between major depressive episode (MDE) and substance use by 1) gender and 2) time. Respondents included 12-17 year-olds (N=217,824) from the annually cross-sectional nationally-representative National Survey on Drug Use and Health from 2005 to 2017. Outcomes were youth-reported past-year marijuana, cigarette, and alcohol use. Youth-reported past-year MDE was assessed using a structured instrument (DSM-IV criteria). Logistic regression models were adjusted for age, race/ethnicity, gender, and income. Teen MDE was significantly associated with marijuana (OR=1.9, 95% CI: 1.9-2.1), cigarette (OR=2.1, 95% CI: 1.9-2.2), and alcohol use (OR=1.9, 95% CI: 1.9-2.0). There were interactions by gender, with stronger associations for girls for marijuana (interaction β [iβ]=0.3, 95% CI: 0.1-0.4), cigarette (iβ=0.4, 95% CI: 0.2-0.5), and alcohol use (iβ=0.3, 95% CI: 0.2-0.4). There was no evidence for changes in the association between teen MDE and substance use over time. Marijuana, cigarette and alcohol use are higher among teens who self-report past-year MDE, and the strength of these relationships are greater for girls compared with boys. Given increases in depression among girls in recent years and the stronger association with substance use, these findings highlight the need for interventions and treatments focused on co-occurring substance use and depression among teen girls in particular. There was no change over time in the association between substance use and depression, indicating stability in these relationships as prevalence changes.
PATIENT PERCEPTIONS OF NOVEL DIGITAL HEALTH INTERVENTIONS IN RANDOMIZED CONTROLLED TRIALS: A QUALITATIVE SYSTEMATIC REVIEW Alexander Perlmutter* Alexander Perlmutter, Viet Thi-Tran, (Columbia University)

Background: It was unknown whether patient perceptions about novel digital health interventions (e.g., wearables, trackers, and sensors) are considered in randomized controlled trials (RCTs) as these interventions become omnipresent in patients’ lives. We conducted a qualitative systematic review of RCTs assessing novel digital health interventions to understand whether patient perceptions are currently assessed and what they are.

Methods: We systematically searched PubMed/MEDLINE for research reports published from January 2017-June 2018 and included publications of RCTs that assessed a novel digital health intervention for home and mobile use that had the capability to collect and transmit data for the purposes of improving patient health. We excluded non-RCTs, RCTs on non-novel interventions (e.g., smartphone only) and non-English publications. Trial characteristics and patient perceptions of interventions were extracted. We synthesized and created a taxonomy of patient perceptions collected in the included RCTs. Results: Our search yielded 1,957 results and 44 publications met inclusion criteria. Trials included a median of 47 participants. Twenty-two publications collected extractable data on patient perceptions which yielded 115 synthesized patient perceptions. Three RCTs collected 26 or more patient perceptions and 10 collected five or fewer. The taxonomy of patient-perceived problems included the following categories: satisfaction, indirect deficit, intrusiveness, new constraints with digital health interventions, perceived effectiveness, and reliability. Conclusions: Half of RCTs assessing novel digital health interventions evaluated patient perceptions. Few of these trials considered all of the categories included in our taxonomy. Trialists should consider using our taxonomy as a guide for assessing currently collected patient perceptions, and prospectively consider other domains of perceptions that are ostensibly unexplored.
ENHANCING ANALYSIS FOR IMPLEMENTATION SCIENCE STUDIES THAT USE STEPPED WEDGE DESIGNS: CASE EXAMPLE OF BAYESIAN SURVIVAL ANALYSIS FOR A VA IMPLEMENTATION TRIAL OF A COLLABORATIVE CARE MODEL ON HOSPITALIZATION RATES

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Background: The VA recently completed a controlled cluster randomized implementation trial for a collaborative care model (CCM). CCM was rolled out to clusters of mental health clinics following a Stepped Wedge Design (SWD). This trial assessed changes in hospitalization rates before and after implementation started using a single-group interrupted time series analysis. Objectives: To discuss methods that build on the VA study by exploiting features of a SWD to achieve: 1) a direct measure of intervention effect compared to control 2) enhanced efficiency 3) improved accuracy of error estimation. Methods: The SWD is a crossover design in which clusters ‘switch’ unidirectionally from control to intervention and randomizes clusters to one of multiple switch points staggered uniformly across time. The overlap allows for contemporaneous direct comparison between pre-CCM and CCM-implementing clusters. Results: In the interrupted time series analysis, hospitalization rates were lower after start of CCM implementation (β=-0.12, 95%CI -0.16 to -0.07; p<.001; unadjusted β=-0.11, 95% CI -0.14 to -0.07; p<.001). These results can be reanalyzed as an extended Bayesian survival analysis using individual hospitalizations as time to event variables extracted from electronic health records in a counting process format. Discussion: Bayesian approach to analysis will enhance efficiency, benefitting subgroup analysis (and balancing computational cost). Moreover, individual-level modeling (the survival analysis) allows for clustering on multiple levels for repeat hospitalizations, robust estimators, and other variables. In addition, any Cox regression that conditions on time provides robust protection against secular trends. Lastly, lag time between overlapping intervention clusters creates differences in treatment fidelity and is adjusted for by controlling for number of days of CCM implementation. Conclusion: These methods may generalize to many implementation science studies using a SWD.
Background: Ovarian cancer is one of the leading cancers to women in Taiwan. Abortion has been recognized as a potential risk factor for developing ovarian cancer; nevertheless, secular trend studies of ovarian cancer with abortion are limited. This descriptive study examined the incidence of ovarian cancer with abortion in a large-scale, population-based Taiwanese cohort. Methods: From 2008 to 2013, about 24,362 new cases with abortion were identified in Taiwan’s National Health Insurance Research Database (NHIRD). Chi-square test was used for evaluating incidence rates in different age groups and periods. We assessed the overall incidence rates during the follow-up years. Results: The incidence of abortion was 0.3 per 10,000 women. Additionally, the incidence rates of ovarian cancer per 100 individuals among abortion patients increased for women in two age groupings (20-29 and >30 years) were 0.167 and 0.411. In addition, patients had more higher incidence rate of ovarian cancer when their abortion visiting records is increasing (incidence rate per 10 individuals was 0.0177 and 0.0238 for visits =1 and ≥2, respectively). Conclusion: Over 14 years, the incidence of abortion had an important impact on our life. By means of the big data, our finding suggested incidence rate of ovarian cancer with abortion is rising; hence, this study indicates that the correlation between ovarian cancer and abortion needs further discussion. Keywords: Ovarian cancer, National Health Insurance Research Database (NHIRD), Abortion.
FEASIBILITY OF CADMIUM EXPOSURE MEASUREMENT THROUGH SALIVA IN THE MARIN WOMEN’S STUDY Michaela F. George* Michaela F. George, Jordana Sandy, LeeAnn Prebil, Rochelle Ereman, (Dominican University of California)

Background: To our knowledge, no studies have examined Cadmium (Cd) from saliva samples in the context of breast cancer as a potentially less invasive, cost effective method. In this pilot study, we assessed the feasibility of using saliva-based Cd levels as a predictor in breast density measures in Marin County, California as this community has a history of one of the highest incidences of breast cancer in the United States, thus making it a crucial population to study. Methods: This study used samples from the Marin Women’s Study (MWS) which recruits participants from Marin County mammography centers within Kaiser Permanente, Sutter Health, and Marin General Hospital locations. Cd was measured in 290 women who met inclusion criteria using mass spectrometry, and included all smokers in the sample for comparison (n=34). Each subject underwent a screening mammogram; and subsequent Single-energy X-ray Absorptiometry (SXA) measurement, which is a quantitative measure of fibrogladular tissue volume and been found to be both accurate and precise in measuring breast density. Additionally, each mammogram result was reviewed by a radiologist and assigned a Breast Imaging-Reporting and Data System (BI-RADS) score, a qualitative measurement of breast density. Results: Cd was quantifiable and detectable over 90% of saliva samples. The levels varied from the lowest detectable level of 12 pg/L to over 20 pg/L. As expected, Cd was higher in smokers. Preliminary analysis shows both SXA and BI-RADS varied in women with higher saliva concentrations of Cd. Further analysis is needed understand confounding factors such as age, BMI, and dietary measurements. Discussion: These results show cadmium can be detected in saliva, while more work is needed to establish a more robust testing protocol before its usefulness can be qualified and quantified. Therefore, there is feasibility in using saliva to detect Cd in larger epidemiological studies.

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ASSOCIATION OF REPRODUCTIVE FACTORS WITH ANTI-MÜLLERIAN HORMONE LEVELS

Nydjie P. Grimes* Nydjie P. Grimes, Brian W. Whitcomb, Alexandra Purdue-Smithe, Susan E. Hankinson, Bernard A. Rosner, JoAnn E. Manson, Elizabeth R. Bertone-Johnson, Katherine W. Reeves, (Department of Biostatistics and Epidemiology, School of Public Health and Health Sciences, University of Massachusetts)

Anti-Müllerian hormone (AMH) has been established as a marker of ovarian aging and time to menopause. It is unclear how pregnancy and breastfeeding affect ovarian function, rate of ovarian aging and AMH. The relation of parity and breastfeeding with AMH levels has been evaluated only in a few cross-sectional studies and findings have been inconsistent. We assessed the association of each reproductive factor with AMH levels prospectively among participants in the Nurses’ Health Study 2. Participants (n=1619) were women 32-49 years of age when providing premenopausal blood sample in 1996-99; AMH was measured using an ultra-sensitive ELISA assay (picoAMH). Parity and breastfeeding duration up until the time of blood collection were measured via biennial questionnaires. AMH values were natural log transformed for analysis, then exponentiated for interpretability. In multivariable linear regression models adjusting for age, smoking, history of infertility, assay characteristics, and other factors, higher parity was associated with higher AMH levels. Geometric mean AMH levels (95% confidence interval) for women with 0, 1, 2, and ≥3 pregnancies were 962 (821 – 1128), 1276 (1076 – 1513), 1313 (1172– 1471) and 1380 (1212– 1572) pg/ml, respectively (P for trend = 0.005). However, results were largely attenuated when adjusted for breastfeeding (P for trend = 0.644). In contrast, breastfeeding was related to higher AMH in multivariable models adjusting for parity. Geometric mean AMH levels for women reporting 1, ≥1 – 12, >12 – 24, and >24 cumulative months of breastfeeding were 1228 (966 – 1562), 1220 (1064 – 1398), 1356 (1181 – 1556) and 1616 (1391 – 1878) pg/ml, respectively (P for trend = 0.036). Findings suggest that breastfeeding duration is positively associated with AMH levels even after accounting for parity and may potentially slow the rate of ovarian decline.

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RISK FACTORS AND CONSEQUENCES OF MISDIAGNOSED CESAREAN SCAR PREGNANCY
Shi Wu Wen* Shi Wu Wen, Ri-hua Xie, Huizhong Lei, Xiaoyan Guo, Laura Gaudet, Mark Walker, (Ottawa Hospital Research Institute/University of Ottawa)

To assess risk factors and consequences of misdiagnosis for cesarean scar pregnancy, we carried out a retrospective cohort study of all cesarean scar pregnancies treated in a tertiary hospital between January 2013 and December 2017. We reviewed all medical charts of eligible participants to retrieve the patient’s demographic and clinical data and assessed the independent effect of risk factors of misdiagnosis for cesarean scar pregnancy by log binomial regression analysis. We also compared hospital costs and adverse outcomes between misdiagnosed and not misdiagnosed cases, and explored the reasons for misdiagnosis and actual diagnoses at an initial contact with health care professionals. The analysis included 195 cesarean scar pregnancies, with 81 (41.5%) misdiagnosed cases at an initial contact with health professionals. Patients initially cared at primary or secondary lower levels of hospitals were at increased as an important risk factor of misdiagnosis: adjusted relative risks (and 95% confidence intervals) were 3.28 (2.06, 5.22) and 1.91 (1.16, 3.13), respectively, as compared with those initially cared at tertiary hospital. Compared with accurately diagnosed cases, misdiagnosed cases had a higher incidence of serious complications (11 versus 0) and post-surgery anemia (23 (28.4%) versus 8 (7.0%), stayed longer in hospital, and resulted in higher cost. Most misdiagnoses were associated with an inaccurate ultrasonographic reading with a diagnosis of normal early pregnancy. We conclude that lack of access to quality maternity care is an important risk factor of misdiagnosis for cesarean scar pregnancy, with serious consequences to the affected women.

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WHY ERROR PROPAGATION MIGHT MATTER: THE CASE OF AREA-LEVEL NOISE POLLUTION AND HEALTH IN THE UNITED STATES

Joan Casey*, Joan Casey, Amber Khan, Kara E. Rudolph, Elizabeth L. Ogburn, Peter James, Daniel Mennitt, Rachel Morello-Frosch, (UC Berkeley School of Public Health)

Many datasets—including the U.S. Census—provide standard errors that accompany area-level point estimates. For example, the estimate of median income in a census tract may be $50,000 +/- $4,000, however, few studies incorporate the variability into regression modeling. We aimed to evaluate the association between census tract level noise and three health outcomes while accounting for the fact that census tract level values are estimated, not known without error. We downloaded the prevalence of health outcomes in 27901 census tracts across the contiguous U.S. from the Centers for Disease Control and Prevention (CDC) 500 Cities project. Health outcomes included poor mental health (i.e., mental health not good for ≥14 days in past 30 days), poor sleep (i.e., sleeping less than 7 hours in 24-hour period, on average), and hypertension (i.e., individuals who were ever told they had high blood pressure by a healthcare professional). Because the CDC estimated these small-area characteristics from county-level Behavioral Risk Factor Surveillance System interviews, they have associated standard errors. Our data on census tract level 24-hour average noise levels, estimated from a geospatial model, also had associated standard errors. In baseline univariate logistic regression models, we observed increased prevalence of the three health outcomes associated with higher average census tract level noise levels. For example, for each 1 dB increase in 24-hour noise, we observed a 3.2% (95% CI: 2.5% to 4.0%) average increase in the prevalence of poor sleep. However, when we propagated the variability in the exposure and outcome variable point estimates using multiple imputation methods, effect estimates became imprecise. All 95% confidence intervals spanned 0; the new association for poor sleep was 3.3% (95% CI: -8.7 to 15.3%).

Computing power now allows researchers to incorporate estimates of variability into their analyses. Neglecting to do so may increase the risk of type I error.
RESIDENTIAL MOBILITY AND MISCLASSIFICATION OF ENVIRONMENTAL EXPOSURES IN A PROSPECTIVE COHORT Danielle N. Medgyesi* Danielle N. Medgyesi, Meredith M. Cervi, Deven M. Patel, Peter J. Weyer, Mary H. Ward, Rena R. Jones, (Occupational and Environmental Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Rockville, MD, United States)

Background. Longitudinal studies of environmental exposures assessed at the participant residence often assume these individuals are residentially stable and do not account for changes in exposure across residences. Few studies have evaluated the effects of participant mobility on exposure misclassification and epidemiologic inference. Methods. We evaluated residential mobility patterns among participants in the Iowa Women’s Health Study cohort over 18-years of follow-up (1986-2004). We estimated residence-based environmental exposures at different spatial scales with dichotomized cutpoints, including exposure to average nitrate concentrations in public water supplies at ½ the regulated limit (≥5 mg/L) and 95th percentile, percent of crop area (row crops and pasture/hay) within 750m at or below the mean, and any animal feeding operations (AFOs) within 5km. In comparison to gold standard exposure metrics integrating exposures across all residences, we estimated the sensitivity and specificity of exposure assignment and we computed the bias for a hypothetical nested case-control study of cancer when assuming residential stability. Results. Of 29,607 participants remaining uncensored in 2004, 7,269 (25%) moved at least once during follow-up; most moves were within the same city (59%). Compared to non-movers, movers were more educated, more likely to work outside the home, and to live in a city/town versus a rural area. Specificity of exposure assignment was high (89-98%) across exposures. Sensitivity was highest for AFOs (95%) exposure and lowest for nitrate (36%) at the 95th percentile. When residential changes were not integrated, attenuation of the true odds ratio ranged from 18% (≥5 mg/L) to 60% (95th percentile) for nitrate, 27% (row crops) to 29% (pasture/hay) for crop area, and 24% for AFOs. Conclusions. The assumption of residential stability resulted in exposure misclassification and attenuation of risk estimates and varied by the characteristics of exposure.
HURRICANE EXPOSURE, MICROFINANCE, AND KEY INFECTIONOUS DISEASES IN HAITI
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Introduction: Hurricanes may increase infectious disease risk in a variety of ways, including contaminating water supplies, leaving standing water for disease vectors, and diverting resources from disease prevention efforts. In low-income settings, anti-poverty programs like microfinance may foster resilience to hurricane risk by increasing financial capacity to engage in prevention efforts. Methods: We interviewed 304 current microfinance clients in Okay, Haiti between December 2017 and February 2018, a little over one year after category 4 Hurricane Matthew made landfall in the area on October 4, 2016. We estimated the association between impact of the hurricane (self-reported household injury or death, validated with objective measures of distance from hurricane path and wind speed) and three self-reported infectious disease outcomes: STI diagnoses since the hurricane, and household-level diagnoses of malaria and cholera in the last year. Among those who were microfinance clients at the time of the hurricane, we explored whether duration of membership was associated with uptake of infectious disease preventive behaviors. We used unadjusted log binomial models to estimate prevalence and prevalence ratios for all associations of interest. Results: Hurricane impact was associated with subsequent diagnoses of STIs [PR (95% CI): 2.0 (1.0, 3.8)], malaria [PR (95% CI): 3.8 (1.5, 9.6)], and cholera [PR (95% CI): 1.9 (1.1, 3.3)]. Microfinance exposure may buffer some of the hurricane impact on infectious diseases through increased access to mosquito nets and clean water (see figure). Small sample size of the dataset limits the precision of measures. Conclusions: We present evidence that a major hurricane in Haiti was significantly associated with an increase in infectious disease diagnoses across multiple modes of transmission. Interventions that may foster health resilience after natural disasters, such as microfinance programs, should be further studied.

Figure. Prevalence estimates and 95% confidence intervals of key infectious diseases among women reporting low vs. high hurricane impact* (n=304, left panel), and uptake of preventive behaviors among those with longer and shorter microfinance exposure prior to the earthquake**, among those who experienced high hurricane impact (n=55, right panel)

Legend

- Hurricane exposure:
  - Low
  - High

- Microfinance duration:
  - Short (<12m)
  - Long (>12m)

* High hurricane impact defined as reporting household members either killed or injured during Hurricane Matthew
** Long microfinance exposure defined as becoming a client at least 12 months before Hurricane Matthew, short microfinance exposure defined as becoming a client less than 12 months before Hurricane Matthew
(1) Self-reported STI diagnosis (chlamydia, gonorrhea, syphilis, or trichomoniasis) among participants, with date of diagnosis after October 4, 2016 (Hurricane Matthew)
(2) Self-reported malaria diagnosis among any household members in the prior 12 months
(3) Self-reported cholera diagnosis among any household members
(4) Condom use frequency with most recent partner described as ‘Always’ or ‘Most of the time’
(5) The proportion of household members sleeping under mosquito nets last night reported above median (35%)
(6) Self report treating water to make it safer for drinking

S/P indicates work done while a student/postdoc
AIR POLLUTION, POVERTY, AND CARDIOMETABOLIC DYSFUNCTION AMONG UNITED STATES ADOLESCENTS Edmond Shenassa* Edmond Shenassa, Andrew Williams, (University of Maryland School of Public Health)

Double jeopardy of residence in high poverty areas and exposure to pollutants may render pathogens more virulent with worse health outcomes. Double jeopardy is an unexamined determinant of cardiometabolic health among adolescents, yet area-level poverty and air pollution have been linked with cardiometabolic dysfunction among adolescents. We hypothesized the association between air pollution and cardiometabolic dysfunction would be strongest in high poverty areas. Data were from 10,651 adolescents aged 12-19 in the National Health and Nutrition Examination Survey (1999-2012), linked with census tract data on area-level poverty (the percent population living in poverty, high poverty ≥ 15.6%), and ambient (ug/m3) volatile organic compounds (VOCs): benzene, chloroform, acrolein, and butadiene. VOCs were summed and categorized into quartiles (quartile 1 = low VOCs). Cardiometabolic dysfunction was parameterized by summing z-scores of six cardiometabolic biomarkers, grouped into quintiles. Hierarchical ordinal models were fit to examine overall association between VOCs and cardiometabolic dysfunction. Next, models were fit with VOC*poverty interaction terms to estimate the association between VOCs and cardiometabolic dysfunction in high poverty areas. Overall, compared to quartile 1 VOC exposure, residence in third (OR1.17 95%CI: 1.02, 1.34) and fourth (OR: 1.22 95%CI: 1.04, 1.42) quartiles of VOC exposure had elevated odds of cardiometabolic dysfunction (Figure 1). Interaction terms suggest the association between exposure to highest levels of VOCs and cardiometabolic dysfunction is stronger in high poverty areas (VOC quartile 4 OR: 1.33 95%CI: 1.06, 1.68) than in low poverty areas (VOC quartile 4 OR: 1.04 95%CI: 0.83, 1.29). Among a nationally representative sample of U.S. adolescents, we found a dose-response association between VOC and cardiometabolic dysfunction. This association was driven by high poverty areas, there was no association in low poverty areas.

![Graph showing association between ambient VOCs and cardiometabolic dysfunction: Overall and by area-level poverty](image)

Models adjusted for: Race/ethnicity, family income to poverty ratio, head of household education, cotinine levels, physical activity, NHANES survey cycle, and area-level prevalence block population. Overall results adjusted for area-level poverty. Outcome standardized by sex and age.

S/P indicates work done while a student/postdoc
PERSISTENT ORGANIC POLLUTANTS EXPOSURE DURING EARLY PREGNANCY AND LONGITUDINAL FETAL GROWTH IN THE NICHD FETAL GROWTH STUDIES - SINGLETONS
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Purpose: Prenatal persistent organic pollutant (POPs) exposure has been inconsistently related to birth weight but not studied in relation to fetal growth. We investigated POPs and longitudinal fetal growth in the NICHD Fetal Growth Studies, Singletons cohort (2010-2013). Methods: Among 2,284 racially diverse pregnant women without major chronic diseases, we measured plasma levels of 9 polybrominated diphenyl ethers (PBDEs), 11 organochlorine pesticides (OCPs) and 11 poly-and-perfluorinated alkyl substances (PFASs) at 8-13 gestational weeks. Fetal growth was measured longitudinally with up to 5 standardized ultrasounds. Using generalized additive mixed models with a smooth function for gestational age and a random effect corresponding to the mother-child pair, we assessed each individual POP and fetal measurements followed by a Bayesian kernel machine regression for assessing chemical class mixtures. False discovery rate correction was applied. Results: POP concentrations were generally lower than National Health and Nutrition Examination levels estimated for pregnant women in 2003-2004. PBDE congener #154 was negatively associated with head circumference (HC, \( \beta = -0.34 \) cm) and estimated fetal weight (EFW, \( \beta = -8.38 \) g), and PBDEs congeners #47, #100 and #209 were negatively associated with femur length. Perfluoroheptanoic acid (PFHpA) was positively associated with HC (\( \beta = 0.39 \) mm), femur length (FL, \( \beta = 0.16 \) mm) and EFW (\( \beta = 8.13 \) g) while Perfluorooctane sulfonamide (PFOSA) appeared to decrease FL (\( \beta = -0.13 \) cm). In the chemical class mixture analyses, OCPs were negatively associated with most fetal measures. Conclusion: Among US pregnant women with low risk antenatal profiles and low plasma concentrations of POPs, we found inconsistent evidence supporting an adverse effect of individual POPs on fetal growth suggesting that reducing maternal exposure to POPs can protect fetal growth. However, the mixture of OCPs was negatively associated with most growth measures.
Background Neighborhood socioeconomic deprivation may worsen mental health in immigrants, but prior work was potentially biased by selection of unhealthy individuals into deprived neighborhoods. We leveraged a natural experiment in Sweden where refugees were quasi-randomly assigned to neighborhoods while non-refugee immigrants self-selected their area of residence, testing the hypothesis that neighborhood deprivation increases depression/anxiety. Methods We used longitudinal Swedish register data for 50,102 refugees and 97,469 non-refugee immigrants over 18 who arrived during 1987-1991. We constructed a composite index of neighborhood deprivation, measured at arrival and 10 years after. The outcome was incident depression/anxiety, operationalized as clinical diagnostic codes, from 2002-2015. Due to a Swedish immigration policy, refugees were quasi-randomly assigned to neighborhoods at arrival, while non-refugee immigrants were not. We compared the association of neighborhood deprivation with mental health among refugees and non-refugee immigrants using Cox proportional hazards models. Results Among non-refugee immigrants, high-deprivation neighborhoods at arrival was associated with higher incident depression/anxiety relative to low-deprivation neighborhoods (HR 1.06, 95% CI: 1.01, 1.11), as did high-deprivation neighborhood residence 10 years after arrival (HR 1.16, 95% CI: 1.10, 1.21). Among quasi-experimentally assigned refugees, we found no evidence that neighborhood deprivation at arrival or after 10 years was associated with incident depression/anxiety. The difference between refugees and non-refugee immigrants in high-deprivation neighborhoods was statistically significant. Conclusions Neighborhood deprivation was associated with worsened depression and anxiety in non-refugee immigrants, but not among refugees. The discrepancy may reflect differential effects by immigration status, or that the quasi-experimental neighborhood assignment reduces confounding due to selection effects.
MITIGATING THE MENTAL HEALTH CONSEQUENCES OF MASS SHOOTINGS: AN IN-SILICO EXPERIMENT  Salma M Abdalla* Salma M Abdalla, Gregory H. Cohen, Shailesh Tamrakar, Laura Sampson, Sandro Galea, (Boston University School of Public Health)

There is approximately one mass shooting per day in the United States. While we know that persons directly involved in such traumatic events have a high incidence of posttraumatic stress disorder (PTSD) after the event, we know very little about the community burden or how to mitigate the consequences of these events. Data from other mass-trauma events suggests that population-level usual psychiatric care (UC) interventions—where all individuals are referred to Skills for Psychological Recovery (SPR)—are insufficient to reduce the burden of PTSD in affected communities. Stepped care (SC) interventions may be more effective in such contexts. Under SC, cases are referred to cognitive behavioral therapy and non-cases are referred to SPR. We assessed: a) the community burden of PTSD after mass shootings; and b) which population-level interventions may offset some of this burden. Given the infeasibility of conducting population-based experiments in the aftermath of mass shootings, we built an agent-based model of 118,000 agents that is demographically comparable to the population of Parkland, Florida and parametrized the model from data after other traumatic events. We estimated the community burden of PTSD following the Stoneman Douglas High School shooting and compared the effectiveness of population-level treatment scenarios (SC vs UC) over a 2-year period. Four weeks following the Parkland shooting, PTSD prevalence in the community was 11.3%. SC was superior to UC in reducing the proportion of PTSD cases: absolute benefit was clear after 3 months (RD, –0.043; 95% CI, –0.050 to –0.036) and increasing through 1.5 years (RD, –0.278; 95% CI, –0.289 to –0.267). Relative benefits of SC were clear at 6 months (RR, 0.857; 95% CI, 0.817-0.898), with continued gains through 1.75 years (RR, 0.593; 95% CI, 0.577-0.610). These results show that there is a substantial community PTSD burden following mass shootings, and that an SC approach is more effective than UC in reducing such burden.
FOOD INSECURITY AND ANTEPARTUM DEPRESSION IN THE NATIONAL CHILDREN'S STUDY Megan Richards* Megan Richards, Ming Li, Molly Rosenberg, Margaret Weigel, Christina Ludema, (Indiana University)

Food insecurity, defined as the limited or uncertain availability of nutritionally adequate food, is a serious problem among pregnant women. Food insecurity is associated with depressive symptoms in adults, supporting the hypothesis that it also increases depression risk among pregnant women. We aimed to assess this relationship in a cohort of pregnant women and to apply this estimate to the US pregnant population by standardizing our cohort results to a nationally representative sample. Among pregnant women who participated in the National Children’s Study, Initial Vanguard Study (NCS-IVS) (n=752), food insecurity was collected using the 6-item Household Food Security Survey Module. Depressive symptoms were assessed twice during pregnancy using the Centers for Epidemiologic Study Depression Scale (CES-D). Generalized estimating equations were used to estimate the association between food insecurity and antepartum depressive symptoms, adjusting for demographic factors, mental health history, previous lost pregnancy, and pregnancy intention. Inverse probability of sampling weights were used to standardize the estimates to the US population using the National Health and Nutrition Examination Survey. We accounted for missing data using multiple imputation. In NCS-IVS, 20.5% of women were food insecure and 8.5% of women reported depressive symptoms. Household food insecurity was significantly associated with an increased risk of antepartum depressive symptoms (aRR:2.88; 95% CI: 1.49, 5.56) in the NCS-IVS cohort. Standardization attenuated the results, but still showed a strong association (aRR: 2.56; 95% CI: 0.99, 6.69). Food insecurity is associated with an increased risk of antepartum depressive symptoms in both the NCS-IVS cohort and the US population. Prevention efforts should focus on decreasing food insecurity through food assistance programs as well as increased screening for both food insecurity and mental health conditions at prenatal visits.
We investigated whether state policies limiting handgun sales to those over 21 years were associated with adolescent suicide fatalities. We used suicide mortality data from the Center for Disease Control and Prevention’s Web-based Injury Statistics Query and Reporting System. We compared suicide fatality rates among those aged 18-20 in the five years before and after policy changes in three states that changed the age of handgun sales policies relative to all neighboring states. Missouri and South Carolina changed the age of handgun purchase from 21 to 18 years in 2007 and 2008, respectively. West Virginia changed the age of handgun purchase from 18 to 21 years in 2010. We used a difference-in-differences analytical approach with all-cause and cause-specific suicide fatality rates as the outcomes and age-21 handgun sales policies as the main exposure, adjusting for state, year, proportion of adult suicides due to firearms, group-specific time trends, and state poverty and unemployment levels and clustering standard errors by state. We conducted permutation analyses to precisely estimate p-values. We conducted robustness checks with different durations, comparison groups, and age groups. There were parallel suicide fatality rate trends in policy-change and comparison states prior to policy changes. Age 21 handgun sales policies were associated with 2.7 fewer suicide fatalities per 100,000 person-years (95% confidence interval [CI]: -4.1 to -1.4, permutation adjusted p-value = 0.02) among adolescents aged 18 to 20 years old. Age 21 handgun sales policies were associated with reduced firearm suicide fatalities (-2.3, 95% CI: -3.6 to -1.0) but not non-firearm suicide fatalities (-0.5, 95% CI: -2.0 to 1.0). The 22% relative reduction in overall suicide fatalities would be equivalent to 249 fewer fatalities each year. Robustness checks were consistent with the main results. State and national policymakers may wish to consider passing age 21 handgun purchase policies.
ASSOCIATIONS OF MATERNAL TRAUMA EXPERIENCES WITH OFFSPRING BEHAVIORAL PROBLEMS: FINDINGS FROM THE PROMIS COHORT STUDY  
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Objective: Trauma tends to run across generations, with devastating consequences at individual, family and population levels. Available evidence, largely from developed countries, suggests that maternal exposure to interpersonal trauma negatively impacts child behavioral development. We sought to evaluate the extent to which maternal exposures to childhood abuse (CA) and intimate partner violence (IPV) are associated with behavioral problems among children in Peru. Methods: A total of 301 mother-child dyads, participants in the Pregnancy Outcomes, Maternal and Infant Study (PrOMIS) were included. The PrOMIS cohort is a longitudinal study aimed at understanding the intergenerational effects of trauma. In-person interviews were conducted to collect information regarding socio-demographic characteristics, history of CA, and IPV. The Child Behavior Checklist (CBCL) was used to identify externalizing and internalizing behaviors in children (2-5 years). Logistic regression was used to estimate adjusted odds ratios (aOR) and 95% confidence intervals (95%CIs). Results: Approximately 46% and 54% of children were characterized to have externalizing and internalizing problem behaviors, respectively (CBCL>70th percentile). Overall, children of mothers exposed to interpersonal trauma (any CA or IPV yes/no) were more likely to have externalizing (aOR=1.98, 95%CI:1.12-3.57 and aOR=1.55, 95%CI:0.96-2.52) and internalizing (aOR=1.66, 95%CI: 0.95-2.90 and aOR=1.66; 95%CI:1.02-2.72) problem behaviors as compared to children of non-exposed mothers. Children of mothers who experienced sexual and physical abuse as a child and as an adult had elevated risks of externalizing (aOR=2.34, 95%CI:1.1-8.0) and internalizing (aOR=2.14, 95%CI 1.07-15.9) problem behaviors as compared with children of non-exposed mothers. Conclusion: Maternal exposure to trauma has lasting effects on child behavior. Family focused trauma-informed programs aimed at promoting maternal and child well-being in LMICs are needed.

S/P indicates work done while a student/postdoc

Background: Adolescent depression and hospitalized suicide attempts have increased in the United States since 2013, particularly among girls. The extent to which changes in adolescent cognitive and emotional well-being underlie these increases is unknown. The present study estimated age, period, and cohort effects in loneliness, high self-derogation (HSD), and low self-esteem (LSE) among U.S. nationally-representative samples of school-attending adolescents from 1991-2016. Methods: Age-period-cohort models were estimated with data drawn from the annual Monitoring the Future cross-sectional survey, of 8th, 10th, and 12th graders from 1991-2016. Four-question scales assessed self-derogation and self-esteem and a three-question scale assessed loneliness. Results: Loneliness, HSD and LSE have exhibited age, period, and cohort effects in the past decade. Period effects indicate loneliness has progressively increased across all ages since 2005, especially among girls. Regardless of age, girls in 2016 had 1.20 (95% CI 1.05–1.35) times the risk of loneliness as those in 2005. However, cohort has little effect on girls’ loneliness, while risk among boys has progressively increased across cohort from 1987 to 2001, where those born in 2001 have 1.40 (95% CI 1.20–1.60) times the risk of loneliness as those born in 1987. HSD and LSE have similar trajectories between sexes across period; both measures exhibited strong period effects since 2007. Those in 2016 had approximately 1.5 (95% CI 1.35–1.70) and 1.4 (95% CI 1.30–1.60) times the risk of HSD and LSE among girls and boys respectively. Discussion: Loneliness, self-derogation, and self-esteem have increased across all ages of adolescents, especially girls, in the past decade. Cohort effects among boys suggest younger boys are at an increasingly high risk. As adolescents progress into adulthood, their mental health and well-being is increasingly a looming public health crisis and services should expand to meet growing need.

S/P indicates work done while a student/postdoc
DEALING WITH COMPETING EVENTS IN THE ESTIMATION OF THE HEALTH EFFECTS OF FERTILITY TREATMENT ON THE OFFSPRING Yu-Han Chiu* Yu-Han Chiu, John Hsu, Mats Julius Stensrud, Paolo Rinaudo, Sonia Hernández-Díaz, Miguel A. Hernán, (Department of Epidemiology, Harvard T.H. Chan School of Public Health)

Quantifying the health effects of fertility treatments on the offspring is difficult because the outcome can only be ascertained when the treatment results in a livebirth. A naïve analysis that restricts to livebirths can introduce selection bias because of censoring due to failure of the fertility treatment, a form of competing event. We propose a systematic approach to assess the impact of competing events in these settings. We illustrate our approach in a randomized trial to estimate the effect of gonadotropins (the G group, N=301) versus clomiphene (the C group, N=300) on the risk of neonatal complications in the presence of competing events (i.e. no live birth). We targeted 3 estimands: 1) the total effect of treatment on the event (no events can occur after a competing event), 2) the direct effect of treatment on the event (competing events are treated as a form of censoring), and 3) the total effect of treatment on the principal stratum of those who would have live births irrespective of treatment assignment (a subgroup in which no competing event would occur irrespective of treatment). Live birth occurred in 32.2% in the G group and 23.3% in the C group. When restricting the data to live births, the intention-to-treat risk difference (RD) of neonatal complications was 12.4% (95% CI: -1.8, 25.1) higher in G compared with C. The corresponding RDs (95% CI) were 5.6(1.3, 9.5)% for estimand 1, 12.4(-0.8, 25.9)% for estimand 2, and 9.0(-4.6, 22.7)% for estimand 3. We used inverse probability weighting to adjust for the predictors of live birth. All estimates were consistent with an increased risk of neonatal complications in G vs C. Under the assumption that the most important predictors of treatment failure were measured, the presence of competing events does not affect the conclusion of the study. Our approach can be viewed as a form of sensitivity analysis when estimating the effect of fertility treatment on child health in the presence of competing events.
PREDICTION OF PREGNANCY LOSS BY VAGINAL BLEEDING AND NAUSEA PATTERNS IN EARLY PREGNANCY: PROSPECTIVE COHORT NESTED WITHIN A RANDOMIZED CONTROLLED TRIAL

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Objective: Predict the probability of clinical pregnancy loss based on personal characteristics and early pregnancy vaginal bleeding and nausea patterns. Methods: Cohort of 738 pregnant women nested within the Effects of Aspirin in Gestation and Reproduction (EAGeR) trial, conducted in the United States 2006-2012; women had 1-2 previous pregnancy losses. Random forest importance measures identified baseline characteristics with the greatest ability to predict clinical loss, which were retained in the algorithm: days since LMP, age, BMI, systolic and diastolic blood pressure. An ensemble learner (stacking) was trained for predicting the occurrence of clinical loss as a function of baseline characteristics and bleeding and nausea symptoms occurring 2-8 weeks post-LMP. This learner was used to compute the risk of clinical pregnancy loss due to varying bleeding and nausea scenarios overall, as well as for women with the lowest, median, and highest baseline risk. Results: After adjusting for baseline characteristics, if bleeding occurred as observed in the sample but nausea was not present, the risk of clinical pregnancy loss would be 2.32 (95% CI: 1.90, 2.83) times the observed sample risk. Conversely, if nausea had occurred as observed, but bleeding was not present, the risk of clinical pregnancy loss would be 0.89 (95% CI: 0.83, 0.95) times the observed sample risk. Per Figure 1, bleeding and nausea pattern had less of an impact on risk of clinical pregnancy loss among women with favorable compared to unfavorable baseline characteristics (age, BMI, blood pressure). If nausea was present, the risk of clinical pregnancy loss was similar regardless of bleeding. Bleeding pattern was more predictive of risk of loss if nausea was not observed. Conclusions: These data could be used to develop a web-based interface whereby women can input their characteristics and vaginal bleeding and nausea patterns to obtain personalized predictions for clinical pregnancy loss.
EVALUATING METHODS TO HANDLE MISSING PREGNANCY INDICATION: IF SHE GAVE BIRTH WAS SHE PREGNANT?

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It is common in reproductive epidemiology to investigate an exposure of interest’s association or effect on both rates of pregnancy and live birth. Given the complex conditional nature of the reproductive process, from pregnancy to live birth, most of these studies involve a variety of analysis including differences in marginal and conditional rates. Similarly, this is a complex setting for missing outcomes data which can be handled in a variety of ways including complete case analysis (CCA), single and multiple imputation (MI) among others. Particularly relevant is how to appropriately address missing pregnancy indication when a live birth (or loss) is observed. While imputing missing pregnancy indication, or backfilling, where a live birth is observed might seem intuitive, it can cause bias in analysis of pregnancy. We performed a simulation study of pregnancy, loss, and live birth modelled after the EAGeR trial and compared various methods for handling missing pregnancy indication, CCA or MI, with and without imputing missing pregnancy indication, where live birth is observed. We assessed these methods over a variety of missingness mechanisms and magnitudes by estimating relative risks for pregnancy and compared bias and variability. Counterintuitively, using the knowledge of a live birth to impute missing pregnancy indication prior to a CCA leads to substantial bias, up to 30%, where performing CCA of pregnancy ignoring live birth is largely unbiased for missing completely at random and at random, though with increased variance. MI with backfill or no backfill performed similarly with minimal bias in most settings and displayed smaller variances than complete case analysis, approximately 10%. This study shows that although counterintuitive, pregnancy indication should not be backfilled when missing for a woman with observed live birth or loss and every effort should be made to collect primary indication of pregnancy in reproductive epidemiologic studies.

S/P indicates work done while a student/postdoc
TARGET TRIAL EMULATION IN PERINATAL EPIDEMIOLOGY: APPLICATIONS IN THE GENERATION R STUDY

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Target trial emulation is increasingly being incorporated into epidemiologic study design and analysis. However, its usefulness in clarifying causal questions and identifying appropriate analyses to study the effects of prenatal exposures has not yet been emphasized. Using the effect of quitting smoking during pregnancy on childhood health outcomes in the Generation R Study (N=9778), we demonstrate there is no single trial analogue of universal public health interest and discuss how considerations of eligibility criteria, protocol specifications and follow-up time for a hypothetical trial of interest inform the best practices for data collection, design, and analysis in an observational study. For example, the eligibility criteria in a hypothetical trial of the effect of quitting smoking during pregnancy on childhood outcomes would only enrol women who were smokers prior to pregnancy; thus, emulating this trial with observational data should likewise restrict to women who report smoking pre-pregnancy. A hypothetical trial could also specify instructions regarding smoking behaviour post-pregnancy (i.e. whether to resume smoking), which can modify the effect of smoking during pregnancy on childhood outcomes. To illustrate these distinctions and their importance in practice, we analyze multiple trial analogues in this observational study, each answering a different causal question and requiring a different analysis. The trial analogues address the effect of smoking cessation during pregnancy among women who smoked pre-pregnancy, but vary the instructions on women’s smoking behaviors post-pregnancy. For comparison, we also provide estimates from common analytic strategies, including of a trial analogue not restricted to prior smokers and to analytic strategies that can induce bias and have no clear trial analogue. Framing perinatal epidemiologic studies as target trials can clarify which study designs and analyses correspond to which public health interventions.
**IMPLICATIONS OF THE CHOICE OF SAMPLE POPULATION FOR THE DEVELOPMENT OF RISK PREDICTION MODELS FOR LONG-TERM OUTCOMES INCORPORATING PREGNANCY-RELATED PREDICTORS** Sonia M Grandi* Sonia M Grandi, Kristian B. Filion, Robert W Platt, (McGill University)

Introduction: To increase the utility of risk prediction models, the sample population used to develop the models should represent the population that are screened in practice. In perinatal epidemiology, the appropriate sample population for models of long-term outcomes incorporating pregnancy-related predictors is unclear since women can contribute >1 pregnancy during the follow-up. Although various sampling methods are possible, the impact of sampling one versus all pregnancies on the accuracy of predictions has not been investigated. Methods: Four sample cohorts were generated using plasmode simulations (Figure). The models were developed for long-term risk of cardiovascular disease including obstetrical history. The first cohort includes the first pregnancy per woman and predictors relating to this pregnancy. The second cohort includes a random sample of pregnancies per woman obtained by simple random sampling to recreate the distribution of parity in the original population. Predictors for this cohort include characteristics of the current and prior pregnancies. The last two cohorts include all eligible pregnancies per woman. For the third cohort, the start of follow-up time begins at the first pregnancy and ends at the start of the next pregnancy. The follow-up for all subsequent pregnancies continues until a future pregnancy, an event, or end of the study period, whichever occurs first. In order to account for the correlation between pregnancies an accelerated failure time generalized estimating equation model is used. In the fourth cohort, the follow-up time for each pregnancy is not censored at the start of the subsequent pregnancy and continues until an event or end of the study period. This scenario allows us to assess the impact of censoring and double counting events and follow-up time. Conclusions: The findings from this work highlight the need for careful consideration when choosing the sample population for development of risk prediction models.
THE IMPACT OF PUBLIC TRANSPORTATION USE ON COGNITIVE FUNCTION IN OLDER AGE: A QUASI-EXPERIMENTAL EVALUATION OF THE FREE BUS PASS POLICY IN THE UK
Erica Reinhard* Erica Reinhard, Mauricio Avendano, (King's College London)

Maintaining a physically, socially, and intellectually active lifestyle is beneficial for cognitive health in older age. Emerging evidence suggests that public transportation may play an important role in enabling older people to maintain active lifestyles, yet there is a lack of research on the relationship between public transport use and cognitive health. This quasi-experimental study examines whether the introduction of an age-friendly transportation policy, free bus passes for individuals aged 60 and older, increased public transport use and in turn impacted cognitive function among older people in England. The sample comes from the English Longitudinal Study of Ageing (n =17688), which provides data on public transport use and validated measures of memory, executive function, processing speed, and global cognitive function before and after the introduction of the bus pass. The analytical strategy is an instrumental variable approach with fixed effects, which exploits the eligibility criteria for free bus passes and provides an estimate of the impact of public transport use on cognitive function that is free from bias due to reverse causality, measurement error, and time-invariant confounding. Eligibility for the free bus pass is associated with a 7% increase in public transport use. The increase in public transportation use is associated with a 0.346 (95% confidence interval [CI]: 0.017,0.674) increase in the global cognitive function Z score and with a 0.546 (95% CI: 0.111,0.982) increase in memory Z score. Results for executive function and processing speed were not statistically significant. This study suggests that increased public transport use due to the free bus passes is beneficial for cognitive health, particularly memory, in older age. Free bus travel may benefit cognition through enabling engagement in physical, social, and intellectual activities. Transport policies may serve as public health tools to promote cognitive health in ageing populations.

S/P indicates work done while a student/postdoc
ASSOCIATION OF DEPRESSION AND POSTTRAUMATIC STRESS DISORDER WITH ALL-CAUSE MORTALITY AMONG OLDER DISASTER SURVIVORS OF THE 2011 GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI Xiaoyu Li*, Xiaoyu Li, Jun Aida, Hiroyuki Hikichi, Katsunori Kondo, Ichiro Kawachi, (Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health)

Objective: Depression and posttraumatic stress disorder (PTSD) have been linked with increased mortality, mostly in veteran and general population samples. However, relatively little is known about the association in survivors of natural disasters, especially in older adults. We examined prospectively the association of depression and PTSD with all-cause mortality in older disaster survivors. Methods: A prospective cohort of Japanese individuals aged 65 years and older in Iwanuma city, Miyagi Prefecture, was exposed to the 2011 Great East Japan earthquake and tsunami. The primary exposures were post-disaster depression (Geriatric Depression Scale Short Form ≥ 5) and PTSD (Screening Questionnaire for Disaster Mental Health PTSD subscale ≥ 6), measured in 2013. Mortality data of the participants up to March 4, 2017 (average 3.1-year follow-up since the 2013 survey) were obtained by linkage to the national long-term care insurance database. Cox proportional hazard models adjusted for pre-disaster socio-demographics, health behaviors, medical comorbidity, social support, social cohesion, disaster experiences (e.g., home destruction), and pre-disaster depression. Results: Of 3,567 participants, 56.5% were women and the mean age was 73.6 ± 6.3 years. Overall, 33.1% reported post-disaster depression and 11.4% PTSD; 283 participants died. In adjusted models, depression was significantly associated with more than double the risk of death (hazard ratio (HR) = 2.29; 95% CI [1.48, 3.54]). In contrast, those reporting PTSD were not at increased risk of death (HR = 0.97; 95% CI [0.54, 1.73]). Conclusions: In a large sample of older disaster survivors, depression, but not PTSD, was associated with mortality over an average of 3.1 years. These findings point to the long-term consequences of natural disasters and suggest the importance of treating depression for disaster recovery efforts in older adults.
CURRENT AND PAST PHYSICAL ACTIVITY AND RISK OF ALZHEIMER'S DISEASE: A LONGITUDINAL STUDY  Yian Gu* Yian Gu, Erika Ogino, Jennifer J. Manly, Nicole Schupf, Richard Mayeux, (Columbia University)

Background: Previous findings have suggested a protective role of physical activity (PA) on Alzheimer's disease (AD) risk, but few studies have examined both past and current PA. Methods: The current study included 1288 participants of a community-based, elderly population in New York City. Information on current PA and past PA [average PA in early life (12-25 years), early-middle life (26-50 years), and late-middle life (>50 years)] were self-reported using standard questionnaires administered at baseline. Cox regression models were used to estimate hazards ratios (HRs) for AD, adjusted for age, sex, race/ethnicity, education, apolipoprotein E genotype. Results: A total of 104 incident AD dementia cases were identified among 5,321 person-years in 1288 initially non-demented participants during 4.14 years's follow-up. Compared to the lowest tertile of PA (measured by total minutes of standard metabolic equivalent), the highest current (HR=0.46, 95%CI=0.24-0.87, p=0.02; p-trend=0.01) and past (HR=0.36, 95%CI=0.18-0.76, p=0.007; p-trend=0.02) PA were both associated with lower risk of developing AD. Current PA remained associated with AD risk after additional adjustment for BMI, occupation, and comorbidities (p-trend=0.03). When current and past PA were considered simultaneously, they had a 47% and 59% reduction in AD risk, respectively. PA in early (p-trend=0.04) and late-middle (p-trend <0.0001) life were associated with lower AD risk. Compared with “always low PA”, “increased to high PA” (HR=0.47, p=0.05) and “decreased from high PA” (HR=0.31, p=0.01) were both protective. Compared with “never high PA”, “ever high PA” had a 59% (p=0.001) reduction in AD risk. Current (HR=0.50, p=0.024) and past (HR=0.46, p=0.03) light-intensity PA were both associated with reduced risk of AD. Conclusions: These findings suggest that both young and old individuals can reduce their likelihood of developing AD via physical activity, including frequent light intensity activities.
DIFFERENTIAL RETURNS TO EDUCATION BY SOCIODEMOGRAPHIC SUBGROUP IN PREDICTING RATE OF MEMORY DECLINE

Anusha Vable* Anusha Vable, Chloe Eng, Willa Brenowitz, Elizabeth Rose Mayeda, Jennifer J. Manly, M. Maria Glymour, (University of California, San Francisco)

Introduction: Evidence on educational attainment and memory decline is mixed, possibly because the effects of education on decline may differ across sociodemographic subgroups. Methods: Data come from N=29,696 respondents from the 1995–2014 biennial surveys of the U.S. Health and Retirement Survey (mean of 4.6 cognitive assessments per individual). We evaluated whether years of education predicted decline in a composite memory score (combining brief neuropsychological assessments and proxy reports), modeled using generalized estimating equations with linear age (coefficients presented for 10-year effects) as the timescale. Differential effects of education on rate of decline were estimated by gender, race/ethnicity (White, Black, Latino), childhood socioeconomic status (cSES; low, middle, high), Southern birth, immigration status, and for combinations of race, gender, and cSES in models adjusted for time-updated interview year and practice effects. Results: Each year of education predicted slower memory decline overall (B age=-0.45; 95%CI:-0.45,-0.44; B age*education=0.03; 95%CI:0.03,0.03). Females (B female*education*age=0.01; 95%CI:0.01,0.02) and those from low cSES backgrounds (B low cSES*education*age=0.01; 95%CI:0.00,0.01) benefited more from each year of education than males or people from high cSES backgrounds. In models examining race, gender, and cSES combinations, White and Black women benefitted more from each year of education than White men, low cSES Whites and middle and high cSES Blacks benefitted more from each year of education than high cSES Whites, and low cSES women benefitted more from each year of education than high cSES men. Conclusions: Education predicts slower memory decline in older adults, however effect estimates varied by sociodemographic background. Heterogeneous associations may reflect differences in access to alternatives to education, quality of education, or confounding and selection biases.

S/P indicates work done while a student/postdoc
ASSOCIATION BETWEEN GLYCA AND COGNITIVE FUNCTION – RESULTS FROM THE ELSA – BRASIL. Claudia Kimie Suemoto*, Viviane Calice-Silva, Claudia Kimie Suemoto, Isabela M. Bensenor, Paulo A. Lotufo, (Sao Paulo University, SP-Brazil)

Background and aim: GlycA is a novel marker of systemic inflammation, which reflects both increased glycan complexity and circulating acute phase protein levels. It is elevated in acute and chronic inflammation, predicts death in healthy individuals and is associated with disease severity in patients with several chronic diseases. This study aimed to evaluate the association between GlycA and cognitive performance in a subset population from the Brazilian Longitudinal Study of Adult Health (ELSA –Brasil) cohort. Methods: In this cross-sectional analysis 5,061 ELSA-Brasil participants with GlycA measured at the baseline were evaluated. GlycA was evaluated as a continuous variable and divided into quartiles. Cognitive function was assessed using delayed word recall test, semantic verbal fluency test, and trail making test version B. We excluded participants with missing values for GlycA, cognitive tests and/or covariates, participants with stroke, and those taking medications that could interfere with the cognitive performance. The associations of cognitive tests performance with GlycA quartiles and other covariates were investigated using linear regression models adjusted for sociodemographic and clinical variables. Results: A sample of 4,327 participants was studied (mean age=51.5±9.0 years old, 46% were male, 60% white, 46% with less than college education). Mean GlycA was 414.9±69.8 µmol/L (range 0-773). Multiple linear regression models identified GlycA as a predictor of cognitive dysfunction, even after adjustments for an extensive list of confounders (β=-0.057, 95% CI=-0.001; -0.000, p<0.001). The interaction between GlycA and estimated glomerular filtration rate were also associated with cognitive function. Conclusion: GlycA was associated with worse cognitive performance in the ELSA-Brasil study.
EDUCATIONAL INEQUALITIES IN SURVIVAL AFTER DEMENTIA DIAGNOSIS

Dominika Seblova*, Dominika Seblova, Pavla Cermakova, Anton Lager, Susanne Wicks, Elizabeth Rose Mayeda, (Aging Research Center & Department of Public Health Sciences at Karolinska Institutet)

Background: Estimates of survival time after dementia diagnosis are important for patients, families, clinicians, and public health planners. Higher educational attainment consistently predicts lower dementia risk, but less is known about inequalities in post-diagnosis survival. We examined educational inequalities in survival after dementia diagnosis in outpatient and inpatient settings. Methods: Swedish national cohort (n=1,334,105) of the dementia-free Swedish population ages 65+ was followed from 2006 to 2016 for incident dementia diagnosis and death. We identified dementia diagnoses using the National Outpatient Register (NOPR) and National Inpatient Register (NIPR) and deaths using the Cause of Death Register. We estimated Cox proportional hazards models for survival. Models included dementia as time-varying variable and adjusted for continuous age and sex. Further, all models had a two-way multiplicative interaction terms between time-varying dementia and education to assess if educational inequalities in post-diagnosis survival differed from survival inequalities in the general population. We estimated separate models by 5-year age bands, allowing people to contribute to multiple age bands. Results: The number of dementia cases during follow-up was 67,328 in NOPR and 101,799 in NIPR. Those with compulsory education only had shortest median survival after dementia diagnosis in NOPR (2.4 years), followed by high school (2.8 years), and university (2.9 years). Median post-diagnosis survival in NIPR was ~1 year and differences in survival by education were negligible. Across age bands, those with lower education had higher mortality, both in dementia patients and in the general population, but relative inequalities were smaller in dementia patients (Figure). Discussion: Educational inequalities in survival after dementia diagnosis persisted in inpatient and outpatient records, and were smaller than mortality inequalities among older adults without dementia.

Figure details: Hazard ratios (95% confidence intervals) showing the most extreme comparison for educational inequalities in mortality across age-bands. A) General population; B) People with incident dementia. The hazard ratios are derived from age stratified Cox proportional hazards models, which included dementia as a time-varying covariates. Models were adjusted for age and sex, and included two-way multiplicative interaction term between education and time-varying dementia variable.
Preterm birth occurs in nearly 10% of US births and increases the risk for adverse social and health outcomes. Socioeconomic and racial disparities in preterm birth are well established, and may be the result of economic insecurity and related stress. The earned income tax credit (EITC) is the largest US poverty alleviation program, providing tax refunds to low-income working families. Studies have shown that the EITC improves birthweight and gestational age. Using a quasi-experimental design, we examined whether the trimester of EITC receipt affects likelihood of preterm birth. We used a probabilistic algorithm to identify the EITC-eligible population. Assuming EITC refund receipt in February, we assigned California births during 2005-2011 (N=3,749,946) to trimester of EITC receipt based on date of birth and gestational age. We created a probabilistic algorithm to identify EITC-eligible births using the 2001-2015 waves of the Panel Study of Income Dynamics and applied it to the CA birth file. We compared this to a common method of using less than high school education as a proxy for EITC. We used difference-in-difference models, comparing outcomes among EITC-eligible women exposed to the EITC in different trimesters, while “differencing” out seasonal trends in outcomes among non-eligible women. Using a probabilistic algorithm to impute EITC eligibility revealed an increase in preterm birth when receiving the EITC refund in the first (β=0.0010, 95% CI 0.0002-0.0018) and second trimester (β=0.0010, 95% CI 0.0002-0.0018) relative to preconception. Using education as a proxy showed lower risk of preterm birth for each trimester relative to preconception. Differences in preterm birth by trimester of income receipt may reveal information about the stress pathway and identify points of intervention for social and economic policy. Prior studies that use simplistic methods to impute EITC eligibility may not accurately capture the exposed population.
INCONSISTENT EFFECT ON BACKGROUND CHECKS OF NEWLY-ENACTED COMPREHENSIVE BACKGROUND CHECK POLICIES IN 4 US STATES Alvaro Castillo-Carniglia* Alvaro Castillo-Carniglia, Daniel W. Webster, Garen J. Wintemute, (Society and Health Research Center, Facultad de Humanidades, Universidad Mayor, Santiago Chile)

Background: Comprehensive background check policies extend background check requirements to private party firearm transfers to prevent firearm acquisitions by prohibited persons. These policies enjoy broad public support and as a way to prevent firearm violence in the United States. We estimated the association between comprehensive background check policies and changes in background check rates—an expected intermediate outcome—for firearm acquisition in 4 states (Colorado, Delaware, Oregon, and Washington) that have newly-enacted CBC policies. Methods: We used monthly data on handgun background checks from January 1999 to December 2018 from the National Instant Criminal Background Check System. Observed trends in exposed states were contrasted with counterfactual trends estimated with the synthetic control group method. Inference was based on permutation tests across 28 states in the donor pool. Results: CBC policies were associated with increases in background checks in Delaware (33.9%; P = 0.0357) and Oregon (18.9%; P = 0.0357), but not in Colorado (6.2%; P = 0.8571) or Washington (-6.5%; 0.4643). An increase in private party checks was seen following enactment in Washington, though firearm transactions coded as “private” represents 3.4% of total background check in that state (1.3% in the first years following implementation; 4.8% in the last year available). Conclusions: We observed inconsistent effects of CBC policies on the overall rate of background checks across the 4 states studies. Findings may be accounted for by combined effects of variation in private party transfers as a proportion of the firearm market, in policy implementation, in compliance, or in enforcement.

S/P indicates work done while a student/postdoc
Objectives. To estimate the effect of Medicaid expansion under the Affordable Care Act (ACA) on the frequency and payment source for Emergency Department (ED) visits related to dental care. Methods. We analyzed data from the State Emergency Department Databases (SEDD) from the Agency for Healthcare Research and Quality (AHRQ). We compared changes in ED visits and payment source for dental conditions in eight states, comprising four distinct policy environments: 1) two states that expanded Medicaid and offer dental coverage for adults through Medicaid (IA, NJ); 2) two states that expanded Medicaid but do not offer dental coverage for adults (AZ, MD); 3) two states that did not expand but offer dental coverage (NC, WI); and 4) two states that did not expand and do not provide dental coverage (FL, UT). We first assessed the overall number of dental-related ED visits in the four groups before (2012) and after (2014) the ACA. Then we used differences-in-differences linear regression to estimate changes in insurance status for dental visits by nonelderly adults aged 19 to 64 years. Results. Our sample contained the universe of 24,164,668 ED visits in these 8 states during the two study years, of which 645,883 visits were due to dental conditions. In states that both expanded Medicaid and offered dental coverage, dental ED visits decreased by 9.3% between 2012 and 2014. By contrast, in the remaining three state groupings, dental ED visits rose, with increases ranging from +2.9% to +28.6%. Meanwhile, the expansion significantly increased Medicaid coverage (11 percentage points, 95% CI, 10.96, 11.04) and decreased the rate of self-pay/uninsured (-6.88 percentage points, 95% CI, -9.04, -4.73) for ED dental visits. Conclusions. Medicaid expansion, combined with dental coverage in Medicaid, was associated with a reduction in ED utilization for dental visits. Medicaid expansion without dental coverage led to higher rates of Medicaid coverage for ED dental visits but did not reduce visit rates.
EFFECTS OF THE AFFORDABLE CARE ACT MEDICAID EXPANSION ON SUBJECTIVE WELL-BEING: QUASI-EXPERIMENTAL EVIDENCE FROM THE UNITED STATES ADULT POPULATION

Lindsay Kobayashi* Lindsay Kobayashi, Onur Altindag, Yulya Truskinovsky, Lisa F Berkman, (Georgetown University)

Background: The 2014 Affordable Care Act Medicaid expansion increased access to health insurance for United States adults with household incomes <138% of the federal poverty line, but its effects on subjective well-being (i.e. emotional states and life satisfaction) both in this policy target population and in the general population as a spillover effect of the policy change are unknown. We investigated whether the Medicaid expansion affected subjective well-being in: 1) the policy target population with household incomes <138% of the federal poverty line; 2) the general adult population. Methods: Data were from daily telephone interviews with adults aged 18-64 in the nationally-representative Gallup-Sharecare Well-Being Index from 2010-2016 (N=1,674,953). Exploiting state-level variation in Medicaid expansion as a natural experiment, we used a difference-in-differences design to estimate the effects of new health insurance coverage through Medicaid expansion on access to and difficulty affording health care, and on five subjective well-being outcomes: happiness, sadness, worry, stress, and life satisfaction. We adjusted for sociodemographic factors, and state and time fixed effects. Results: Consistent with other data sources, we observed that access to and difficulty affording health care declined following the Medicaid expansion. However, Medicaid expansion was not associated with changes to emotional states or life satisfaction over the study period in the low-income population who newly gained health insurance or in the general adult population as a spillover effect of the policy change. Conclusions: To the extent that people care about equity and health care access of others in their state, we expected that well-being would improve in the general population; this was not the case. Although the public health benefits of Medicaid expansion are increasingly apparent, improved population well-being over this short-term period does not appear to be one of them.

*S/P indicates work done while a student/postdoc
SAFETY OF GUIDELINES RECOMMENDING LAIV FOR ROUTINE USE IN CHILDREN AND ADOLESCENTS WITH ASTHMA

Gabriela Vazquez Benitez, James Nordin, Avalow Olsen, Leslie C. Kuckler, Ashley Y. Gao, Elyse O. Kharbanda, (HealthPartners Institute)

Objective: Evaluate whether a guideline recommending LAIV for children 2 years and older with asthma increased risks for wheezing and other lower respiratory events (LREs) within 21 or 42 days of vaccination, as compared to standard guidelines to administer IIV in children with asthma. Methods: Quasi experimental design of pre/post guideline controlled study of children ages 2 through 17 years receiving care in two large medical groups from 2007 through 2016. Both groups recommended IIV in the pre-period; in 2010, one group implemented a guideline recommending LAIV for all children, including those with asthma. Main outcomes were LREs occurring within 21 and 42 days after influenza immunization. Analysis used a generalized linear model and estimated the ratio of rate ratios (RORs) comparing pre/post events between LAIV guideline and control groups. Results: The cohort included 7851 influenza vaccinations in 4771 children with asthma. Among those receiving an influenza vaccine in the LAIV guideline group, the proportion receiving LAIV increased from 23% to 68% post-guideline implementation, versus an increase from 7 to 11% in the control group. Age and baseline asthma severity adjusted ROR showed no increase in LREs following implementation of the LAIV guideline: overall ROR (95% Confidence Interval): 0.75 (0.43-1.31) for LRE within 21 days of vaccination, 0.78 (0.53-1.15) for LRE within 42 days of vaccination; among ages 2-4: 0.94 (0.35-2.56) for 21 days, 0.99 (0.51-1.89) for 42 days. Conclusion: In a large cohort of children with asthma, a guideline recommending LAIV rather than IIV did not increase LREs following vaccination.
Efficacy of a Behavioral Intervention among Patients with Gunshot Wounds: A Comparison of Analytic Methods

Vivian H. Lyons*, Vivian Lyons, Frederick P. Rivara, Anthony S. Floyd, Kevin P. Haggerty, Lauren Whiteside, Ali Rowhani-Rahbar, (University of Washington)

Intent-to-treat (ITT) is typically the primary analytic approach for randomized controlled trials (RCT). Epidemiologic research has shown that as-treated and per-protocol analyses of RCTs are subject to confounding and collider-stratification bias, respectively. While ITT analysis estimates the effect of treatment assignment, it fails to capture the effect of engaging with treatment, something of particular interest with behavioral interventions. We will use data from an ongoing RCT of a behavioral intervention among patients admitted to a Regional Level 1 Trauma Center for a firearm injury who were assigned either to the behavioral intervention or usual care. The outcome of interest is arrest for a crime. Study recruitment ended December 31, 2018, with final analyses planned for March 2019. We are currently analyzing data from this RCT using 3 approaches: ITT, propensity score-based complier average causal effect analysis (CACE) to account for point compliance at the outset of the study, and G-computation to account for dose and the time-varying nature of the intervention over the intervention delivery period. Our ITT analyses are conducted using Cox proportional hazards model adjusting for baseline covariates with a standardized difference of >0.10 between the intervention and control arm. Our propensity score model-based CACE analysis will include baseline covariates determined a priori to influence engagement with our interventionist. For the G-computation analysis, we will define study dose as a continuous, time-varying measure that increases each time a patient has contact with the study interventionist. We will present and contrast the point estimates resulting from these three analytic approaches, and discuss the implications and interpretations of each. Our overarching goal is to provide further empiric evidence for considering analyses beyond ITT that support additional understanding of the intervention in practice.

*S/P indicates work done while a student/postdoc
PREVALENCE OF “RESPONSIBLE SELLING” TENDENCIES IN AN ONLINE FIREARMS MARKETPLACE
Ashley M. Hernandez* Ashley M. Hernandez, Coleman Drake, Yang Liu, Adam H. Schwartz, Maria E. Sundaram, (University of Minnesota School of Public Health)

Firearms are among the top 10 causes of injury and injury death in the United States. In 2016, there were 116,414 non-fatal firearm-related injuries and 38,658 firearm-related deaths. While federal law regulates firearm purchases (e.g. via background checks) from licensed dealers, these regulations do not apply to private sales. State laws also generally do not regulate private firearm sales. Websites such as Armslist.com, a large online marketplace for firearm sales, facilitate private sales, including those not requiring a background check. This study assesses the prevalence of listings demonstrating “responsible selling” tendencies on Armslist.com. A web scrape identified active Armslist.com listings posted between 2008 through 2018. Listings were identified as displaying “responsible selling” tendencies if they included terms such as “concealed carry license”, “federal firearm license”, or “background check”. There were 4.90 million firearm listings identified. Of these, only 523,854 (10.7%) demonstrated “responsible selling” tendencies. The most common categories of firearms being sold were “handguns” (n=2,367,588; 47.9%), “rifles” (n=1,636,201; 33.1%), and “shotguns” (n=411,276; 8.3%). The proportion of listings indicating “responsible selling” tendencies for “handguns”, “rifles”, and “shotguns” was 14.3%, 8.8%, and 7.0%, respectively. Of 8,588 National Firearm Act (NFA) listings (i.e. machine guns and short-barreled shotguns), 11.4% (n=975) indicated “responsible selling” tendencies. Overall, only 10.7% of all firearm listings, and 11.4% of NFA listings, demonstrated “responsible selling” tendencies. This analysis provides an estimate of the number of potentially unregulated private sales that may be facilitated by an online marketplace. Stronger firearm regulations are associated with decreases in firearm-related deaths. However, unregulated sales facilitated by the online marketplace may reduce the efficacy of federal- and state-level firearm regulations.
Background: Very little is known about the population of individuals who legally purchase a firearm and subsequently become prohibited from ownership. We aim to describe all individuals in the state of California who illegally retain their legally purchased firearms after becoming prohibited from owning or purchasing firearms and ammunition. These findings can inform policymakers, law enforcement officials, and others interested in violence prevention. Methods: Using administrative data from the Armed and Prohibited Persons System, we employed univariate and bivariate statistics to describe the cross-section of armed and prohibited people in California on February 1, 2015. We characterized the demographic features and geographic distribution of these individuals and will compare them with a random sample of non-prohibited firearm owners in the state. We additionally characterized the armed and prohibited population’s legally purchased firearms and described their prohibitions. Results: There were 18,875 armed and prohibited people living in California on the study date. A majority were men (93%) and a plurality were white (49%). The mean age was 47 years. The median number of firearms owned was 1 (range 1-539), and a majority (84.3%) owned semiautomatic pistols. Nearly half (48%) of armed and prohibited people were prohibited due to a felony conviction. Conclusions: Many individuals in California have been deemed dangerous enough to prohibit firearm possession but nevertheless retain legally-purchased firearms. This single-state study suggests that there are a large number of armed and prohibited people throughout the country. California’s program of recovering firearms from prohibited people – the only such program in the country – should remain a priority for the state.
NON-VIOLENT MISDEMEANORS AS A RISK FACTOR FOR FUTURE ARREST FOR VIOLENT CRIME AMONG HAND GUN PURCHASERS  
Aaron Shev* Aaron Shev, Rose Kagawa, Mona Wright, Garen Wintemute, (UC Davis)

Background Current federal law does not prohibit persons with non-violent misdemeanor charges from purchasing firearms. This study will estimate the association between non-violent misdemeanors and future violent crime among legally authorized purchasers of handguns in California and identify a class of non-violent misdemeanors that are associated with the greatest increase in risk. Methods We conducted a retrospective longitudinal observational study on a cohort of all legal handgun purchasers in California who purchased a handgun in 2001 (N=79,927). All purchasers were between the ages of 21 and 49 at the time of their first gun purchase in 2001. We followed the cohort’s hand gun purchase history and criminal history back to 1985 and forward through 2013. The exposure of interest was conviction for non-violent misdemeanors, and outcomes included arrest for violent Crime Index offenses (murder, rape, robbery, and aggravated assault), violent firearm-involved offenses, and violent offenses generally. We used Cox regression and controlled for a range of individual and community level characteristics to estimate the association generally. To determine the class of misdemeanors that are associated with the largest increase in risk, we used a latent class analysis. Preliminary results Compared to handgun purchasers with no prior criminal history, those with a history of non-violent misdemeanor convictions were at increased risk of subsequent arrest for a violent Crime Index offense had adjusted hazard ratio (AHR)=3.6 (95% CI=2.4, 5.5); a violent firearm-involved crime had AHR=3.5 (95% CI=1.5, 7.8), and any violent crime had AHR=3.8 (95% CI=2.8, 5.1) indicating a significant increase in risk across all outcomes. Latent class analysis results are forthcoming. Conclusion In our preliminary models we found strong evidence that non-violent misdemeanor convictions are associated with increased risk of future violence among handgun owners.
Over 30 states have enacted or voted for policies that legalize the use of marijuana for medicinal purposes. Although public opinion towards marijuana use has become increasingly positive, there remains concern about the negative impacts of liberalized medical marijuana laws (MML). MML may increase marijuana use and secondary outcomes, such as individuals driving under the influence of marijuana and traffic injuries. Research to date has not shown an increase in traffic fatalities following medical marijuana legalization. Across states, specific policy components vary widely. Limited research exists examining specific policy components and traffic fatalities. In addition, few studies have given consideration to the impact of the alcohol policy environment. We used Latent Class Analysis to classify the MML and alcohol policy environment of states. We abstracted components such as possession limits, dispensaries, cultivation, sobriety check points, speed limits, drug per se, adult use, for a total of 13 items. Using data from the Fatality Analysis Reporting System (1987-2017), we examined the association between the latent classes and traffic fatality rate using linear multilevel regression models with state-level random intercepts. We identified a three-class solution 1) restrictive MML and strong alcohol policy class (12 states), 2) liberal MML and moderate alcohol policy class (14 states), and 3) no active MML and weak alcohol policy class (24 states). States in classes with MML had lower traffic fatality rates compared to the class without MML. States in the restrictive MML policy and strong alcohol policy class had lower rates of traffic fatalities (19.5% lower, CI 1.1-38.2%) compared to the no MML and weak alcohol policy class. Within classes with MML, states with stronger alcohol policies had a larger reduction of traffic fatalities. Results suggest that MML enactment is related to reduction of traffic fatalities and differences in alcohol policies may be a factor.
Drugged driving increases injury risk for drivers, passengers and bystanders. Medical marijuana laws (MML) are associated with increases in adult cannabis and alcohol use. Ecological studies show post-MML reduction in traffic fatality rates, but do not address individual intoxicated-driving behaviors. We therefore investigated the effect of MML on individual-level self-reported adult driving under the influence (DUI) of alcohol (DUIA) or cannabis (DUIC), using data from 3 U.S. surveys: the National Longitudinal Alcohol Epidemiologic Survey (NLAES; 1991/1992), the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; 2001/2002), and the NESARC-III (2012/2013). We used a difference-in-difference (DiD) specification to estimate the effect of MML enactment on change in DUIA and DUIC prevalence in MML states compared to non-MML states. From 1991/1992 to 2012/2013, DUIC prevalence increased from 1.02% to 1.72% in states that did not pass an MML (never-MML states) and from 1.02% to 2.31% in states that did pass an MML (ever-MML states) (DiD=0.59%; 95% CI=0.06-1.12%). DUIA prevalence increased from 4.00% to 4.09% in never-MML states and from 3.22% to 3.62% in ever-MML states (DiD=0.31%; 95% CI=-0.45-1.07%). Focusing on the more recent 2001/2002 to 2012/2013 period, DUIA prevalence increased, but was unrelated to state MML. In contrast, DUIC prevalence increased more in states that passed MML (DiD=0.77%; 95% CI=-0.05-1.59%) than in never-MML states. The DUIC increase in all MML states was driven by changes in California (DiD=0.79; 95% CI=0.05, 1.53) and Colorado (DiD=1.32; 95% CI=0.11, 2.53), two states with rapid growth in medical marijuana dispensaries after the 2009 relaxation of a federal Department of Justice policy. In summary, MMLs were specifically associated with increased prevalence of driving under the influence of cannabis but not alcohol. Reasons for overall post-MML reduction in traffic fatalities remain to be identified.
DO THE BENEFITS OF CERVICAL CANCER SCREENING OUTWEIGH ITS HARMs: A DECISION MODELING ANALYSIS COMPARING MEASURES OF HARMs AND BENEFITS OF SCREENING WITH CYTOLOGY AND HPV TESTING

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Objectives: Screening programs should entail more benefits than harms. We used a simulation model to compare different measures of the balance of benefits to harms of cervical cancer screening. Methods: We calibrated a Markov model of cervical cancer natural history and screening to Canadian cervical cancer incidence and human papillomavirus (HPV) prevalence. We modeled cervical cancer incidence in a cohort of 100,000 unvaccinated women, assuming either screening with cytology every 3 years from 20-70 years old or screening with HPV testing every 5 years from 25-60 years old. We compared two measures of balance of benefits to harms: 1) number of colposcopies/life year gained, the most commonly used measure, and 2) the net quality-adjusted life years (QALY) gain, which is the sum of QALY gains from screen-prevented cancers and deaths, subtracting QALY losses from screening follow-up and colposcopies. QALYs were obtained from a review of the literature. Results are the average (minimum-maximum) predictions of 55 parameter sets. Results: For a cohort of 100,000 women, the model predicted that cytology screening led to 14,252 colposcopies and 15,549 life years gained, for 0.9 (0.7-1.5) colposcopies/life year gained. HPV testing led to 15,865 colposcopies and 15,231 life years gained, for 1.0 (0.8-1.8) colposcopies/life year gained. Cytology screening led to a net gain of 9,805 (3,972-17,192) QALY over a lifetime, and HPV testing to 15,721 (10,063-22,963) QALY over a lifetime. The higher net QALY gain with HPV testing was due to a lower number of lifetime screens leading to less QALY losses from overscreening. Conclusion: While screening with HPV testing may lead to more colposcopies, it may increase the balance of benefits to harms of cervical cancer screening compared to current cytology-based screening when assuming longer (5-year) screening intervals. Net QALY gains integrate women’s health preferences when assessing the harms and benefits of screening.
A PROSPECTIVE STUDY OF CERVICAL INTRAEPITHELIAL NEOPLASIA, ITS TREATMENTS, AND FECUNDABILITY
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Background: Treatments for cervical intraepithelial neoplasia (CIN) remove pre-cancerous cells from the cervix by excising or ablating the transformation zone. Most studies of CIN, its treatments, and fertility show no association. However, only two studies have examined time-to-pregnancy (TTP), both using retrospective study designs, with one showing a two-fold increased risk of infertility (TTP>12 months) following excisional or ablative treatments. Methods: We analyzed data from Pregnancy Study Online (PRESTO), a prospective cohort study of 6,368 North American pregnancy planners enrolled during 2013-2018. At baseline, women reported whether they ever had an abnormal Papanicolaou (Pap) test, the number of abnormal Paps, and their age at first abnormal Pap. They also reported whether they underwent diagnostic (colposcopy) or treatment (loop excision, cryosurgery, conization, laser ablation) procedures, and their age at each procedure. We restricted the analyses to women with ≤6 cycles of attempt time at study entry who reported a Pap test in the past 3 years. We estimated fecundability ratios (FR) and 95% CIs using proportional probabilities models adjusted for sociodemographics, smoking, number of sexual partners, history of sexually transmitted infections (STIs), and human papillomavirus vaccination (HPV). Results: History of abnormal Pap test, a proxy for CIN, showed little association with fecundability (FR=1.04, 95% CI: 0.97-1.11). Likewise, receipt of colposcopy, type of treatment, and time since diagnosis or treatment were not materially associated with fecundability. Results were similar when stratified by age, smoking status, history of STIs, or HPV vaccination. Conclusion: We observed no appreciable association of self-reported history of abnormal Pap test, colposcopy, treatments for CIN, or recency of diagnosis/treatment with fecundability. These results agree with most previous studies indicating no adverse fertility effects from CIN or its treatments.
TRENDS IN SURGICAL TREATMENT FOR BREAST CANCER IN GERMANY AFTER THE IMPLEMENTATION OF THE MAMMOGRAPHY SCREENING PROGRAM Andreas Stang*, Andreas Stang, Oliver Kuss, Vanessa Kääb-Sanyal, Oliver Heidinger, (Center of Clinical Epidemiology, University Hospital of Essen)

Introduction: In Germany, the nationwide population-based mammography screening program (MSP) was introduced in 2005 and is full-running since 2010. By 2014, incidence rates for invasive breast cancer were very similar to those of the pre-screening era. Therefore, the ongoing effect of the MSP on breast cancer surgery rates can now be investigated. Methods: We analyzed nationwide population-based breast-conserving (BCS) and mastectomy (MET) surgery rates (per 100,000) among women aged <50, 50-69 (eligible for the MSP), and 70+ years among women with in-situ and invasive breast cancer during 2005-2015 in Germany. Results: For invasive breast cancer, both BCS and MET rates slightly increased in the age-group <50 years (38.3 in 2005 versus 42.5 in 2015 and 15.7 versus 18.2, respectively). In contrast, MET rates considerably decreased among women aged 50-69 and 70+ years (92 versus 65.4 and 155.4 versus 122.1, respectively), while BCS rates increased in both age-groups (210.6 versus 254.4 and 147.2 versus 187, respectively). For in-situ breast cancer, MET rates slightly increased in all age-groups. BCS rates slightly increased in women aged <50, but nearly doubled for women aged 50-69 (26.9 versus 49.1) and markedly increased in the 70+ age-group (11.5 versus 16.1). During and after the implementation of MSP, there was a strong shift towards BCS within the screening-eligible age-group and for women aged 70+. Conclusions: Women with invasive breast cancer in these age-groups may profit from screening with a decline of MET rates in favor of BCS rates at the expense of higher surgery rates for in-situ breast cancer.
ASSOCIATIONS BETWEEN SERUM INFLAMMATORY BIOMARKERS AND COLORECTAL CANCER INCIDENCE IN THE SINGAPORE CHINESE HEALTH STUDY (SCHS)

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Background: Serum inflammatory biomarkers may serve as noninvasive screening and prediction tools for colorectal cancer. We estimated the associations between 70 biomarkers and colorectal cancer incidence in an exploratory case-control study nested in the Singapore Chinese Health Study (SCHS). Methods: The SCHS is a prospective population-based cohort of Chinese men and women aged 45-74 years at baseline (1993-98). Participants were followed for cancer incidence for an average of 7.03 ± 1.35 (range: 3.75-8.99) years after biomarker collection. For this analysis, an Olink Proseek Multiplex Inflammation kit was used to measure serum levels of 92 protein biomarkers from 71 colorectal cancer cases and 69 controls without cancer. Reproducibility was confirmed in a subset of 15 cases and 15 controls; 74% of biomarkers had intraclass correlation coefficients > 0.7 for measures from two laboratories. After eliminating proteins undetectable for at least 5 participants, 70 protein levels were measured, standardized and log-transformed. Multivariable logistic regression was used to evaluate the association between each biomarker and colorectal cancer incidence, adjusting for age, sex, education, body mass index, and sample collection date. Results: We identified 12 biomarkers associated with colorectal cancer incidence at p<0.05 (Figure 1). ORs and 95% CIs for colorectal cancer were highest for macrophage colony-stimulating factor 1 (4.79, 1.62-14.17, p=0.005), osteoprotegerin (3.29, 1.41-7.67, p=0.006), and monocyte chemotactic protein-1 (2.64, 1.22-5.71, p=0.01). These findings are in line with recent studies of these proteins and colorectal cancer in European populations. In stratified analyses, ORs were similar for cases occurring before and after the median follow-up time. Conclusion: The findings of this study, though imprecise, suggest positive associations between 12 serum biomarkers and incident colorectal cancer and should be validated in a large prospective study.

Figure 1: Log-Transformed Odds Ratios and 95% Confidence Intervals for Colorectal Cancer by Serum Biomarker, the Singapore Chinese Health Study, 1993-2008 (n=140)

Macrophage colony-stimulating factor 1
Osteoprotegerin
Monocyte chemotactic protein-1
Hepatocyte growth factor
Vascular endothelial growth factor A
Interleukin-7
Interleukin-12 subunit beta
CXC motif chemokine 6
Interleukin-10
CXC motif chemokine 1
CXC motif chemokine 11
CXC motif chemokine 5

logOR and 95% CI

S/P indicates work done while a student/postdoc
CAN WE SCREEN MORE PRECISELY FOR COLORECTAL CANCER? Ellen M. Mikkelsen* Mette Kielsholm Thomsen, Lars Pedersen, Rune Erichsen, Henrik Toft Sørensen, Timothy L. Lash, Ellen M. Mikkelsen, (Department of Clinical Epidemiology, Institute of Clinical Medicine Aarhus University Hospital, Aarhus, Denmark)

Introduction A nationwide colorectal cancer (CRC) screening program was introduced in Denmark in 2014. The screening test searches for asymptomatic cancer, revealing blood in participants’ stool, and uses a cut-off value of 20 µg of hemoglobin per gram feces, to determine initial high probability of cancer, and therefore need of further examination. Even then, only 5.2% of participants with a screening result above the cut-off value turn out to have CRC detected by colonoscopy. Thus, many participants unnecessarily go through the colonoscopy procedure, which is unpleasant, expensive and entails a risk of complications. Therefore, the question remains: can we risk-stratify more precisely in the screening program? Consequently, we aimed to develop a prediction model to assess individual risk of CRC. Methods The study is registry-based and includes all participants (38,847) in 2014-2015 who had a hemoglobin value above the cut-off and received a colonoscopy. We specified a basic model including age, gender and hemoglobin, and an elaborated model, which additionally considered measures of comorbidity and socioeconomic position to predict CRC. We compared the two models and evaluated their performance by calibration plots and area under the curve (AUC) for discrimination. Results Of the study population, 2,029 had CRC (5.2%) at colonoscopy. Preliminary results from the basic model (age, gender and hemoglobin) indicate good calibration and discrimination (AUC=75%), with considerable added performance from hgb compared to age and gender only (AUC=65%). Individual risk estimates calculated from this model provides an alternative to the current general hgb cut-off. Using the overall risk of cancer (5.2%) as risk cut-off would mean 25,000 fewer colonoscopies needed, but conversely 631 missed CRCs.
ACCOUNTING FOR ENDOSCOPE SCREENING IN COLORECTAL CANCER RISK PREDICTION MODELS

Most current colorectal cancer (CRC) risk prediction models include screening endoscopy as a traditional confounder. However, undergoing an endoscopy affects future risk; a negative endoscopy indicates a lower risk of CRC (versus no endoscopy), whereas polyp detection may indicate either higher susceptibility and higher risk of CRC, or lower CRC risk due to polyp removal. Thus, the standard method of accounting for screening endoscopy may lead to distorted effect estimates. To better account for endoscopic screening in CRC risk prediction, and toward risk stratification for screening, we have developed a model of the predictors of screening endoscopy. Among N=1,010,352 person-years from the Nurses’ Health Study, accrued between 1980 and 2010, we observed N = 39,633 reported first endoscopic screenings. Our model included CRC risk factors (reported on the most recent biennial questionnaire), and factors that have been associated with mammography (co-morbidities, healthcare utilization, etc). We estimated HR of endoscopy from age-adjusted, multivariate, and stepwise multivariate Cox proportional hazards models. The risk factors most strongly directly associated with an endoscopy in our stepwise model were: a family history of CRC (HR=1.42, 95% CI: 1.38-1.46; p<0.0001), mammography within the past 2 years (HR=1.81, 95% CI=1.74-1.88; p <0.0001), and a routine physical exam in the past 2 years (HR=1.44, 95% CI: 1.39-1.48; p <0.0001). The strongest negative predictors were: current smoking (HR= 0.82, 95% CI: 0.79- 0.85; p1 serving per day vs zero: HR = 0.88, 95% CI: 0.82- 0.93; p trend<0.0001). We have identified a parsimonious prediction model for endoscopic screening; this should be tested in other populations. After combining this model with screening outcomes, we will apply inverse-probability weighting to our previously published CRC risk model; accurately accounting for endoscopy will improve risk stratification for screening.
Selection bias is the subject of much controversy. Oftentimes selection bias is associated with collider bias in epidemiologic research. Recently, however, Hernán explained using causal diagrams that selection bias might also occur without colliders in the situation described by Greenland in 1977. A clear definition of selection bias would improve communication and the conduct of epidemiologic research. We propose a definition of selection bias that has two types. Type 1 selection bias is due to restricting to one level of a collider (sometimes called "collider restriction bias"), and type 2 selection bias is due to restricting to one level of an effect modifier (sometimes called "generalizability bias"). We illustrate both types of selection bias using causal diagrams and practical examples. We argue that when the selection variable acts as both a collider and an effect modifier, both types of selection bias can occur, and in such cases, caution is required when making covariate adjustment.

While type 1 selection bias is typically associated with traditional selection bias, and type 2 selection bias with generalizability, we demonstrate that both types of selection bias can affect internal and external validity.

Finally, we describe methods based on the extended g-formula to address these biases under certain assumptions including the relevant covariates being measured.

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1. Selection bias due to restricting to one level of a collider

2. Selection bias due to restricting to one level of an effect modifier

3. Selection variable acting as both a collider and an effect modifier

4. Both types of selection biases can occur in the same study: complex scenarios

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Notations:
E: exposure
D: outcome
L, M: covariates
C: selection

S/P indicates work done while a student/postdoc.
BIAS FROM INCOMPLETE CASE ASCERTAINMENT IN STUDIES EXAMINING THE TRANSITION FROM PEDIATRIC TO ADULT-CENTERED CARDIAC CARE IN YOUNG ADULTS WITH CONGENITAL HEART DISEASE: RESULTS FROM THE COLORADO CONGENITAL HEART DISEASE (COCHD) SURVEILLANCE SYSTEM Lindsey M Duca* Lindsey M Duca, Amber Khanna, David Kao, Christopher M Rausch, Lisa McKenzie, Tessa Crume, (Colorado School of Public Health, University of Colorado at Anschutz Medical Campus)

The 2018 AHA/ACC guidelines for the management of adults with congenital heart disease (CHD) identified the need for U.S. population-based studies of the transition process from pediatric to adult congenital cardiology care. Studies on this scale must be implemented using electronic medical records (EMR), which may be biased by characteristics of individuals able to be identified in the EMR. Using simulations, we evaluated quantitative bias analysis (QBA) for selection bias correction in EMR-based studies of a lapse in care during the transition from pediatric to adult care and risk of adverse outcomes in adults with CHD. Simulations were conducted based on ongoing studies out of the statewide Colorado Congenital Heart Disease surveillance system (n=12,412). We simulated 4 studies of 2 exposure groups during the transition from pediatric to adult care (lapse in care vs. no lapse in care) and 2 outcome levels (10 and 250/1,000 person-years), with 3 relative risk (RR) levels (RR=0.50, 1.00, and 2.00), across 1000 replications using probabilistic modeling. We quantified bias parameters from different selection probabilities previously measured in EMR-based studies in a population of adults with CHD. We calculated outcome observed RRs and bias-corrected RRs following the QBA approach. With a true RR = 2.00, median bias was towards the null, with severe bias (median observed RR = 1.24) with differential selection of individuals with CHD by heart defect severity (70% with severe and 40% with mild/moderate CHD) and modest bias (median observed RR = 1.96) when selection did not differ by CHD severity. Similar results, but opposite in direction, were found when using a true RR = 0.50. QBA techniques were generally effective in correcting for selection bias. Failure to address the presence of selection bias in EMR-based studies examining a lapse in care during the transition from pediatric to adult-centered care may lead to erroneous conclusions translated into public policy.

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SIMPLE SENSITIVITY ANALYSIS FOR SELECTION BIAS 


When epidemiologic studies are conducted in a subset of the population, selection bias can threaten the validity of causal inference. This bias can occur whether or not that selected population is the target population, and can occur even in the absence of exposure-outcome confounding. However, it is often difficult to quantify the extent of selection bias, and sensitivity analysis can be challenging to undertake and to understand. We present a simple method to assess the possible effect of selection bias. We demonstrate that the magnitude of the bias due to selection can be bounded by simple expressions defined by parameters characterizing the relationships between unmeasured factor(s) responsible for the bias and the measured variables. No functional form assumptions are necessary about those unmeasured factors. Using knowledge about the selection mechanism, researchers can account for the possible extent of selection bias by specifying the size of the parameters in the bounds. We also show that the bounds, which differ depending on the target population, result in summary measures that can be used to calculate the minimum magnitude of the parameters required to shift a risk ratio or risk difference to the null. A summary measure can be used as a simple sensitivity analysis to determine the overall strength of selection that would be necessary to explain away a result. When researchers are willing to make assumptions or have knowledge about the selection mechanism, the bounds and summary measures can be further simplified. We present examples of simple sensitivity analyses in various contexts.
Left truncation, also known as late-entry, occurs when subjects enter the study cohort after the origin. Under the scenario where some subjects enter the study late, late-entry is troublesome for causal inference with observational data. One approach is to limit the analysis to those entering the study at the origin, but this approach results in data loss and may harm external validity. Alternatively, we can allow participants to enter the study late under the assumption that late-entry occurred completely at random, unlikely to be true. Clearly, late-entry is a barrier to analysis that requires a better analytical approach. We propose a novel inverse probability weighting procedure to correct for informative late-entry, which we term inverse probability of left truncation weights (IPLTW). The proposed approach relaxes the standard assumption (that late-entry occurs completely at random) to a weaker assumption (that late-entry occurs at random, conditional on measure variable(s)). Inverse probability of censoring weights can be simultaneously used with IPLTW to reduce bias in analyses subject to informative right censoring and left truncation. We derive the IPLTW estimator and describe the necessary identifiability assumptions. Using simulations, we explore the finite sample (bias, variance) and asymptotic (consistency) properties of the proposed approach. Specifically, we show that, when late-entry occurs at random, use of IPLTW results in unbiased estimates of risk, unlike naïve methods that assume late-entry occurs completely at random. We further demonstrate that the nonparametric IPLTW estimator is root-n consistent. Finally, we illustrate use of IPLTW in a randomized trial of job skills training among those being treated for substance abuse with artificially induced late-entry. Our approach creates a unified framework of weighting approaches for right censored and left truncated observations for time-fixed treatments in longitudinal and survival data.
AN INTERVAL ESTIMATION APPROACH FOR SELECTION BIAS IN IV STUDIES Matthew Tudball, Matthew Tudball, Kate Tilling, Jack Bowden, (University of Bristol)

Background: Instrumental variables (IV) analysis is increasingly being used in epidemiological research due to its relaxation of the “no unmeasured confounding” assumption. Sensitivity to selection bias (e.g. by non-random participation or drop-out), however, is seldom examined in practice. A common approach for handling selection bias, inverse probability weighting, relies on correct specification of the individual weights, which may not be possible in practice. To address this problem, Aronow and Lee (2013) proposes an interval estimator for population means in settings where these probability weights are unobserved but are known to be bounded.

Methods: We extend that estimator to derive bounds for IV estimates. We also develop methods to incorporate a variety of information related to sample selection in order to tighten the interval estimate. Specifically, we show how to incorporate three types of information that are commonly available to researchers. 1) the study response rate (unconditional or stratified by covariates), 2) variables that are only observed in-sample, 3) variables that are observed among all individuals who were invited to enter the study, typically baseline data such as age, sex or location.

Results: Using simulations, we demonstrate how information about sample selection can be used to produce bounds on the causal effect from an IV analysis. E.g. for a true null effect of a continuous exposure on a continuous outcome, using the observed study response rate tightened the lower bound of the interval from -0.27 to -0.19, and additional knowledge of in-sample data tightened this to -0.12. We also include an applied example of estimating the effect of education on BMI in UK Biobank.

Conclusion: Given that commonly-used datasets such as UK Biobank are known to suffer from non-random sample selection, our method provides a flexible way for researchers to check the sensitivity of their conclusions to plausible sample selection mechanisms.

S/P indicates work done while a student/postdoc
LONGITUDINAL POPULATION-LEVEL HEALTH-RELATED FITNESS PATTERNS IN NEW YORK CITY PUBLIC SCHOOL CHILDREN AND ADOLESCENTS, 2006-2017 Emily D'Agostino*
Emily D'Agostino, Sophia Day, Michael Larkin, Kevin Konty, (Miami-Dade Department of Parks, Recreation and Open Spaces)

Just 25% of United States youth meet national physical activity guidelines. Low youth physical activity predicts low cardiopulmonary fitness, metabolic syndrome, cardiovascular disease, type 2 diabetes, and dementia. Standardized fitness monitoring methods provide a more accurate proxy for child/adolescent health when compared with physical activity. No prior studies demonstrate utilization of wide-scale population-level fitness testing in youth. We examined longitudinal trends in population-level fitness for 4th-12th grade New York City (NYC) youth during 2006/7-2016/17 (n=646,210 per year). The primary outcome was attainment of Healthy Fitness (HF; binary variable), based on the Progressive Aerobic Cardiovascular Endurance Run, muscle strength and endurance tests. Prevalence estimates were weighted, accounted for school clustering, and adjusted for student age, gender, race, language, birthplace, home and school poverty. Subgroup analyses were run by sociodemographics and year, and also a three-way age*gender*race interaction. The overall HF prevalence increased from 15.5% (95%CI: 13.9%-17.0%) to 23.3% (95%CI: 22.2%-24.4%). Sociodemographic gaps were greatest across grade-level (19.2% [95%CI: 17.3%-21.1%] and 12.0% [95%CI: 8.4%-15.6%] vs. 24.5% [95%CI: 22.8%-26.2%] and 15.9% [95%CI: 14.5%-17.3%] for 4th and 12th grade students from 2006/7 to 2016/17) and also race (24.5% [95%CI: 22.8%-26.2%], 14.0% [95%CI: 12.3%-15.7%] and 14.0% [95%CI: 12.4%-15.6%] vs. 33.1% [95%CI: 30.5%-35.7%], 21.4% [95%CI: 20.4%-22.5%] and 20.1% [95%CI: 19.1%-21.0%] for non-Hispanic white, black and Hispanic students from 2006/7 to 2016/17). Findings show a significant increasing trend in fitness prevalence for NYC youth, although sociodemographic disparities widened over time. Given forecasted sharp increases in cardiovascular disease prevalence, physical activity resources may make important contributions to promoting youth cardiovascular health, particularly for at-risk groups.
Background: Trimethylamine-N-oxide (TMAO) – a gut-microbiota derived metabolite – is an emerging biomarker of cardiometabolic risk. No studies have investigated the utility for TMAO as an early biomarker of diabetes risk. We investigated the association between plasma TMAO and biomarkers of diabetes risk. 

Methods and Results: The Oral Infections, Glucose Intolerance and Insulin Resistance Study (ORIGINS) is a longitudinal cohort study among n=300 diabetes-free participants enrolled at baseline and re-examined at 2-years. Participants were men and women (77%) aged 20-55 years (mean=34±10) without: i) Diabetes Mellitus based on self-report physician diagnosis, fasting plasma glucose (FPG)≥126 mg/dl or HbA1c≥6.5%; ii) self-reported history of myocardial infarction, congestive heart failure, stroke or chronic inflammatory conditions. Plasma TMAO was measured using Ultra Performance Liquid Chromatography-Mass Spectrometry. Baseline FPG, HbA1C and insulin were measured after an overnight fast. Insulin resistance was defined using HOMA-IR. FPG was remeasured two-years after baseline in n=241 participants. Multivariable generalized linear models regressed FPG, HOMA-IR and HbA1c on tertiles of TMAO. Multivariable relative risk regressions modeled prediabetes across TMAO tertiles. 

Mean values of 2-year longitudinal FPG±SE across tertiles of TMAO were 86.6±0.9, 86.7±0.9, 86.4±0.9 (p=0.98). Trends were similarly null for FPG, HbA1c and HOMA-IR, cross-sectionally. The prevalence ratio of prediabetes among participants in the 2nd and 3rd TMAO tertiles (vs. the 1st) were 1.94 [95%CI 1.09-3.48] and 1.41 [95%CI: 0.76-2.61]. Conclusion: TMAO levels are modestly associated with an increased prevalence of prediabetes in a nonlinear fashion but not with insulin resistance or longitudinal FPG change.
THE IMPACT OF GROWTH DIFFERENTIATION FACTOR 15 (GDF-15) ON CORONARY ARTERY DISEASE, BREAST AND COLORECTAL CANCER RISK: A MENDELIAN RANDOMIZATION STUDY

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Background: Growth differentiation factor 15 (GDF-15), a biomarker for metformin use, may explain the potential cardioprotective and anti-cancer properties of metformin. We conducted a Mendelian randomization study to examine the role of GDF-15 in coronary artery disease (CAD) risk, CAD risk factors (blood pressure, lipids and body mass index), type 2 diabetes, and breast and colorectal cancer risk. Methods: We obtained single nucleotide polymorphisms (SNPs) strongly (p value < 5 x 10^-8) predicting GDF-15 from a genome wide association study (GWAS) (n=5,440) and applied them to genetic studies of CAD (CARDIoGRAMplusC4D 1000 Genomes-based GWAS (n=184,305)), type 2 diabetes (DIAbetes Genetics Replication And Meta-analysis (n=898,130)), blood pressure, breast cancer and colorectal cancer (UK Biobank (n<=401,447)), lipids (Global Lipids Genetic Consortium (n<=92,820)), and adiposity (Genetic Investigation of ANthropometric Traits consortium (n=681,275)). Causal estimates were obtained using inverse variance weighting, taking into account correlations between SNPs. Sensitivity analyses included focusing on the lead SNP (rs888663) and validation for CAD in the UK Biobank and breast cancer in the breast cancer association consortium (BCAC). Results: Using 5 SNPs, increased GDF-15 was associated with lower CAD (0.93 per standard deviation (SD), 95% confidence interval (CI) 0.87 to 0.99), and breast cancer (0.89 per SD, 95% CI 0.82 to 0.96), with similar results from lead SNP analysis. However, the association with CAD and breast cancer were not replicated in the validation datasets. Associations of GDF-15 with type 2 diabetes, CAD risk factors and colorectal cancer were less clear. Conclusions: There is no convincing evidence that GDF-15 may reduce CAD or cancer risk. Whether the inverse association between metformin use and cancer risk is an artefact of biases or via other unexplored mechanistic pathways warrant future investigations.

S/P indicates work done while a student/postdoc

Background: Recent evidence suggests that higher atrial fibrillation (AF) burden is linked to higher risk of cardiovascular (CV) events, but determinants of AF burden are not clearly defined. The American Heart Association’s Life’s Simple 7 (LS7) metric was designed to promote ideal CV health. We aimed to assess the association of LS7 score and individual LS7 factors in midlife with AF burden in late-life. Methods: We followed 2,440 ARIC study participants from Visit 3 (V3: 1993-95) to Visit 6 (V6: 2016-17) when a 2-week continuous heart rhythm monitor (Zio XT Patch) was applied. LS7 factors were assessed at V3 and a composite score from 0-14 was calculated. A higher score indicates better health. AF burden (% time in AF) was categorized as none (referent), intermittent (>0-30 kg/m2), risk of continuous AF was lower among those with intermediate and ideal (}
Often epidemiological studies assess a single ‘omic (e.g. epigenetic shifts) as a biological response in relation to an exposure or as a biomarker precursor that may underlie disease pathology; however, such an approach is likely misrepresentative of true biological processes. It is pertinent to address more than one ‘omics (e.g. epigenome and transcriptome) at a time and to determine the relation of each ‘omic to another, as there is significant cross-talk between ‘omic platforms. Additionally, most ‘omic processes are likely mediators between exposures and disease, yet are not examined as such due to the large multidimensionality of ‘omics data. However, a multi/cross-omics mediation approach can greatly improve causal inference, signifying mechanistic pathways for interacting genes. We present two examples of cross-omics responses within a large European study of Exposomics. We take a multi/cross-omics approach to assess potential ‘omics shifts that lie on the causal path between exposure to air pollutants and cardiovascular disease (CVD) and assess prenatal multi-omics responses from exposure to multiple air pollutants. ‘Omics of epigenome, transcriptome, metabolome, and proteome are assessed in relation to one another using sparse partial least squares regression for variable selection. Secondly, we used a supervised approach, whereby cross-omics were assessed based on exposure to the air pollutants and disease status. ‘Omics that were selected were furthered analysed at a biological pathway level. Lastly, we assess cross-omics responses in counterfactual mediation models to determine if ‘omics pathways mediate the relationship between exposure and disease. We find cross-talk between certain pathways of inflammation that mediate the relationship between exposure to air pollutants and CVD, that differ from a single ‘omic approach. Cross-omics mediation may be more biologically relevant of molecular mechanisms, signifying the importance for methods in molecular epidemiology.
TESTOSTERONE THERAPY AND RISK OF VENOUS THROMBOEMBOLISM AMONG MEN WITHOUT HYPOGONADISM Rob Walker* Rob Walker, Neil A Zakai, Richard F MacLehose, Logan T Cowan, Alvaro Alanso, Pamela L Lutsey, (University of Minnesota)

Introduction: Testosterone therapy (TT) prescriptions among men increased in 2001 because of relaxed TT prescription guidelines for common symptoms associated with aging without a clear hypogonadism diagnosis. The FDA warned about potential cardiovascular complications in 2014, however TT prescription is still common. TT may increase VTE risk through hematocrit levels which affect blood viscosity and platelet accumulation for up to 6 months. Previous studies regarding the association between TT and VTE are both limited and unclear. Methods: A case-crossover design among men diagnosed with VTE assessed whether TT exposure increased short-term risk of VTE from 2012 to 2016 using the MarketScan Commercial and Medicare Supplemental administrative database. We identified 36,251 eligible male VTE patients with 1 year of follow-up prior to their VTE diagnosis and assessed whether they had a prescription for TT preceding their first VTE (0-6 months, ‘case period’ and 6-12 months ‘control period’). Conditional logistic regression was used to estimate use of TT in the case period relative to the control period, adjusting for number of hospitalizations. Results: Overall, 754 of the 36,251 patients (2.1%) had a TT prescription during the 12 months prior to their VTE event. Of these, 588 were aged less than 65 years (78%). Overall use of TT did not vary substantially in the case period compared to the control period (OR: 1.19; 95% CI: 0.86, 1.64). The point estimate was slightly elevated for TT use among men under 65 years old (OR: 1.31; 0.91, 1.89). For men aged 65+ the OR was 0.85 (95% CI: 0.42, 1.69). Conclusions: Overall TT was not associated with greater risk of VTE among men without hypogonadism. However, when stratified by age there was suggestion of a higher risk in younger men. This analysis suggests that TT overall is not a strong risk factor for VTE; however further studies are needed to determine if TT among certain sub-groups could increase VTE risk.
IDENTIFYING ENVIRONMENTAL AGENT PROFILES ASSOCIATED WITH EARLY MENARCHE AMONG U.S. ADOLESCENT GIRLS: A MACHINE LEARNING APPROACH

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Using non-traditional data analytic approaches may enhance multiple exposure environmental epidemiologic investigations. We have applied a two-stage, data-driven approach to investigate associations between single and joint effects of environmental agents with earlier menarche. Data from 253 girls (12-16 years) from National Health and Nutrition Examination Survey with 41 exposure biomarker measures across six classes of hormonal agents were analyzed. Menarche was dichotomized into “earlier” (≤11 years; 37% of girls) and “later” (≥12 years). Phase 1: Random Forests (RF), consisting of 2000 classification trees, were used to identify important single and joint predictors of menarche. Mono-(2-ethyl)-hexyl phthalate (MEHP), with a mean depth of 2.64 was identified as the most important predictor based on mean decrease in accuracy and decrease in Gini coefficient. Later menarche was found to be more likely in girls with higher urinary MEHP concentrations, consistent with previous research. The 2 next important single predictors were 2,4-dichlorophenol and mono-(3-carboxypropyl) phthalate, which is also in agreement with earlier reports. The most frequent interaction pair was MEHP and blood lead. Consistent with studies that have used other data analysis methods, the order of predictors in overweight girls differed when stratifying RF models by BMI; however differences may also be due to small sample size (42% overweight). Phase 2: The effect sizes of the identified predictors and most frequent interaction pair were obtained from regression models. MEHP was independently associated with later menarche (PR = -0.56, 95% CI: -0.99 to -0.126). However, there was no evidence of multiplicative interaction between MEHP and blood lead. The association between MEHP and menarche remained after adjusting for confounders (PR=-0.52, 95% CI -0.95 to -0.10). These results illustrate how a data-driven approach can generate hypotheses within high-dimensional exposure data.
ASSOCIATION OF EARLY ABUSE WITH PLASMA METABOLOMICS IN MIDDLE-AGED WOMEN

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Background: Metabolomic profiling may provide insights into the mechanisms underlying the strong epidemiologic links between early abuse and increased risk of mental and cardiometabolic disorders in later life.

Methods: We examined the associations between early abuse and plasma metabolomics in two independent samples from the Nurses’ Health Study II, comprising 784 and 210 women who provided blood samples in 1996-1999 and 2013, respectively. LC-MS/MS assays were conducted for each sample, with 283 plasma metabolites passing quality control in both datasets. Abuse before age 18 was assessed by validated questions and quantified by a score integrating abuse frequency and severity. Secondarily, we considered type (physical, sexual) and timing (childhood, adolescence) of abuse. Separate analyses using multiple linear regression were conducted in each sample, and meta-analysis was used to pool the results. We considered a false discovery rate <0.2 as statistically significant to account for multiple testing.

Results: After adjusting for age, race, menopausal status, body size at age 5 and childhood socioeconomic indicators, a higher score (i.e., more severe/frequent abuse) was associated with lower levels of serotonin and C10-carnitine and higher levels of alanine, glutamate and tyrosine, as well as multiple lipid species including triglycerides, diglycerides (DAG), and phosphatidylcholines (0.16-0.24 SD differences in metabolites). The associations with lipids were mostly positive, with the strongest association observed for DAG 34:3. Physical abuse was more strongly associated with amino acid metabolites, whereas the metabolites associated most strongly with sexual abuse were lipids. No clear differences were seen by timing of abuse.

Conclusion: Early abuse was associated with altered metabolomic profiles even into middle age, suggesting that factors such as amino acids (e.g., glutamate) and certain lipid species (e.g., triglycerides) may mediate its relationships with future disease risk.
THE MODIFYING EFFECT OF SOCIAL SUPPORT ON THE ASSOCIATION BETWEEN NEIGHBORHOOD VIOLENCE EXPOSURE AND PRETERM BIRTH Timothy Ihongbe* Timothy Ihongbe, Juan Lu, Wen Wan, Robert Perera, Shawnita Sealy-Jefferson, (Virginia Commonwealth University)

Introduction: Preterm birth is a major public health concern in the US. Maternal exposure to neighborhood violence has been linked with increased risk of preterm birth across different racial/ethnic groups. However, it is unclear whether receipt of social support modifies the association. This study aims to examine the modifying effect of social support on the association between neighborhood violence exposure and preterm birth among a nationally representative sample of US women. Methods: Data from the National Longitudinal Study of Adolescent to Adult Health (Waves I-IV) were analyzed (N=4,419). Study outcome was preterm birth (yes or no) and the exposure and effect modifier were continuous measures of neighborhood violence and social support, respectively. Multivariable log-binomial regression was used to examine the association. The modifying effect of social support was examined using a continuous-continuous interaction between neighborhood violence exposure and social support. Results: The rate of preterm birth was 10.7% and median scores for neighborhood violence exposure and social support were 0.0 (IQR: 0.0-0.3) and 4.0 (IQR: 3.0-5.0), respectively. Adjusted prevalence ratios for the association at low (mean - 1SD), mean, and high (mean + 1SD) values of social support were 1.16 (95% CI=1.15-1.16, p<.0001), 0.95 (95% CI=0.95-0.96, p<.0001), and 0.78 (95% CI=0.78-0.79, p<.0001), respectively. Conclusions: This study showed that maternal exposure to neighborhood violence is significantly associated with preterm birth in a nationally representative sample of US women. However, the direction of the observed association varied depending on the level of social support received, such that women with higher levels of social support who were exposed to neighborhood violence had decreased rates of preterm birth. Intervention programs aimed at identifying and providing adequate social support to women who are exposed to neighborhood violence are needed to mitigate the risk of preterm birth.
Uterine leiomyomata (UL) are hormone-dependent benign neoplasms that can cause severe reproductive morbidity. Components of cigarette smoke may inhibit aromatase and shift estradiol metabolism toward less potent forms of estrogen; however, they may also exert estrogen-related uterine effects that could promote cell proliferation. Early studies report a lower risk of UL among current or ever smokers; more recent studies have generally found no association. No prospective studies have employed systematic screening for UL to reduce potential for detection bias. The Study of the Environment, Lifestyle, and Fibroids is a prospective cohort study of 1,693 Black women aged 23-34 years from Detroit, MI. At baseline (2010-2012), women completed self-administered questionnaires on demographics, reproductive history, and lifestyle, including questions on active, passive, and in utero smoking. We used transvaginal ultrasound to assess UL at baseline and 20, 40, and 60 months of follow-up. We used Cox proportional hazards regression models to estimate incidence rate ratios (IRR) and 95% confidence intervals (CI) for the association between smoking and UL risk, adjusting for potential baseline confounders. Among 1,309 women without prevalent UL, 19% were current smokers and 7% were former smokers. Over 70% reported current passive smoke exposure and 25% reported in utero smoke exposure. Compared with never smoking, IRRs for current and former smoking were 0.77 (CI: 0.54-1.10) and 0.93 (CI: 0.58-1.48), respectively. IRRs were 0.70 among those smoking ≥10 cigarettes/day (CI: 0.37-1.36) and 0.61 among those smoking for ≥15 years (CI: 0.31-1.20). UL risk was lower for current passive smoke exposure (≥24 vs. 0 hours/week: IRR=0.67, CI: 0.42-1.07), but not in utero smoke exposure. In this prospective ultrasound study, smoking was associated with lower UL risk. These results indicate that detection bias is an unlikely explanation for the inverse association reported in some studies.
Early menopause, the cessation of ovarian function before the age of 45, affects roughly 10% of women and is associated with increased risk of premature mortality, cognitive decline, osteoporosis, and cardiovascular disease. Oral contraceptives may modify the rate of follicular atresia, preserve oocytes and suppress follicle-stimulating hormone and thus, may be associated with risk of early menopause. Most studies assessing this relationship have been cross-sectional and results have been conflicting. Our study included 108,813 participants in the prospective Nurses’ Health Study II who were 25-42 years old and premenopausal in 1989. We assessed timing, duration, and type of oral contraceptive (OC) use using biennial questionnaires and followed women for early natural menopause through 2013. We used Cox proportional hazards models to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) adjusted for lifestyle, dietary, and reproductive factors including parity and infertility. During 1.7 million person-years of follow-up, 2,603 members of the analytic cohort experienced early natural menopause. In multivariable-adjusted models, current or past OC users had higher risk of early menopause compared to never users (HR=1.28, 95% CI: 1.07-1.52 and HR=1.31, 95% CI: 1.06-1.61, respectively). Duration of use was not linearly related to risk; for example, compared to never users, women reporting 120+ months of total use had an HR of 1.10 (95% CI: 0.92-1.30). Results from additional analyses that considered age at first and last OC use to address the potential for reverse causality also suggested modest positive associations. In this large prospective study, our results suggested that OC use was associated with higher risk of early menopause. Further analyses of age and timing of use are needed to better understand the complex relationship between OC use and menopause timing.
THE ASSOCIATION BETWEEN WOMEN'S INTER-BIRTH INTERVALS AND CARDIOVASCULAR MORTALITY

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Background: Conflicting results were shown for the association between women's inter-birth interval (IBI) and future cardiovascular disease (CVD) risk; both a J-shaped and no association have been reported. We aimed to assess whether IBI was associated with all-cause- and CVD-related mortality. Methods: The Jerusalem Perinatal Study cohort includes all births to residents of Jerusalem in 1964-1976. Follow-up data on all-cause and cause-specific mortality through 2016 was obtained via record linkage. This study included women who had at least two singleton births (N=18,546, total person-years=880,399). We calculated intervals between women's first and second birth in the cohort, and minimum intervals between births, as both continuous and categorical variables. We used Cox’s proportional hazards models to estimate the associations between IBI and all-cause and CVD mortality, adjusting for age, parity, education, origin, and socioeconomic status. Results: In this highly parous population (mean parity=3.5), women with IBIs <15 months had higher all-cause mortality rates (HR 1.15; 95% CI: 1.03–1.29) compared to women with IBIs of 20-30 months. No difference was found for women with IBIs of 30-45 months (HR 0.97; 95% CI: 0.88–1.08). The linear trend was highly significant (HR 0.96; 95% CI: 0.93–0.98). Rates of CVD mortality were not statistically significantly different for women with IBIs<15 months (HR 1.13; 95% CI: 0.81–1.57), compared to those with IBIs of 20-30 months. However, women with IBIs of 30-45 months had substantially lower rates (HR 0.69; 95% CI: 0.50–0.95). The linear trend for CVD mortality was also significant (HR 0.90; 95% CI: 0.83-0.97). We found similar trends using minimum IBIs. Discussion In this large population-based study with long follow-up IBI was inversely associated with mortality, suggesting that women with longer IBIs may have sufficient time to recover from the physiological stress of previous pregnancies, leading to reduced CVD mortality.
Prior studies have shown that 10-30% of women in the US fill an opioid prescription after vaginal delivery, making this a common source of exposure to opioids in young women. Limited evidence is available regarding the impact of opioid use after vaginal delivery on the risk of subsequent persistent opioid use and misuse. We assembled a nationwide cohort of women without chronic opioid use, continuously enrolled in Medicaid from 90 days before to >= 365 days after vaginal delivery from 2009-2013. We ascertained opioid dispensings within 7 days of the date of delivery (DOD), as well as persistent opioid use (>= 10 fills or > 120 days' supply, primary outcome) and opioid use disorder (secondary) between 30 to 365 days after DOD. We conducted logistic regression analysis after propensity-score (PS) 1:1 matching and instrumental variable analysis (IVA) using a 2-stage least squares approach to control for potential confounding. Within each region, facilities were ranked according to their opioid dispensing rate after delivery and divided into deciles as the instrument. Among 226,995 vaginal deliveries, 29.9% had an opioid dispensing. Overall, 3,113 out of 67,954 (4.6%) exposed vs. 1,445 out of 159,041 (0.9%) unexposed had persistent opioid use during follow-up, for an unadjusted odds ratio (OR) of 5.2 (95% CI, 4.9 - 5.6) and a risk difference (RD) of 3.7% (3.5 - 3.8). After PS matching, the risk remained higher among the exposed, with an OR of 2.7 (2.5 - 3.0) and an RD of 2.4% (2.3 - 2.6), confirmed by the IVA (pseudo R2=0.3, Figure 1, adjusted RD=2.8%, 2.5 - 3.1). For opioid use disorder, the unadjusted OR of 2.4 (2.2 - 2.5) attenuated to 1.5 (1.4 - 1.6) after PS matching. The adjusted risk difference estimates were 0.9% (0.7 - 1.0) after PS matching and 2.1% (1.8 - 2.4) using IVA. For every 83 women given opioids after vaginal deliveries, one became a persistent opioid user within one year postpartum. Given the observed risk, judicious opioid prescribing after vaginal deliveries is warranted.
Background: Mortality risks among opioid-dependent individuals are substantially higher than the general population and have escalated during an opioid overdose crisis in British Columbia (BC), Canada. While sustained adherence to opioid agonist treatment (OAT) reduces the risk of mortality, low levels of treatment engagement and adherence are common among people with opioid use disorders (PWOD). We quantified mortality rates among treated PWOD and compared them over time, before and during the opioid overdose crisis. Methods: We used provincial health administrative databases to construct a population-based cohort of PWOD in BC from 01/01/1996 to 30/11/2017. We compared all-cause crude mortality rates (CMR) and standardized mortality ratios (SMR) according to periods on or off OAT, medication type, and key dates characterising the overdose crisis in BC. Results: Among 76,926 diagnosed PWOD, 13,265 (17.2%) died during follow-up. SMRs were significantly lower during periods on OAT compared to periods off OAT, both overall (4.6 vs. 7.2) and for individuals accessing Methadone (4.7 vs. 9.7) and Buprenorphine/Naloxone (2.9 vs. 11.8). During periods off OAT, all-cause mortality increased significantly after the announcement of a public health emergency in BC (14/04/2016; SMRbefore:6.0; SMRafter:7.5; CMR ratio:1.30, 95%CI:1.23,1.37). This increase was not observed for PWOD on OAT (Figure 1). All-cause mortality was highest among people with HIV (SMR: 23.6(22.4,24.8)), in the first week after discontinuation from OAT (SMR:141.5 at ≤3 days and SMR:27.1 at 4-7 days), in the year after the first record of OUD (SMR:12.6, 95% CI:12.2,13.1), and after first drug-related hospitalization (SMR:14.9(14.4,15.5)). Conclusion: As mortality risks escalate within the current opioid overdose crisis, these findings confirm the importance of early OAT intervention and adherence for individuals presenting to health care services for OUD and other SUDs.
Background: Alcohol can lead to fatal and non-fatal overdose through its neurobiological inhibitory effects. Alcohol increases the likelihood of overdose when consumed with other substances, such as opioids, but little research has examined the characteristics of alcohol overdoses in high risk patient populations. Methods: We examined self-reported drugs used during the most recent alcohol-related overdose among 660 study participants in a residential addiction treatment facility. We used latent class analysis (LCA) to identify alcohol overdose typologies based on concomitant drug use. We examined how typologies were related to overdose outcomes (receiving medical attention and hospitalization), sociodemographic characteristics, and comorbidities using LCA with covariates. Results: We identified three alcohol overdose typologies: no/low drug involvement typically involving 0-1 drugs (61% of participants), moderate drug involvement (33%) typically involving 2-4 drugs, and high drug involvement (6%) wherein nearly all events involved concurrent alcohol, prescription opioid, prescription sedative, cocaine, and marijuana use. Participants admitted to the hospital had 6.4-fold higher odds (95% CI: 2.4-16.6) of a high drug involvement alcohol overdose relative to non-hospitalized participants after adjustment for age and sex. Participants who received emergency medical attention also had higher odds of a high drug involvement overdose (aOR: 2.2, 95% CI: 1.1-4.5). Evidence of major depression at the time of the survey was positively associated with moderate drug involvement (aOR: 2.8, 95% CI: 1.8-4.3) and high drug involvement (aOR: 7.0, 95% CI: 3.2-14.9). Conclusions: Many self-reported alcohol overdoses involved concomitant drug use. Receiving medical attention and being depressed were related to experiencing an alcohol overdose that involved concomitant polysubstance use. Overdose prevention programming should assess both alcohol and drug use.
DO TOBACCO TAXES AFFECT CORONARY HEART DISEASE MORTALITY RATES DIFFERENTIALLY AMONG BLACK COMPARED TO WHITE AMERICANS? Gregory H Cohen*
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Racial disparities in Coronary Heart Disease (CHD) have persisted for decades. While we know that tobacco taxation is effective in reducing smoking and may favor ethnic minority populations, we do not know whether tobacco taxes differentially affect CHD mortality among black and white Americans. This has clear implications for the design of programs and policies aimed at reducing racial disparities in CHD mortality. We conducted an empirical study of the effectiveness of tobacco taxes on age-adjusted CHD mortality among white men, white women, black men and black women. We constructed a yearly panel of age-adjusted mortality rates for all 50 US states and the District of Columbia, stratified by race and gender, using death certificate data from the CDC’s Wide-ranging Online Data for Epidemiologic Research (WONDER). We also constructed a panel for state-by-year smoking rates stratified by race and gender using the Behavioral Risk Factor Surveillance System. We linked this panel data with annual federal and state tobacco tax data from the State Tobacco Activities Tracking and Evaluation System, and state-by-year data on education and median-household-income stratified by race. We estimated Poisson regression models for panel data including state and year fixed effects to assess whether tobacco taxes (lagged by 1 year) differentially affect CHD deaths by race and gender, controlling for smoking rates, income and education. We found in multivariable adjusted models that over the period of 2005-2016 tobacco taxes were similarly effective per dollar increase at reducing CHD deaths among white men (IRR, 0.95; 95% CI, 0.94-0.96), white women (IRR 0.94; 95% CI, 0.93-0.96), and black men (IRR 0.95; 95% CI, 0.94-0.96), and more effective among black women (IRR 0.92; 95% CI, 0.90-0.93). These preliminary results show that tobacco taxes may be an effective approach to reducing disparities in CHD among black and white women.
IMPACT OF STATE POLICY ON OPIOID PRESCRIBING AFTER COMMON SURGICAL PROCEDURES  Thomas P. Ahern* Thomas P. Ahern, Mayo H. Fujii, Ashley C. Hodges, Ruby Russell, Kristin Roensch, Bruce Beynnon, Peter Holoch, Jesse S. Moore, Elizabeth Ames, Charles D. MacLean, (University of Vermont)

Background: Opioids prescribed for post-operative pain control contribute substantially to community opioid burden. Vermont enacted a strict opioid prescribing policy for acute pain control in 2017, limiting both the quantity and duration of prescriptions. The impact of this policy on post-operative prescribing is unknown.

Methods: We enrolled a cohort of patients from the University of Vermont Medical Center who underwent a surgical procedure during an 18-month period covering the pre-policy, policy adoption, and post-policy time periods. We computed morphine milligram equivalents (MME) dispensed at discharge by applying established conversion factors. We visualized the trend in prescribed MME over the study period by fitting a local polynomial function to weekly median values. We fit quantile regression models to estimate differences in median MMEs prescribed—both overall and by specific procedures—comparing the pre- and post-policy periods.

Results: Our analysis included 15,349 patients (median age=57 years, 57% female) who underwent 22 different procedures. The proportion of surgical patients prescribed an opioid at discharge decreased from 71% to 64% in the pre- and post-policy periods, respectively. Across all procedures, the median MME prescribed at discharge fell from 113 (IQR: 0 to 240) in the pre-policy period to 68 (IQR: 0-150) in the post-policy period (difference: -45, 95% CI: -50, -40). Reductions were apparent for most individual procedures. The largest decreases were seen for hip arthroplasty (difference: -225 MME, 95% CI: -290, -160) and rotator cuff repair (difference: -272 MME, 95% CI: -357, -188). Figure 1 shows the smoothed trend in weekly median MME prescribed across the study period. Conclusions: Legislation aimed at curbing acute opioid prescribing had a dramatic impact on the median MMEs prescribed after common surgical procedures.
UNDERSTANDING THE EFFECT OF SYRINGE SERVICE PROGRAMS ON NEIGHBORHOOD CRIME COMPLAINT RATES IN NEW YORK CITY Michelle L. Nolan* Michelle L. Nolan, Elizabeth Mello, Denise Paone, (New York City Department of Health and Mental Hygiene)

Background: Despite strong evidence that syringe service programs (SSPs) are an effective public health intervention, opposition to opening an SSP includes community members’ perception that crime will increase. This study aims to measure whether the opening of an SSP location affects neighborhood crime complaint rates (CCRs). Methods: We used a quasi-experimental design with synthetic controls. We identified all locations where an SSP opened in New York City during 2006-2016. We selected a pool of potential donor controls from a list of legally operating businesses. Donor controls were required to be in a Neighborhood Tabulation Area where an SSP operated and at least 0.5 miles from an SSP. Using New York Police Department Crime Complaint data, we calculated annual CCRs per 1,000 residents in the 0.25 miles around SSPs and donor controls for four crime categories: felony, property, violent, and quality of life. For each SSP location and crime complaint type, we constructed a synthetic control using the optimal weighted averages of donor control locations. We tested for parallel trends in CCRs between the SSP and the synthetic control before the SSP location opened. We used a difference-in-difference model to measure change in CCRs after an SSP opened. Rates for the four CCRs were modeled separately for each SSP. We conducted a meta-analysis of the 27 models using random effects. Results: During 2006-2016, 8 SSP locations opened. Five models without parallel trends were excluded; 27 models were included in the analysis. The opening of an SSP was not associated with changes in CCRs around SSPs (RD = 0.12, 95% CI: -0.78-1.01). Subgroup analysis by CCR type showed similar results: felony (RD = 0.36, 95% CI: -2.51-3.25); property (RD = -0.50, 95% CI: -1.59-0.58); violent (RD = 0.52, 95% CI: -0.65-1.70); quality of life (RD = 1.79, 95% CI: -2.93-6.50). Conclusion: Opening an SSP location was not associated with a significant change in neighborhood crime complaint rates.
THE ROLES OF MATERNAL COMORBIDITIES AND CESAREAN BIRTH IN THE ASSOCIATION BETWEEN PREPREGNANCY BODY MASS INDEX AND SEVERE MATERNAL MORBIDITY
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High prepregnancy body mass index (BMI) has been proposed as a risk factor for severe maternal morbidity (SMM), but evidence has been mixed and potential explanations have not been examined. Both high prepregnancy BMI and SMM have increased substantially over the past 15 years. We evaluated the association between prepregnancy BMI and SMM in 2,650,182 California births during 2007-2012 and assessed potential mediation by BMI-related comorbidities (hypertensive conditions, diabetes, asthma) and cesarean birth. Multivariable logistic regression was used to model total associations and an inverse probability weighting approach for multiple mediators was used to estimate absolute and relative natural direct effects. The prevalence of SMM per 10,000 births was 150 in underweight women, 136 in normal-weight women, 142 in overweight women, 147 in obese class 1 women, 162 in obese class 2 women, and 188 in obese class 3 women. Adjusted risk differences for the total association between prepregnancy BMI and SMM were 14 (95% CI: 6, 22) per 10,000 births for underweight, 5 (95% CI: 2, 9) for overweight, 11 (95% CI: 6, 15) for obesity class 1, 26 (95% CI: 19, 33) for obesity class 2, and 52 (95% CI: 42, 62) for obesity class 3, in comparison to normal weight. After accounting for mediation by comorbidity and cesarean, the risk of SMM associated with underweight increased but there was no risk associated with overweight or obesity. These results suggest that common comorbidities and cesarean birth may explain an association between high—but not low—prepregnancy BMI and SMM. Promotion of healthy prepregnancy weight, along with management of comorbidities and support of vaginal birth when appropriate for women with high BMI, could be potential strategies to reduce the risk of SMM.
ASSOCIATION OF MATERNAL VEGETARIAN DIETS WITH NEONATAL ANTHROPOMETRY IN THE NICHD FETAL GROWTH STUDY

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Vegetarian diets appear to reduce risk of chronic disease in the general population, but the possible effect on fetal growth is understudied. Our aim was to examine associations of gestational vegetarianism (self-defined and operationalized) with neonatal anthropometry. We studied 1964 women who had a singleton livebirth in a diverse multi-site cohort of U.S. pregnant women (2009-2013). To assess peri-conception and first trimester diet, women completed a 145-item self-administered Food Frequency Questionnaire at enrollment (8-13 weeks’ gestation). Self-defined vegetarians said “yes” to the question “For all of the past 3 months, did you follow a vegetarian diet?” Operationalized vegetarianism was defined based on servings of first trimester meat, poultry, and fish (MPF) intake (vegetarian = MPF < 1 month; pesco-vegetarian = MP < 1 month and fish ≥ 1 month; semi-vegetarian= MPF ≥ 1 month and < 1 week). Birthweight was abstracted from medical records and neonatal anthropometrics (upper-arm length, upper-thigh length, head circumference, abdominal circumference, skinfold thickness) were measured post-delivery using a standard protocol. Linear regression was used to model neonatal outcomes. To assess the association of vegetarianism with gestational age, we also used cox proportional hazards models to estimate time to delivery. There were 99 (6.03%) self-defined, 32 (1.91%) operationalized, 7 (0.42%) pesco- and 321 (19.12%) semi-vegetarians. Neonates of vegetarians had significantly lower birth weight and birth length than nonvegetarians in maximally adjusted models (Figure). Associations with all other measures of neonatal anthropometrics and time to delivery were null. Both self-defined and operationalized vegetarianism was significantly associated with decreased birth weight and birth length. Further work is needed to better understand the impact of this maternal diet on the neonate.

Figure 1: Adjusted associations of maternal self-defined and operationalized vegetarianism with neonatal birth weight and birth length (β (95% CI)) Models adjusted for age, parity, pre-pregnancy BMI, race, marital status, education, income, current job/student status, insurance coverage, infant sex, pre-pregnancy weekly physical activity, total daily energy, and diet quality. Diet quality was defined using the Healthy Eating Index-2010 (HEI-2010) without the Total Protein Foods and Seafood/Plant Proteins components. Multiple imputation was used to address missing data.
CAFFEINATED BEVERAGE INTAKE AND SERUM CAFFEINE METABOLITES AND RISK OF PREGNANCY LOSS


The association between caffeine and pregnancy loss remains controversial due to limitations of prior studies such as relying on self-reported intake only, exposure measurement after clinical confirmation of pregnancy, and potential time-varying confounding by nausea/vomiting and lifestyle factors, which may be affected by prior caffeine exposure. Thus, our aim was to evaluate associations of preconception and early pregnancy serum caffeine, paraxanthine, and theobromine, self-reported intake of caffeinated beverages, and risk of pregnancy loss among 1228 reproductive-age women attempting pregnancy in the EAGeR trial during 2007-2011. We estimated HRs and 95% CIs for any pregnancy loss, hCG loss (prior to ultrasound confirmation), and clinical loss (after ultrasound confirmation) according to caffeinated beverage intake and caffeine biomarkers measured at preconception and the 8th week of gestation using weighted adjusted Cox proportional hazards models. At preconception, 67%, 28%, and 9% of women reported any intake of caffeinated sodas, coffee, and tea, respectively. Preconception total caffeinated beverage intake of ≥3 vs. 0 cups/day was associated with 85% (95% CI: 1.18, 2.94) higher risk of any pregnancy loss, driven primarily by associations for hCG loss (HR: 2.88 (95% CI: 1.20, 6.91)). Caffeinated soda intake was associated with hCG loss (≥2 vs. <2 cups/day HR: 2.11 (95% CI: 1.14, 3.89)), whereas caffeinated coffee intake was associated with clinical loss (≥2 vs. 0.2 vs. ≤0.2 ng/mL) at preconception was strongly associated with hCG loss (HR: 4.51 (95% CI: 1.36, 14.91)). Serum caffeine, paraxanthine, and theobromine measured at the 8th week of gestation were not associated with risk of loss. Collectively, these data suggest that caffeine intake prior to pregnancy may increase risk of pregnancy loss, particularly in early gestation.
EXAMINING DISPARITIES IN FOOD ACCESSIBILITY AMONG HOUSEHOLDS IN COLUMBUS, OHIO: AN AGENT-BASED MODEL Ayaz Hyder* Ayaz Hyder, Keumseok Koh, Rebecca Reno, (College of Public Health, The Ohio State University)

The objectives of this study were to evaluate the effect of complex interactions among household and environmental-level factors on household-level food availability via a simulation model, the Food Accessibility Agent-based Model in Central Columbus, Ohio and to test impacts of novel interventions for reducing disparities in food availability. The model simulates food shopping patterns of households based on actual location of homes and food stores, transportation network, household income, vehicle ownership, and distance to food stores. Policy interventions, which were evaluated as single or combined interventions, include: (1) reducing preference for convenience stores/partial markets; (2) increasing food availability in stores; and (3) increasing household income through a guaranteed basic income supplement program. The simulation model estimated that mean food availability for food insecure households is 23% (95% Confidence Interval (CI): 22-24%) lower than for food secure households. Increasing household income among the poorest households may lead to a 14% (95% CI: 13-18%) increase in monthly food availability for food insecure households. Implementing multiple interventions would lead to a 41% (95% CI: 40-43%) increase in monthly food availability among food insecure households. This study exemplifies how a systems science approach may serve as an effective and efficient tool for evaluating “What if?” scenarios for improving household-level food security.

S/P indicates work done while a student/postdoc
**DISORDERED EATING BEHAVIORS AND 15-YEAR TRAJECTORIES IN BODY MASS INDEX: FINDINGS FROM PROJECT EAT**

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**Background:** A broad range of disordered eating behaviors (DEB), including binge eating, caloric restriction, and purging types of weight control behaviors are prevalent among adolescents. Longitudinal studies report individual DEB associates with higher BMI and obesity. However, it is unclear whether trajectories in BMI are graded by the number of DEB endorsed. **Objectives:** This study had three objectives: (1) assess the distribution of the number of DEB used by adolescents (age 11 to 18 years), (2) examine whether the use of DEB is associated with a higher BMI trajectory throughout adulthood (age 27 to 33 at EAT-IV), and (3) examine if BMI trajectories are graded by the number of DEB. **Methods:** Data on 1230 cohort members of the Project EAT (Eating and Activity in Teens and Young Adults) study were used to examine adolescent’s report of DEB and to create a summed DEB scale. The summed DEB scale corresponds to the count of DEB constructs (0-7) that were endorsed at baseline (EAT-I). Self-reported BMI at baseline (EAT-I) and at each three follow-up assessment (EAT II-IV) was provided by cohort members. Repeated measures regression examined the association between DEB and BMI trajectories. **Results:** Approximately 21% of the adolescents endorsed one DEB and 19.7% engaged in multiple DEB (DEB ≥ 2 points) at baseline (1998-1999). BMI trajectories were higher among females with disordered eating behaviors (DEB ≥ 1 point) compared to females without disordered eating behaviors (DEB 0 points) after adjustment for demographics. The mean BMI difference between DEB ≥1 point vs 0 points diverged over time. After further adjustment for baseline BMI, the mean BMI difference attenuated and remained significant only at EAT-III and IV (p <0.05). **Conclusions:** DEB have a long-lasting effect on BMI among females, but the trajectory is not graded by the number of DEB.

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**15-year longitudinal associations between disordered eating behaviors categories and BMI trajectory (N=1230)**

**Note:**

Male DEB 0 points n=411, 1 point n=102, 2-7 points n=43
Female DEB 0 points n=356, 1 point n=133, 2 points n=183

S/P indicates work done while a student/postdoc
Childhood maltreatment (CM) is common and several studies report associations between CM exposure and obesity in adulthood; however, few studies have explored associations between CM and obesogenic behavior among adults. The goals of this study were to assess associations between retrospectively self-reported CM and self-reported obesogenic behaviors over the last week among young adults (ages 24-32) and to assess whether associations differed by sex. The associations were explored in the National Longitudinal Study of Adolescent to Adult Health, a United States nationally representative study (analytic N=10,969). We examined CM exposures individually (sexual abuse, physical abuse, emotional abuse and neglect) and as a sum (1 versus 0 exposures and 2+ versus 0 exposures). Each obesogenic behavior (sugar sweetened beverage consumption (SSB), fast food consumption, hours of computer use outside work/school, hours of television/video watching, and lack of physical activity) was operationalized as the 50th (above average) and 90th (high) percentiles. We used predicted marginal proportions accounting for the complex sample design to obtain prevalence ratios (PRs) and adjusted for demographic factors and a CM*sex interaction term.

In men, experiencing 2+ CM exposures was associated with high fast food consumption (aPR=1.28(95% CI:1.02,1.60)), and in women, it was associated with high SSB (aPR = 1.55(95% CI:1.16,2.07)) and high computer use outside of work/school (aPR=1.68 (95% CI:1.22,2.32)). In men and women, exposure to non-parent/caregiver perpetrated sexual abuse by physical force tended to yield the largest associations with obesogenic behaviors (e.g., for high computer usage outside work/school, aPR=1.96(95% CI:1.33,2.89)). These findings show that high levels of certain obesogenic behaviors in adulthood are associated with CM, namely polymaltreatment and non-parent/caregiver sexual abuse by force, and provide evidence for effect modification by sex.
MORTALITY AMONG OIL SPILL RESPONSE AND CLEAN-UP WORKERS 1-6 YEARS FOLLOWING THE DEEPWATER HORIZON DISASTER

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Introduction: Little is known about mortality following the Deepwater Horizon oil spill, but possible deaths due to chemical exposures, substance abuse, violence, and suicide are of concern. We examined mortality 1-6 years following the disaster. Methods: We studied 32,360 participants in the Gulf Long-Term Follow-up (GuLF) study, a prospective study of oil spill response and clean-up workers (n=24,756) and non-workers (n=7,604). Mortality through 2016 was ascertained via the National Death Index (NDI). To describe mortality in the overall cohort, we used the Kaplan-Meier estimator and calculated causal mortality ratios (CMR’s) using reference rates from the CDC WONDER Online Database. To quantify the association between oil exposures and mortality among workers, we used proportional hazards regression to calculate covariate-adjusted hazard ratios (HR’s). Results: The 6-year cumulative incidence of all-cause mortality was 2% (95% CI: 2%, 3%) and the CMR was 0.78 (95% CI: 0.72, 0.84). Mortality was comparable between workers and non-workers (HR: 1.07; 95% CI: 0.50, 2.29). Among workers, mortality was elevated among those in jobs with higher overall oil exposures compared to those in administrative support roles, particularly for decontamination workers (HR: 1.49; 95% CI: 1.02, 2.18). Exposure to burning/flaring was also associated with elevated mortality (HR: 1.39; 95% CI: 1.05, 1.84). The top five causes of death among workers were heart disease (CMR=0.68; 95% CI: 0.54, 0.81), accidents (CMR=1.20, 95% CI: 0.96; 1.49), cancer of the trachea/bronchus/lung (CMR=0.75, 95% CI: 0.52; 1.03), suicide (CMR=1.01, 95% CI: 0.68; 1.45), and assault (CMR=1.55, 95% CI: 0.99; 2.35). Conclusions: We did not find evidence of excess mortality following the Deepwater Horizon oil spill in the overall GuLF cohort. Among workers, higher overall oil exposures during the clean-up was associated with increased mortality.
LUNG FUNCTION IN OIL SPILL RESPONDERS 4-6 YEARS AFTER THE DEEPWATER HORIZON DISASTER

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Background: Individuals who participated in the oil spill response and cleanup (OSRC) efforts following the 2010 Deepwater Horizon (DWH) disaster had reduced lung function 1-3 years later. However, questions remain about whether reduced lung function in OSRC workers persists over time. Objective: To evaluate lung function in OSRC workers 4-6 years following the DWH disaster. Methods: We used data from the Gulf Long-Term Follow-up Study, a cohort of OSRC workers and nonworkers. Eligible participants completed an initial pulmonary function test (PFT) at a home visit (2011-2013) and a second test at a clinical exam (2014-2016) (N=2,422). We included participants with complete covariate information who met 2005 American Thoracic Society PFT acceptability criteria (N=2,129). We evaluated OSRC work job classes and potential exposure to burning oil/gas among workers only (N=1,801). Outcomes assessed include forced expiratory volume in one second (FEV1; mL) and the forced vital capacity (FVC; mL). We evaluated the cross-sectional relationship between OSRC work exposures and lung function 4-6 years later using multivariable linear regression. We assessed the longitudinal relationship, modeling the change in lung function between the first and second PFT using multivariable linear mixed models with age as a time varying confounder. Results: 4-6 years later, workers with high potential exposure to burning oil/gas had lower lung function compared to unexposed workers: FEV1 (Beta: -267 mL, 95% CI: -633, 99) and FVC (Beta: -281 mL, 95% CI: -629, 67). In longitudinal analyses this represented lung function improvement over time: FEV1 (Beta: 115 mL, 95% CI: -197, 428) and FVC (Beta: 52 mL, 95% CI: -200, 303). Patterns were similar for decontamination versus support workers. Conclusions: Lung function remained lower for some OSRC workers 4-6 years after the spill, but changes in lung function suggest improvement rather than decline over time.
Background: Miners are highly exposed to diesel exhaust emissions from powered equipment. Although biologically plausible, there is little evidence based on quantitative exposure assessment that long-term diesel exposure increases the risk of chronic obstructive pulmonary disease (COPD). To fill this gap, we examined COPD mortality and exposure to diesel exhaust in the Diesel Exhaust in Miners Study (DEMS). Methods: We fit Cox models to estimate hazard ratios (HRs) for COPD mortality in relation to cumulative exposure (µg/m3-years) to respirable elemental carbon (REC), a key metric for diesel exhaust exposure. Separate models were fit for ever-underground and surface-only miners to examine effect modification. Exposure was lagged by 0, 10 and 15 years. In a secondary analysis, we addressed the healthy worker survivor effect by applying the parametric g-formula to handle time-varying confounding by employment status (as a marker of health) for ever-underground workers. Results: Based on 149 cases, the HRs for COPD mortality increased as categories of lagged REC exposure increased for all workers, with wide confidence intervals. In stratified models there was more evidence of an exposure-response relationship for each location than there was in the pooled models. The highest HRs were observed among surface workers; HRs were two-fold for the middle tertiles (>8-22 µg/m3-yrs) in the unlagged (HR 2.24: 95% CI 1.08-4.61) and 10-yr lagged models (2.03: 1.01-4.09). In the 15-year lagged model, the risk of COPD mortality was highest among those exposed above 22µg/m3-yrs (2.06: 0.81-5.28). Using the g-formula, we estimated that the simulated lifetime cumulative risk of COPD mortality would have been reduced from the observed 9.7% to 6.6% under a hypothetical intervention where all underground workers were always unexposed. Conclusions: Our results suggest that long term exposure to diesel exhaust may increase risk of COPD in miners, though power was limited in this study.
HEALTH EFFECTS OF SILICA IN THE SETTING OF MIXED DUST EXPOSURES IN TACONITE MINING
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Objective: The objective of this study was to explore possible combined effects of silica, elongate mineral particles (EMP) and non-silica dust on non-malignant respiratory disease (NMRD) in taconite miners. Methods: The Respiratory Health Survey was a cross-sectional study of current and former Minnesota taconite industry miners comprised of a health assessment (medical questionnaire, chest x-ray and pulmonary function testing). This was combined with extensive exposure assessment for silica– the primary exposure of interest, EMPs, and non-silica respirable dust. Non-asbestiform EMPs and cleavage fragments were the predominant fibers. Prevalence ratios (PR) were estimated for individual and combined associations analyses for silica, EMPs, and non-silica fractions. Relative excess risk due to interaction (RERI), attributable proportions (AP) and synergy index (SI) with 95% CIs, were estimated for additive interaction analyses. Multiplicative (using product terms in the models) and additive interactions were estimated adjusting for age, BMI, gender, smoking and commercial asbestos exposure in a Poisson regression model. Results: The prevalence of spirometric restrictive ventilatory defect (RVD) was 7.2%. The prevalence of chest x-ray parenchymal abnormalities was 5.4%. Silica exposure was significantly associated with RVD (PR = 1.40, 95% CI= 1.08 – 1.81) and parenchymal changes (PR = 1.30, 95% CI= 1.00 – 1.69). There were no statistically significant multiplicative or additive interaction estimates noted for either silica-EMP or silica-non-silica dust analyses, and for either spirometric restriction or parenchymal abnormality outcomes. Conclusions: These analyses suggest that neither the presence of EMPs or non-silica dust significantly modify the association between respirable silica exposure in taconite mining and NMRD outcomes on either the additive or the multiplicative scales at levels experienced in this work setting.
Background: Agricultural work and occupational pesticide use have been associated with increased risk of renal cell carcinoma (RCC), the most common form of kidney cancer. However, few prospective studies have investigated links to specific pesticides. Methods: We evaluated the associations between lifetime use (intensity-weighted lifetime days [IWD]) of 38 pesticides and incident RCC in the Agricultural Health Study, a prospective cohort of licensed pesticide applicators in Iowa and North Carolina. Among 55,873 applicators, 308 cases were diagnosed between enrollment (1993-1997) and the end of follow-up (2014-2015). We estimated incidence rate ratios (RRs) and 95% confidence intervals (CIs) using Poisson regression, controlling for potential confounding factors, with lagged and unlagged pesticide exposures. Results: A statistically significant increased risk of RCC was observed among the highest users of 2,4,5-T compared with never users (unlagged RR IWD Tertile 3 2.90, 95% CI 1.64-5.14; p-trend=0.001), with similar risk estimates in lagged analyses (20-year lag RR IWD Tertile 3 3.35, 95% CI 1.82-6.19; p-trend=0.001). In 20-year lagged analyses, we also found exposure-response associations with chlorpyrifos (RR IWD Quartile 4=1.64, 95% CI 1.02-2.63; p-trend=0.03), chlordane (RR IWD Tertile 3=2.04, 95% CI 1.09-3.82; p-trend=0.04), cyanazine (RR IWD Quartile 4=1.56, 95% CI 1.00-2.42; p-trend=0.05), and atrazine (RR IWD Quartile 4=1.39, 95% CI 0.98-1.98; p-trend=0.04). Conclusions: This is, to our knowledge, the first prospective study to comprehensively evaluate RCC risk in relation to various specific pesticides with unlagged and lagged exposures. We found evidence of associations with RCC for several pesticides, most notably 2,4,5-T, a chlorophenoxy herbicide of particular interest given its historical contamination with 2,3,7,8-tetrachlorodibenzo-p-dioxin.
MATERNAL OCCUPATIONAL OIL MIST EXPOSURE AND BIRTH DEFECTS — UNITED STATES, 1997–2011

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Background: Over one million U.S. workers in approximately 40 industries are exposed to metalworking fluids. When metalworking fluids are aerosolized, workers can be exposed to the resultant oil mists through skin contact or inhalation. A previous CDC birth defect cluster investigation at a steel strip manufacturing company found oil mists were one common exposure among fathers of infants born with heart defects. A potential explanation was take-home exposure — workers wore oil mist-contaminated clothes home from work, exposing pregnant partners. However, little research exists on reproductive effects of direct maternal occupational oil mist exposure. We aimed to investigate associations between occupational oil mist exposure during pregnancy and a spectrum of birth defects.

Methods: We analyzed population-based case-control data from the multisite National Birth Defects Prevention Study. We evaluated occupational exposure among 22,011 mothers of infants with birth defects and 8,140 mothers of infants without birth defects. To estimate associations between oil mist exposure during pregnancy and individual birth defects, we used logistic regression to calculate odds ratios (OR) and 95% confidence intervals (CI), controlling for study site and smoking status.

Results: Manufacturing jobs, particularly apparel manufacturing, comprised the largest groups of exposed mothers. Mothers of infants with septal heart defects (OR: 1.8; CI: 1.1–3.3), especially perimembraneous ventricular septal defects (OR: 2.5; CI: 1.2–5.2), were more likely to be exposed to oil mists than control mothers. Associations for both defects were stronger for mothers with higher exposure (OR: 2.3; CI: 1.1–4.9, OR: 2.8; CI: 1.1–7.6, respectively) than lower exposure. Conclusions: Results support an association between maternal occupational oil mist exposure and septal heart defects. Further research could evaluate reproductive effects of occupational oil mist exposure.

S/P indicates work done while a student/postdoc
AMBIENT AIR POLLUTION DURING PRECONCEPTION AND PERI-IMPLANTATION AND ODDS OF MALE VERSUS FEMALE LIVE BIRTH

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Introduction: The systemic inflammation and oxidative stress associated with ambient air pollution may differentially affect probability of male and female live birth. Possible mechanisms include alterations of the sperm X:Y chromosome ratio, hormone levels at conception and endometrial receptivity. As these pathways occur before recognition of pregnancy, no prior population-based studies have evaluated exposure to air pollution during these sensitive windows and offspring sex. Methods: The LIFE study enrolled 501 couples without infertility and followed them for up to one year of attempting pregnancy, and, if they became pregnant, through delivery. Criteria air pollutants and temperature were estimated using the Community Multiscale Air Quality (CMAQ) and Weather and Research Forecasting models. Exposure windows were spermatogenesis (75 days before ovulation), pre-conception (5 days before to 1 day after ovulation) and peri-implantation (6 to 10 days after ovulation). Discrete-time survival models estimated menstrual-cycle probability of male and female live birth (versus pregnancy loss, no pregnancy or opposite sex live birth) adjusting for season, site and couple-level characteristics. Results: During spermatogenesis, an interquartile increase in ozone and nitrogen oxides was associated with 40% lower (95% CI 0.39, 0.92) and 33% higher (95% CI 1.01, 1.76) odds of male live birth. Pre-conception ozone was similarly associated with 32% lower odds of male live birth (95% CI 0.46, 1.02). Conversely, during peri-implantation, an interquartile increase in ozone and degree Celsius increase in temperature was associated with 34% (95% CI 0.44, 1.00) and 8% (95% CI 0.87, 0.98) lower odds of a female live birth. Discussion: These novel findings suggest that timing of exposure to air pollutants may influence offspring sex, with unique mechanisms affecting male versus female live birth. Further work confirming these findings and elucidating underlying mechanisms is warranted.

S/P indicates work done while a student/postdoc
Evidence suggests that changes in household socioeconomic status [SES] are associated with children’s health outcomes. The 2008 Great Recession had a dramatic economic impact on many families, and recent studies have linked household SES changes, including parental job loss, during the economic downturn to a range of child health outcomes. As of yet, no studies have examined the underlying biological mechanisms that may link changes in household SES during recessions to health in early life. This study uses data on a range of metabolic, cardiovascular, and stress-related inflammatory biomarkers and anthropometric measures for 5842 seven year old children from the Generation XXI cohort to examine whether parental unemployment during the Great Recession in Portugal is associated with worse biomarker profiles and anthropometric outcomes. Using linear regression models, we find that mother’s job loss was associated with higher systolic blood pressure, diastolic blood pressure, heart rate, and fat mass percent, while father’s job loss was associated with higher weight, waist circumference, hip circumference, body mass index, waist to height ratio, and low-density lipoprotein cholesterol levels. Sub-group analyses reveal associations are stronger for girls and for children from households with lower parental education levels. This study contributes to the literature by using biomarkers to examine the potential underlying pathways through which economic shocks impact health in childhood. The findings suggest that experiencing an SES shock, specifically parental job loss, may have primarily impacted children through nutrition related pathways, which are reflected in worse metabolic and cardiovascular biomarker profiles as well as worse anthropometric outcomes. The results highlight the importance of protecting vulnerable families during economic downturns, as they may have lasting consequences for child health.
CONSIDERING RACE, GENDER, DISABILITY AND THE DISCIPLINE GAP Karishma Furtado*
Karishma Furtado, Sarah Van Alsten, Pranav Nandan, Jennifer Kocher, Alexis Duncan, (Washington University in St. Louis)

Background: Out-of-school suspension (OSS), a common form of school discipline, has been tied to several adverse educational and life outcomes. Individual characteristics, like being disabled or Black, put students at greater risk of OSS. However, few studies examine these risk factors from an intersectional perspective.

Methods: We constructed a multilevel dataset using school-level data for the 30 school districts in the metropolitan St. Louis, MO region from the publicly available 2015-16 Civil Rights Data Collection. Reverse engineering from cell count aggregates, we reconstituted individual-level race, gender, disability (Individualized Education Program; IEP) status, and OSS history variables, and appended school-building and district-level variables to them. We applied logistic multilevel regression to the resulting dataset of over 166,000 K-12 students to examine the interaction of race, gender, and disability on the likelihood of OSS. Results: Being male, Black, or having an IEP were all significant risk factors for OSS. All two-way interactions of these characteristics were statistically significant (p<0.001); however, the three-way interaction was not significant. The greatest independent risk factor of OSS was being Black (OR=7.55, p<0.001), followed by having an IEP (OR= 4.49, p<0.001), and being male (OR= 2.83, p<0.001). Taking into account all the two-way interactions, white females without IEPs had a 1.3% predicted probability of being suspended. Black males with IEPs were over 17 times as likely to be suspended (predicted probability = 22.8%). Conclusion: Students—like all people—claim and are perceived as holding multiple identities simultaneously. Some “doubly” marginalized student populations like Black males or Black students with disabilities are at higher risk for suspension than would be expected when considering only one identity. We must apply a more intersectional approach to our collective pursuit of educational equity.
WORKPLACE GENDER COMPOSITION AND TREATMENT FOR DEPRESSION AMONG BLUE-COLLAR WORKERS IN THE U.S. ALUMINUM INDUSTRY

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Introduction: Past research finds that workers in male-dominated workplaces experience decreased job satisfaction and increased work-related stress. However, systematic evidence regarding the association between workplace gender composition and mental health remains limited. Methods: Using data from the American Manufacturing Cohort Study (AMC), we examined the association between workplace gender composition and treated depression among blue-collar workers employed at 32 U.S. aluminum plants from 2003 - 2013. We used generalized additive models (GAM) to model the risk of treated depression as a function of workplace gender composition and covariates (baseline age, race, sex, plant, and calendar year) with cubic smoothing splines to capture potential non-linearities. We used g-computation to estimate the counterfactual risk of treated depression under three hypothetical interventions wherein women comprised at least 10, 20, or 30 percent of the workforce for all plants and years of follow-up. We compared these counterfactual risks to the risk in the observed data (i.e. no intervention). All risk differences reported are per 1,000 workers. Results: The study sample included 5,279 blue-collar women and 24,124 blue-collar men. We observed decreased risk of treated depression when women comprised at least 20 percent of the workforce for women (RD = -3.95; 95% CI -7.18, -0.72) and men (RD = -6.4; 95% CI -8.65, -4.15) versus the observed data. We observed larger decreases in risk of treated depression when women comprised at least 30 percent of the workforce for both women (RD = -11.7; 95% CI -20.5, -2.88) and men (RD = -14.5; 95% CI -17.7, -11.2). Conclusion: We find that workplace feminization is associated with decreased risk of treated depression among both women and men in blue-collar jobs. Our results motivate continued examination of the implications of workplace gender composition for the health of workers employed across varied industry sectors and workplaces.

![Graph](image)

*Figure:* We used generalized additive models (GAM) with a logit link to model the risk of treatment for depression as a function of the plant-level gender composition and covariates (age at the start of follow-up, race, and sex). All models included a set of controls for plant and calendar year to account for geographic and temporal variation, respectively. We used g-computation to summarize the population average association between the plant-level gender composition and treatment for depression under three hypothetical intervention scenarios for all workers, and then separately among female and male workers. Using fitted GAMs, we estimated the risk that at least one depression-related outpatient visit occurred within a given person-year under the hypothetical intervention wherein all plants employed at least 10, 20, or 30 percent women for all years of follow-up. All observations below the specified threshold were re-assigned to equal 10, 20, or 30 percent, and assumed their original, observed value otherwise. We calculated risk differences (RDs) by contrasting the risk of the outcome under each hypothetical intervention scenario versus the risk calculated from the observed data. All risk differences reported correspond to the difference in the number of workers treated for depression per 1,000 within a given study year.

S/P indicates work done while a student/postdoc
SEX STEROID HORMONES AND ASTHMA IN A NATIONWIDE STUDY OF US ADULTS Yueh-Ying Han* Yueh-Ying Han, Erick Forno, Juan C. Celedón, (University of Pittsburgh)

Background: Although sex-specific differences in asthma are well-known, the role of male and female sex hormones in asthma pathogenesis is not well understood. Methods: In a cross-sectional study, we analyzed data from 9,290 adults aged 18-79 years from the 2013-2016 National Health and Nutrition Examination Survey (NHANES) who had data on serum levels of sex steroid hormones (total testosterone, estradiol, and sex hormone binding globulin). Asthma was defined as physician-diagnosed asthma and report of still having asthma. Asthma exacerbation were defined as ≥1 asthma attack or emergency care visit for asthma in the past year. Multivariable logistic regression was used for the analysis of sex hormone levels and asthma stratified by sex. All analyses were adjusted for age, race/ethnicity, annual household income, body mass index, family history of asthma, second-hand smoke, and smoking status. Results: Among women, higher total testosterone and estradiol were associated with 35% and 28% lower odds of asthma, respectively (OR for 2nd to 4th quartiles vs. 1st quartile=0.65 [95% CI=0.50-0.85] for total testosterone; and 0.72 [95% CI=0.53-0.98] for estradiol). Given a significant interaction between obesity and sex steroid hormones on asthma and significant change of hormone levels after menopause in women, we stratified the analysis by obesity and menopausal status. In this analysis, higher total testosterone and estradiol were each associated with lower odds of asthma in post-menopausal obese women, but not in pre-menopausal women or post-menopausal non-obese women. Higher estradiol was also associated with decreased odds of asthma exacerbation in women (OR for 2nd to 4th quartile vs. 1st quartile=0.41 [95% CI=0.22-0.78]). Sex steroid hormones were not significantly associated with asthma or asthma exacerbation in men. Conclusion: Our results suggest that testosterone and estradiol are linked to reduced risk of asthma in women, particularly post-menopausal obese women.
THE EFFECT OF NEIGHBORHOOD PERCEPTION ON THE DIVERGENCE BETWEEN CHRONOLOGICAL AND DNA METHYLATION AGE

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Neighborhood-level disadvantage has been shown to hasten the acceleration of DNA methylation (DNAm) aging, yet the impact of an individual’s neighborhood perception on methylation aging has been understudied. Using data from 160 primarily African-American participants of the Detroit Neighborhood Health Study, we examined the association between neighborhood perception and DNAm aging. Neighborhood perception was based on responses to how much participants liked living in their neighborhood: a great deal, somewhat, not too much, or not at all, where a higher score reflects better perception. DNAm aging was measured using Horvath's epigenetic clock and calculated as the difference between DNAm and chronological age. Linear regression models were used to investigate the associations and effect measure modification by sex was examined using a Wald test. DNAm age and chronological age were correlated (ρ = 0.81, p-value <0.0001). In the age adjusted model, we observed differences in the neighborhood perception-DNAm aging association by gender (Wald p-value = 0.04). Among males, we observed that higher neighborhood perception scores were associated with younger DNAm age (β = -1.71, 95% CI: -3.70, 0.28) after adjusting for age, race/ethnicity, educational attainment, income level, and marital status. However, among females, a higher perception score was associated with older DNAm age (β = 1.44, 95% CI: -0.13, 3.00), after the same adjustment set. Sex-stratified associations were attenuated upon further adjustment for lifetime cigarette smoking and alcohol use, but continued to indicate divergent patterns (males: β = -1.30, 95% CI: -3.35, 0.75 and females: β = 1.50, 95% CI: -0.07, 3.07). Our findings suggest distinct gender differences in the association between perception of adverse neighborhood conditions and DNAm age. Future research should aim to uncover the social and biological factors that drive these countervailing neighborhood perception effects on DNAm age by gender.
COGNITION, MOOD, AND FECAL MICROBIOTA COMPOSITION IN A POPULATION-BASED SAMPLE OF OLDER ADULTS Audrey Renson* Audrey Renson, Lora J. Kasselman, Francesco Beghini, Heidi E. Jones, Levi Waldron, Pamela Herd, Jennifer B. Dowd, (Department of Epidemiology, The Gillings School of Global Public Health, The University of North Carolina Chapel-Hill, Chapel Hill, NC, USA)

Introduction: Recent evidence from in vivo experiments and small clinical studies suggests gut microbiota may be etiologically involved in depression, anxiety, and degenerative cognitive decline, but to our knowledge no population-based study has examined these hypotheses. Methods: A random subsample of Wisconsin Longitudinal Study participants in 2011 was selected for a full stool sample and 16S rRNA sequencing. We calculated alpha and beta diversity and estimated compositionality-robust associations between relative abundance of bacterial taxa and cognition [quantitative reasoning (McArdle & Woodcock task), verbal fluency (factor score for letter and category fluency), and memory/attention (factor score digit ordering and recall)] and mood [depression (CES-D), anxiety (Spielberger index), anger (Spielberger index), and hostility], corrected for <5% false discovery rate. We used propensity score methods to adjust for multiple confounders. Results: In 313 participants aged 52-86 years, all cognition and mood measures were associated with differential abundance of between 2 and 7 bacterial taxa. Higher quantitative, memory/attention, and verbal cognition scores were associated with greater abundance of members of the genera Ruminococcus, Akkermansia, Blautia, and unclassified members of families Ruminococcaceae and Lachnospiraceae, but lower abundance of Roseburia, Clostridium, Eubacterium, and Ruminococcus gnavus. Several Bacteroides species were positively associated with depression, anxiety, anger, and hostility. Anxiety was negatively associated with Clostridium, and anger was positively associated with Coriobacteriaceae and with Alistipes massiliensis. Cognition and mood were not associated with alpha or beta diversity. Conclusion: Of bacteria associated with mood and cognition variables, the majority were common short-chain fatty acid producers, suggesting a possible role of gut mucosal barrier maintenance in mental health and cognitive decline.

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A MEDICARE CLAIMS-BASED FRAILTY PHENOTYPE IS ASSOCIATED WITH COGNITIVE DECLINE IN COMMUNITY-BASED OLDER ADULTS Bryan D. James* Bryan D. James, Aron Buchman, Julie A. Schneider, David A. Bennett, Raj C. Shah, (Rush Alzheimer's Disease Center)

Physical frailty is associated with rate of cognitive decline in older adults using an in-person index with performance-based and self-report items. Recently, a claim-based phenotype of frailty from administrative health records has been developed. This study examined the relationship of this claims-based frailty phenotype with cognitive decline in community-dwelling older adults, and whether this association was independent of an in-person measure of frailty (not frail, pre-frail, frail). We used clinical, cognitive, and survey data from the Rush Memory and Aging Project (MAP), a longitudinal study of aging, linked to Medicare claims data from 1999 to 2010. MAP participants included 902 persons age 65 years and older (mean=82 years) without dementia who had at least one year of Medicare claims, and underwent in-person assessments of frailty at baseline and annual evaluation of cognition. The claims-based frailty phenotype was based on ICD-9, CPT, and HCPC codes derived from a previously validated index (correlation with in-person measure=0.33. We used linear mixed effects models with a measure of global cognition derived from 19 neuropsychological tests as the outcome, adjusted for age, sex, education, and the interactions of these terms with time since baseline. During a mean 5 years of follow-up, the mean annual rate of cognitive decline was 0.10 z-score units (SE = 0.01 units). In a model including both frailty measures, claims-based frailty was independently associated with both level (est=-0.24, SE=0.04, p<0.001) and rate of change (est=-0.03, SE=0.01, p=0.002) in cognition, as was the in-person frailty measure (level: est=-0.21, SE=0.04, p<0.001, rate: est=-0.03, SE=0.08, p<0.001). There were no significant interactions between the two measures. These findings indicate that claims-based frailty phenotype may have clinical validity for cognitive outcomes, but that it captures complementary yet distinct aspects of the frailty construct from in-person measures.
MATERNAL DYSLIPIDEMIA DURING EARLY PREGNANCY AND EPIGENETIC AGING OF THE PLACENTA Deepika Shrestha* Deepika Shrestha, Tsegaselassie Workalemahu, Salman M. Tajuddin, Fasil Tekola-Ayele, (Epidemiology Branch, Division of Intramural Population Health Research, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD, USA.)

Introduction: Disruption of physiological aging of the placenta is associated with obstetric complications. Altered lipid metabolism is a known trigger of tissue aging, but the effect of maternal dyslipidemia on placental aging is not clearly understood. We examined the relationship between maternal dyslipidemia and placental age acceleration (PAA), the difference between DNA methylation age and chronological gestational age and tested whether the association varies by maternal prepregnancy obesity status and fetal sex. Methods: We used placental data (n=301) obtained as part of the NICHD Fetal Growth Studies that involved participants from four race/ethnic groups. Placental DNA methylation age was estimated using 62 CpG sites that have previously been found to have high prediction accuracy. We used multivariate linear regression to test associations between maternal dyslipidemia during early gestation (i.e., high-density lipoprotein cholesterol (HDLc), low-density lipoprotein cholesterol (LDLc), triglycerides, and total cholesterol (TChol) and PAA. Results: There was no significant association of dyslipidemia and PAA in the overall samples. Among normal weight women, low HDLc, compared to high HDLc, was significantly associated with 0.82 (95% CI: 0.00, 1.64) weeks higher PAA. Among women with female neonates, low HDLc, compared to high HDLc, was associated with 1.20 (95% CI: 0.17, 2.24) weeks higher PAA. High TChol was associated with 1.28 (95% CI: 0.12, 2.45) weeks higher PAA among Whites. Conclusions: Our study showed that maternal dyslipidemia due to low HDLc is associated with accelerated epigenetic aging of the placenta among mothers with normal prepregnancy weight and in female fetus gestations.
Latinos are disproportionately burdened by dementia. As the elderly Latino population grows, identification of modifiable determinants is needed to inform interventions. The etiology of dementia is complex and acculturation provides an opportunity to disentangle the health pathways that shape dementia under broad cultural orientations. We examined the association of high US acculturation, compared to high acculturation towards another origin/ancestral country, with cognitive performance and incident dementia/cognitive impairment, not dementia (CIND) in an older Latino cohort in Sacramento, California: Sacramento Area Latino Study on Aging (1998-2008; N=1778; median age: 69.8 years). We used hierarchical linear mixed models and Fine and Gray competing risk regression to assess associations between a multidimensional US acculturation measure, repeated cognitive assessments, and a multistage clinical dementia diagnosis. Participants were followed for up to 7 visits. We accounted for attrition with inverse probability weights. We also investigated the modifying role of education and whether language acculturation (vs. practice and identity) drove associations. In adjusted models, participants with high US acculturation had 0.20 fewer log-errors on the baseline cognitive assessment (better cognitive performance) than those with low (β [standard error]: -0.20 [0.05]). Participants with high practice and identity US acculturation had 44% lower risk of dementia/CIND than those with low (hazard ratio [95% confidence interval]: 0.56 [0.32, 0.98]). Education did not modify associations. Among older Latinos, high US acculturation was associated with improved cognitive performance and reduced dementia/CIND risk. Acculturative factors like social support and networks, rather than language, may drive associations. If replicated, future studies should determine which modifiable mechanisms stemming from high US acculturation may explain findings for potential intervention targets.
GENDER AND SOCIOECONOMIC DISPARITIES IN HEALTH OUTCOMES AMONG OLDER ADULTS IN PARAGUAY: RESULTS FROM THE SURVEY ON HEALTH, WELL-BEING AND AGING (SABE), ASUNCION Jakyung Lee* Soong-nang Jang, Jakyung Lee, Hwajun Kim, Yeon Yoo, Kyuhyun Yoon, (Chung-Ang University)

Paraguay is expected to enter an aging society as the proportion of older people aged 65 or over is getting higher from 3.2% in 1960 to 6.4% in 2017. Unfortunately, important gap in knowledge exists about the present status of health inequity between countries based on the relevant national survey data. We explored the health disparity profile of older adults in Paraguay. We conducted the survey benchmarking the SABE (Survey on Health, Well-being and Aging) of Latin America between November and December 2017 in Paraguay. The questionnaire consists of 10 sections including health status, functional status, anthropometry, utilization of medical services, family and social support. Participants were 487 older adults who are 60 years of age and older, living in Asunción and eight districts of the Central Department. Absolute and relative socioeconomic disparities in health outcomes were estimated according to gender, educational level, and household income. Most older adults in Paraguay had an educational level below elementary school, accounting for 61.4% of men and 75.3% of women. The higher educational level was associated with a better self-rated health (OR: 1.99, 95% CI: 1.15, 3.44). The absolute gender gap in obesity increased with age and women were more likely to be obese than men (OR: 2.47, 95% CI: 1.42, 4.30). The prevalence of diabetes was high in both men (19.6%) and women (32.5%), and the odds ratio was 1.84-fold higher in women than men (95% CI:1.03-3.31). Age and gender were associated with disability in daily activities: the odds ratio was 2.66-fold higher (95% CI: 1.51, 4.66) in 70-79 age group and 6.35-fold higher (95% CI: 2.80, 14.43) in 80+ age group compared to the 60-69 age group, and women were more dependent than men (OR: 2.74, 95% CI: 1.54, 4.86). This study provides the current profiles of health disparities among Paraguayan older adults. Continued research and policy development focusing on preventing chronic diseases and reducing its socioeconomic gap is needed.
Background: Although higher midlife Body Mass Index (BMI) may be a risk factor for Alzheimer’s disease (AD), weight loss is common in the years before AD diagnosis, likely due to appetite changes and worse nutrition. The age at which this change in BMI emerges is unclear but may point the earliest manifestations of AD and a target for AD prevention. We examined the association between AD genetic risk and BMI across mid to late-life as an innovative approach to determine the age at which BMI changes and may indicate preclinical AD. Methods: We studied 407,386 UK Biobank participants aged 39-73 with Caucasian genetic ancestry, and enrolled 2007 - 2010. BMI (kg/m²) was calculated from height and weight measured during the initial Assessment Centre visit. A genetic risk score for AD (AD-GRS) was calculated as a weighted sum of 23 single nucleotide polymorphisms previously confirmed to be genome-wide significant predictors of AD (Z-scored). We evaluated whether the association between AD-GRS and BMI differed by age using linear regression with adjustment for sex and genetic ancestry stratified by age grouping (39-60, 61+). Linear and quadratic terms for age and interactions with AD-GRS determined the earliest age at which AD-GRS trends in BMI diverged from normal age-related trends in BMI. Results: In 39-60 year olds, AD-GRS was borderline but not significantly associated with lower BMI (-0.02 kg/m² per SD in AD-GRS; 95%CI: -0.04, 0.00). In 60+ year olds AD-GRS was more strongly associated with lower BMI (-0.10 kg/m² per 1 SD in AD-GRS; 95%CI: -0.11,-0.07). Model-based BMI age-curves for people with high versus low AD-GRS scores began to diverge by age 57. Conclusion: Weight loss may manifest as an early pathophysiologic change of AD. Genetic factors that increase sporadic AD risk predict lower BMI as early as age 57, over a decade prior to the average AD diagnosis (mid 70s). AD prevention efforts may be most fruitful if focused on mid-life.
EPIGENETIC-BASED MORTALITY RISK SCORE AND THREE AGING BIOMARKERS: ASSOCIATIONS WITH MORTALITY RISKS AMONG OLDER ADULT MALES Xu Gao*, Xu Gao, (Columbia University)

Background: A “mortality risk score” (MS) based on ten prominent mortality-related cytosine-phosphate-guanine (CpG) sites was previously associated with all-cause mortality, but has not been verified externally. We aimed to validate the association of MS with mortality and to compare MS with three aging biomarkers: telomere length (TL), DNA methylation age (DNAmAge) and Phenotypic age (DNAmPhenoAge) to explore whether MS can serve as a reliable measure of biological aging and mortality. Methods: Among 534 males aged 55–85 years from the US Normative Aging Study, the MS, DNAmAge, and DNAmPhenoAge were derived from blood DNA methylation profiles from the Illumina HumanMethylation450 BeadChip, and TL was measured by qRT-PCR. Results: A total of 147 participants died during a median follow-up of 9.4 years. The MS showed strong associations with all-cause, cardiovascular disease (CVD), and cancer mortality. After controlling for all potential covariates, participants with high MS (>5 CpG sites with aberrant methylation) had almost fourfold all-cause mortality (hazard ratio: 3.84, 95% CI: 1.92-7.67) compared to participants with a low MS (0-1 CpG site with aberrant methylation). Similar patterns were observed with respect to CVD and cancer mortality. MS was associated with TL and DNAmPhenoAge acceleration but not with DNAmAge acceleration. Although the MS and DNAmPhenoAge acceleration were independently associated with all-cause mortality, the former exhibited a higher predictive accuracy of mortality than the latter. Conclusions: MS has the potential to be a prominent predictor of mortality that could enhance survival prediction in clinical settings.

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THE EFFECT OF DELAYED SCHOOL START TIME ON OBJECTIVELY MEASURED ADOLESCENT SLEEP DURATION AND QUALITY Aaron T Berger* Aaron T Berger, Darin J Erickson, Conrad Iber, Kyla Wahlstrom, Melissa Laska, Gunna Kilian, Rachel Widome, (Mr.)

Introduction. Previous research has revealed that sleep insufficiency is common among adolescents, leading many school districts to delay high school start times to better align with adolescent circadian timing. Students attending later-starting high schools report longer sleep; however, this has not been measured over multiple years of follow-up or with a contemporaneous control group. The objective of this study was to examine the effect of delaying school start time on changes in sleep duration, timing, and quality in a cohort of high school-aged adolescents. Methods. The START study followed a cohort of students enrolled in 5 public high schools in the Twin Cities, MN metro area from grade 9 through 11. All schools started at 7:30am at baseline in 2016. At waves 2 (2017) and 3 (2018) two schools had delayed their start times by 50-80 min. A subsample of student participants (n = 456) wore wrist activity monitors, which were used to derive sleep timing and quality, for one week at each wave. We used linear mixed model regression to assess changes in sleep over time between school start time groups. Results. Students in later-staring schools had longer school-night sleep periods at follow-up (wave 2: 37 minutes; CI: 23, 50; wave 3: 31 min; CI: 16, 46) and shorter weekend sleep periods (wave 2: -33 min; CI: -56, -10; wave 3: -44 min; CI: -71, -18). Weekday sleep efficiency did not differ significantly (wave 2: 0.4; CI: -0.8, 1.6; wave 3: -1.4; CI: -2.7, 0.01); late-starting students had greater weekday sleep fragmentation at wave 3 (wave 2: 2.1; CI: -0.1, 4.3; wave 3: 4.8; CI: 2.3, 7.3). Weekend sleep midpoint did not differ significantly at follow-up (wave 2: -15 min; CI: -36, 6.8; wave 3: 21 min; CI: -3.5, 45). Discussion: Delayed high school start time can increase weeknight sleep duration and regularity of weeknight versus weekend sleep in adolescence. Compared to studies that rely on self-report or historical control we find a comparable increase in weeknight sleep duration.

Background Gut microbiome diversity varies greatly even among healthy individuals. Previous studies have linked the microbiome to health outcomes such as cancer, gastrointestinal disease, obesity, allergy, and asthma. As this research continues to emerge, it is important to understand whether the microbiome varies according to important health behaviors such as physical activity (PA). Our study builds on previous research analyzing the impact of sedentary time and PA on microbiome diversity. Methods The sample was adults (n = 242, 51% female, mean age 57 [18, 93] years) in the Survey of the Health of Wisconsin who completed visits in 2016 and wore a waist accelerometer (ActiGraph) for 7 consecutive days to measure sedentary time and PA. Following accelerometry, a stool sample was collected and sequenced. Sample richness was estimated using the ACE index and coupled with species abundance to calculate overall alpha diversity using Shannon's index. Multiple linear regression was used to estimate associations between metrics of species richness and diversity and sedentary time and PA, adjusting for age, gender, race, BMI, smoking, alcohol use, dietary fiber and macronutrient composition. Results Greater amounts of time spent sedentary were associated with lower alpha-diversity (-11 [95% CI: -28, 6] microbe species per 10% increase in sedentary time relative to mean abundance of 295 [95% CI: 280, 311]) and lower Shannon’s index (-0.06 [95% CI: -0.1, -0.004] per 10% increase in sedentary time relative to a typical range of 1.5-3.5). Beta-diversity did not significantly vary with sedentary time. Increased percentage of time in moderate or vigorous PA was not significantly associated with alpha-diversity or beta-diversity. Further study is needed to identify the composition of the microbial population that sedentary subjects appear to be lacking.

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Purpose: To examine healthy lifestyle behaviors and their associations with health insurance status among US adults. Methods: The 2017 Behavioral Risk Factor Surveillance System collected data on health insurance coverage in 50 states and the District of Columbia (DC), and on type of insurance in 5 states and DC. We examined four healthy behaviors: current no tobacco use, no or moderate drinking, meeting aerobic physical activity recommendations, and maintaining a healthy body weight. We conducted log-linear regression analyses to assess the associations between health behaviors and insurance status, while adjusting for potential confounders. Results: In general, the percentages of adults who reported current no tobacco use, meeting physical activity recommendations, or having all 4 healthy behaviors were significantly higher, and the percentages of adults with a healthy body weight were significantly lower among those who were insured versus uninsured, or among adults with private insurance versus uninsured. These patterns persisted after multivariate adjustment for potential confounders including sociodemographic status, routine physical checkup, and the number of chronic diseases. Adults with public insurance were also more likely to report no tobacco use and no or moderate drinking compared with adults who were uninsured. Additionally, adults with private insurance were significantly more likely to report no tobacco use and meeting physical activity recommendations, but were less likely to report no or moderate drinking than adults with public insurance. Conclusions: Significant associations existed between health insurance status and having some healthy behaviors among US adults, suggesting potential effects of improved insurance coverage on adopting health lifestyle behaviors.
OVER-REPRESENTATION OF INFECTIOUS DISEASES IN PATIENTS WITH FRAGILE X SYNDROME


Fragile X syndrome (FXS) is a rare genetic disorder caused by the silencing of the Fragile X Mental Retardation 1 (FMR1) gene on the X chromosome. Immune system dysfunction and inflammatory dysregulation have been previously described in several animal models of the disease and case reports of FXS patients. However, the phenotypical impact of this dysregulation has not been systematically evaluated in a large patient cohort. Using un-identifiable member claims data from Aetna, a nationwide health insurance plan in the United States, we systematically characterized the comorbidity patterns of FXS patients. We identified 5,737 FXS patients from this database, who were compared to 573,700 age-and-gender-matched participants without FXS. We discovered that in addition to the expected neurodevelopmental phenotypes, there is an over-representation of infectious diseases reported as top comorbidities, such as otitis media (OR=2.85, 95% CI=(2.59, 3.15)), cellulitis and abscess of fingers or toes (OR=2.28, 95% CI=(1.79, 2.90)), viral enteritis (OR=1.96, 95% CI=(1.51, 2.53)), candidiasis (OR=1.81, 95% CI=(1.34, 2.44)), and pneumonia (OR=1.76, 95% CI=(1.45, 2.14); comorbidity group 1 in Figure 1). Conversely, many autoimmune disorders, including systemic lupus erythematosus, psoriasis, rheumatoid arthritis, bullous dermatoses, and ankylosing spondylitis were never reported in the FXS cohort, while their incidence rate in the non-FXS population is greater than 0.1% (comorbidity group 2 in Figure 2). All of the reported differences are statistically significant after correcting for multiple testing. This data-driven analysis revealed phenotypes associated with the immune dysfunction reported in the previous murine and human studies. These results indicate the importance of immune-related pathways in FXS patients and their relevance to FMR1 gain and loss of function. Figure 1. Distinct comorbidity patterns are observed in the FXS and non-FXS cohorts between age 0 and 20.
Introduction: Quitting smoking among cancer patients improves the prognosis of cancer patients and produces survival benefits. We compared smoking prevalence of incident cancer cases with the general population and estimated the association between smoking status at diagnosis and overall prognosis in a large U.S. state population-based cohort of incident cancer patients. Methods: We studied the ten most common cancers in both men and women in Massachusetts for the years 2008-2013 (181,477 incident cases) and used the reported smoking status at the time of diagnosis (never, former, current). For 155,936 non-Hispanic white cases, we compared the observed with the expected prevalence of current smoking by use of the population-based ethnicity-, age-, and sex-specific smoking prevalence for the years 2012-2013 (standardized prevalence ratios). We used multivariable Cox regression analysis to estimate the association between smoking status and overall survival (hazard ratios). Results: Standardized prevalence ratios of current smoking were above 2 for several cancers including head and neck cancers, lung cancer, bladder cancer and liver cancer. Current smoking compared to former smoking is associated with a mortality rate increase of at least 50% for the following cancers: head and neck cancer HR=1.70 (95% CI 1.45-1.99), lung cancer HR=1.59 (95% CI 0.76-3.34), non-melanoma skin cancer HR=2.28 (95% CI 1.19-4.37), female breast cancer HR=1.59 (95% CI 1.40-1.81), and prostate cancer HR=1.57 (95% CI 1.36-1.80). Conclusions: The Surgeon General’s report concludes that cancer patients who quit smoking have an improved prognosis and that smoking cessation services for cancer patients are likely to have substantial benefits for survival. Our analyses provide an indication of the order of magnitude of the population of incident cancer patients eligible for smoking cessation and an indication of the possible effect on overall survival.
POST-DIAGNOSIS USE OF ANTIHYPERTENSIVE MEDICATIONS AND THE RISK OF DEATH FROM OVARIAN CANCER  Barbara N Harding* Barbara N Harding, Noel S Weiss, Joseph A Delaney, Renata R Urban, (University of Washington)

BACKGROUND: While antihypertensive (AH) use following the diagnosis of some forms of cancer appears to be associated with a reduced case-fatality rate, information is limited on the impact of such use among women with ovarian cancer. OBJECTIVE: To examine associations between post-diagnosis use of thiazide diuretics (TDs), angiotensin converting enzyme inhibitors (ACEIs), beta blockers (BBs) [both non-selective (NSBBs) and selective (SBBs)] and calcium channel blockers (CCBs) and ovarian cancer-specific survival. METHODS: This cohort study used SEER-Medicare data on 2,195 women 66+ years of age who were diagnosed with ovarian cancer during 2007-2012 and who survived for at least 12 months. Use of an AH class was defined as two or more fills during the year after diagnosis. Ovarian cancer-specific death was assessed starting one year after diagnosis until the end of 2013. Associations between AH use and ovarian cancer-specific mortality were assessed using Cox proportional hazard models, comparing users of a given class of AH to non-AH users, adjusting for demographic factors and cancer characteristics at diagnosis and comorbidity during the year following diagnosis. RESULTS: Overall, 718 (33%), 690 (31%), 521 (24%), 154 (7%) of women met our criteria for having used a TD, ACEI, BB, or CCB, respectively, with some women using more than one class of drug. Ovarian cancer-specific mortality was found to be lower among women who used an ACEI (adjusted hazard ratio [aHR] 0.75, 95% confidence interval [CI] 0.62-0.90), a TD (aHR 0.80, 95%CI 0.67-0.96), or a NSBB (aHR 0.58, 95%CI 0.42-0.79) relative to that among non-AH users, but no such association was seen in women who took a SBB or CCB. CONCLUSION: We observed that women who took one of several forms of an AH medication following a diagnosis of ovarian cancer to be at a reduced risk of dying from their disease. However, the potential for residual confounding by disease severity argues for a cautious interpretation.
Background: Radiation exposure is an established risk factor for the development of stomach and colon cancers, although its association with rectum cancer remains controversial. Few studies, however, have investigated the relationship between pre-diagnostic radiation exposure and survival after cancer diagnosis. Methods: Using data from the Life Span Study (LSS) of atomic bomb survivors, we identified 8262 participants with a first primary invasive stomach or colorectal cancer (CRC) diagnosed between 1958-2009 and followed-up for mortality through 2014. Analyses utilized weighted absorbed organ-specific radiation doses from the atomic bombs (Dosimetry system 2002 revision 1) in gray (Gy). Cox regression was used to calculate hazard ratios (HR) and 95% confidence intervals for categories of radiation doses (<0.005 / 0.49 / 0.99 / 1+ Gy) with overall survival (i.e., death from any cause) and gastrointestinal cancer (GIC)-specific survival (i.e., death attributed to colon, rectal, or stomach cancer). HRs were adjusted for age at diagnosis, with further adjustment for age at radiation exposure, year of diagnosis, and sex via stratification of the baseline hazards. Results: Among LSS participants with GIC, participants with pre-diagnostic radiation doses of ≥1.0 Gy experienced significantly poorer overall survival than did those with radiation doses <0.005 Gy. In analyses stratified by cancer sites, this association was strongest among those with CRC, and was particularly pronounced among those with rectal cancer. HRs were attenuated, and not statistically significant, in analyses of GIC-specific survival. The HRs at lower radiation doses were close to one, regardless of cancer site. Conclusions: Our preliminary results suggest that high dose pre-diagnostic radiation exposure may adversely affect overall survival after CRC, particularly among individuals with rectal cancer. Additional analyses incorporating cancer stage at diagnosis and lifestyle factors are in progress.
DIETARY GLUCOSINOLATES AND ISOTHIOCYANATES INTAKES, GLUTATHIONE S-TRANSFERASE POLYMORPHISMS, AND BREAST CANCER RISK: A CASE-CONTROL STUDY IN CHINA

Cai-Xia Zhang* Cai-Xia Zhang, Nai-Qi Zhang, (Sun Yat-Sen University)

Background Current evidence suggests that cruciferous vegetables intake is associated with a lower risk of breast cancer. The anticarcinogenic effect may be due to glucosinolates (GSLs), which can hydrolyze into indole-3-carbinol and isothiocyanates (ITCs) by the catalytic action of plant myrosinase and gastrointestinal microflora. ITCs affect phase II enzyme activity and are also substrates of glutathione S-transferases (GSTs). We investigated the association of GSLs/ITCs intake with breast cancer and examined whether the association was modified by polymorphisms in GSTP1, GSTT1 and GSTM1 genes in Chinese women.

Methods 737 newly diagnosed and histologically confirmed breast cancer cases and 756 age-matched (5-year interval) controls were recruited in this hospital-based case-control study. Cruciferous vegetables intake was assessed using a validated food frequency questionnaire (FFQ). Dietary GSLs and ITCs were computed using two food composition database linking GSLs and ITCs contents in cruciferous vegetables with responses to the FFQ. Genotyping of GSTP1 rs1695 was performed using an improved multiplex ligation detection reaction (iMLDR) technique. Multiplex PCR protocol was used to examine the absence or presence of the GSTM1 and GSTT1 genes.

Results After adjusting for various potential confounders, inverse associations of cruciferous vegetables intake, dietary GSLs and ITCs with breast cancer were found, with OR comparing the highest versus lowest quartile being 0.48 (95% CI=0.35-0.65), 0.54 (95% CI=0.40-0.74) and 0.45 (95% CI=0.35-0.84), respectively. However, no association of the GSTP1 rs1695 A>G polymorphism and the GSTM1 and GSTT1 null genotypes with breast cancer was found. We also found no evidence of interactions between dietary ITCs and GST genotypes in relation to breast cancer risk. Conclusions We found that cruciferous vegetables intake, and dietary GSLs and ITCs were inversely associated with breast cancer risk, and the associations were not modified by GST genotypes.
PREVALENCES AND TIME TRENDS IN THE PREVALENCES OF CANCER RISK FACTORS AMONG CANCER SURVIVORS IN THE UNITED STATES (2005-2016) CHINENYE C UGOJI* CHINENYE C UGOJI, LORRAINE DEAN, ELIZABETH PLATZ, (Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health)

Background: 15.5 million cancer survivors lived in the US in 2016 and 26.1 million is projected by 2040. Cancer survivors grapple with a myriad of subsequent outcomes but little is known about the burden and contribution of known cancer risk factors (RFs) to these outcomes. In this study, we quantify and compare trends in the prevalence of RFs among cancer survivors and persons with no cancer history (NCHs) Methods: We analyzed data for 34,180 adults aged >20yrs who participated in NHANES in 2005-2016. Participants were classified as survivors if they reported physician diagnosis of any malignancy except non-melanoma skin. We estimated prevalences and time trends over 12yrs in 2-yr survey period and 6-yr blocks. Using Poisson regression, we estimated age, sex and race-adjusted prevalence ratios for each RF in cancer survivors compared to NCHs. Results: The prevalence of cancer survivors increased from 6.7% in 2005/06 to 9.1% in 2015/16. In 2015/16, 73.4% of survivors were overweight/obese, 14.7% current smokers, 52.2% self-reported physical inactivity, 11.3% had >2 alcoholic drinks/day, 23.3% rated their diet as poor/fair and 15.5% had physician-diagnosed diabetes. Among survivors aged 20-49, 23.7% smoked and 21.8% drank >2 alcoholic drinks /day. Compared to NCHs, survivors had higher prevalence of diabetes (adjusted prevalence ratio (aPR): 1.27, 95%CI:1.08-1.49), lower prevalence of smoking (aPR: 0.81(0.69-0.95) and alcohol use but no differences in other risk factors. However, in adults <50, the prevalence of current smoking was higher in cancer survivors. Trends showed similarly increasing prevalence of poor diet, obesity and diabetes among cancer survivors and NCHs; and some decline in smoking/alcohol use. Conclusions: Despite a cancer history, the prevalence of cancer risk factors is high in survivors and based on what is known, may contribute to a higher risk of recurrence and second cancers, and as in those without cancer, a higher risk of non-cancer outcomes.
INTERACTIONS BETWEEN POLYGENIC RISK SCORE AND NON-GENETIC RISK FACTORS IN YOUNG-ONSET BREAST CANCER Clarice Weinberg* Clarice Weinberg, Katie O’Brien, Min Shi, (National Institute of Environmental Health Sciences)

Genome-wide association studies have identified hundreds of genetic loci associated with breast cancer risk. Results from gene-environmental studies, however, remain inconclusive. Most studies have focused on breast cancers generally, the preponderance of which are found after age 50. Young-onset breast cancers tend to be more aggressive and may be etiologically different. The goal of this analysis was to assess interactions between an established polygenic risk score (PRS) and non-genetic risk factors of young-onset breast cancer. We constructed the 77-SNP polygenic risk score using genotype data from the Two Sister Study, a family-based study of 1,461 women diagnosed with breast cancer before age 50 and their unaffected sisters and parents. We used conditional logistic regression to analyze interactions between PRS and 14 established risk factors in non-Hispanic white families. In further analyses we assessed the same interactions, but for invasive breast cancer, estrogen receptor (ER) positive breast cancer and with inclusion of other racial/ethnic groups. Results from the case-control logistic regressions showed a decreased association between the PRS and breast cancer risk for women who had ever used hormonal birth control (ratio of odds ratios [ROR] =0.55, 95% CI =0.31, 0.97) and a stronger association between PRS and breast cancer risk in pre-menopausal women (ROR =1.83, 95% CI =0.96, 3.49). Restricting the analysis to ER+ cancers or invasive cancers or using samples from all ethnic groups produced similar results. In conclusion, we have identified potential interactions between PRS and birth control use and PRS and menopausal status on risk of young-onset breast cancer.
GENES IN THE FOLATE METABOLISM PATHWAY AND RISK OF CHILDHOOD ACUTE LYMPHOBLASTIC LEUKEMIA  Ellen Hailu* Ellen Hailu, Josie Hayes, Xiaorong Shao, Alice Y Kang, Catherine Metayer, (School of Public Health, University of California Berkeley)

Folate is an integral molecule for DNA synthesis, stabilization, and methylation. Its deficiency during pregnancy has previously been associated with an increased risk of different diseases in the offspring, including childhood leukemia. Prior studies have also examined genes and their variants involved in folate metabolism as potential risk factors for childhood leukemia. Findings, however, have been inconclusive, and studies have not yet investigated a wider set of folate metabolism genes in relation to childhood leukemia. The current study assessed if single nucleotide polymorphisms (SNPs) in genes that regulate folate metabolism are linked with risk of childhood acute lymphoblastic leukemia (ALL) using genome wide association data from the California Childhood Leukemia Study. A total of 1,121 cases and 899 controls were genotyped using the Illumina Omni Express Exome and Illumina Omni Express, and missing genotypes were imputed. Folate metabolism genes were obtained from four web-based genomic databases. 46 genes were selected for analyses, and 7,979 SNPs passed quality control steps. Frequentist Score Test (SNPTEST v2.5) was utilized adjusting for seven multidimensional scaling components to account for population stratification. We used volcano plots to identify SNPs that may have an association with ALL (p<0.05). rs129940 in Sarcosine Dehydrogenase (SARDH) (genotyped), was indicative of a reduced risk of ALL (OR=0.67, 95% CI: 0.51-0.89, p=0.009). SARDH, along with pipecolic acid and sarcosine oxidase metabolize sarcosine, a byproduct of folate metabolism, and increased sarcosine levels have previously been linked with cancerous cells, invasion, and metastasis. Our results indicate that this SNP in SARDH may reduce risk of childhood ALL and provide evidence to further validate or investigate additional SNPs involved in folate metabolism as possible predictors of childhood ALL.
ORGANOCHLORINE PESTICIDES, DNA METHYLATION AND BREAST CANCER RISK

Joyce Rhoden*, Humberto Parada, Alexandra J. White, Xinran Xu, Yoon Hee Cho, Susan L. Teitelbaum, Alfred Neugut, Regina M. Santella, Mary S. Wolff, Jia Chen, Marilie D. Gammon. (Department of Epidemiology, University of North Carolina at Chapel Hill, Gillings School of Global Public Health, Chapel Hill, NC)

Purpose: Organochlorine pesticides have been inconsistently associated with breast cancer risk. Whether the relationship between organochlorine pesticides and breast cancer risk varies by DNA methylation status—which may be an early marker of carcinogenesis—is unknown. The objectives of this study were to assess heterogeneity of the organochlorine pesticide-breast cancer association by gene-specific tumor methylation and global methylation markers in the blood. Methods: In a population-based case-control study, promoter methylation of 13 breast cancer-related genes was measured in archived tumor tissue (n=765-851 cases). Blood samples from breast cancer cases (n=873) and controls (n=941) were used to assay for the organochlorines DDT, DDE, and chlordane, and the global methylation markers LINE-1 and LUMA. We used logistic regression to estimate adjusted odds ratios (ORs) and 95% confidence intervals (CI); and used the ratio of the OR (ROR) to assess heterogeneity by methylation status with likelihood ratio tests (LRT) on the multiplicative scale. For global methylation, heterogeneity was evaluated on the additive scale using interaction contrast ratios. Results: Comparing methylated vs unmethylated cases for breast cancer specific genes in tumors, cases with DDT concentrations above the median were less likely to have methylated HIN1 (ROR=0.51, 95%CI=0.32-0.84), RASSF1A (ROR=0.41, 95%CI=0.20-0.83), and CDH1 (ROR=0.33, 95%CI=0.11-0.96) compared to unmethylated cases. Cases with chlordane above the median were less likely to have methylated BRCA1 (ROR=0.59, 95%CI=0.36-0.96) and TWIST (ROR=0.46, 95%CI=0.22-0.97). No heterogeneity in tumor methylation was noted for exposure to DDE or when considering global methylation. Discussion: DDT and chlordane associations varied by methylation status at multiple promoter regions in breast tumors. DNA methylation may be a marker of etiologic heterogeneity for the associations between organochlorine pesticides and breast cancer risk.
CIRCULATING MARKERS OF ONE CARBON METABOLISM AND ENDOMETRIAL CANCER RISK Kara A. Michels* Kara A. Michels, Stephanie J. Weinstein, Nicolas Wentzensen, Ruth M. Pfeiffer, Britton Trabert, (Division of Cancer Epidemiology and Genetics, National Cancer Institute, NIH)

BACKGROUND: Epidemiologic risk factors for endometrial cancer are known, but we need to identify biomarkers that will refine our understanding of disease risk. We previously observed associations between endometrial cancer and intake of nutrients involved in one carbon metabolism (1CM); to build upon this, we evaluated risk with circulating markers of 1CM. METHODS: Data are from a nested case-control study within the screening arm of the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial (353 cases, 353 controls, age 55–74 at enrollment). Using targeted mass spectrometry assays, we measured biomarker concentrations in pre-diagnostic serum. We used adjusted logistic regression to estimate overall associations and those stratified by body mass index (BMI). We evaluated heterogeneity via likelihood ratio tests (p-het).

RESULTS: In the full population, we generally did not identify associations. However, the highest concentrations of several B vitamers were associated with reduced risk of endometrial cancer among obese women (highest [Q5] v. lowest quintile [Q1] ORs and 95% CIs: thiamine monophosphate [B1] 0.21, 0.07–0.67; flavin mononucleotide [B2] 0.28, 0.09–0.87; pyridoxal phosphate [B6] 0.25, 0.10–0.65; and 5-methyltetrahydrofolate [B9] 0.32, 0.12–0.85; p-het<0.07 for all). High B9 was associated with increased risk among those with normal BMI (Q5 v. Q1: 2.72, 0.97–7.63). Correlations between these markers ranged from 0.13–0.49. The PAr Index—a measure of B6 catabolism attributable inflammation and immune activation—was associated with a tripling in risk for obese women (Q5 v. Q1: 2.89, 1.03–8.09). CONCLUSIONS: High levels of B vitamins were associated with reduced endometrial cancer risk among obese women. However, these vitamins are enzymatic cofactors in many processes—we found that B6 catabolism related to inflammation increased risk. Our findings indicate that the influence of B vitamins may depend on other risk factors, such as BMI.
PREFERENCES FOR PRIMARY COLORECTAL CANCER SCREENING MODALITIES: KOREA NATIONAL CANCER SCREENING SURVEY (KNCSS) 2017

Kyeongmin Lee* Kyeongmin Lee, Eunji Choi, Yoonyoung Lee, Mina Suh, Yeol Kim, Kui Son Choi, (Graduate School of Cancer Science and Policy, National Cancer Center)

Purpose: Despite the importance and effectiveness of colorectal cancer (CRC) screening, uptake of CRC screening is exceedingly low in Korea. This study aimed to examine the factors associated with preference for the CRC screening tests. Materials and methods: This study was based on the 2017 Korean National Cancer Screening Survey (KNCSS), an annual cross-sectional survey utilizing nationally representative random samples to investigate cancer screening rates. Data were analyzed from 2,245 randomly selected Korean aged 50 to 74 years. Chi-squared and ANOVA were used to delineate baseline characteristics of participants. Logistic analyses were conducted to determine factors associated with preference between annual Fecal Occult Blood Test (FOBT) and colonoscopy with 10-year interval. Results: In 2017, the latest CRC screening uptake rates for FOBT, colonoscopy and both FOBT and colonoscopy were 16.1%, 13.0% and 17.9% respectively. Among 2,245 participants, 1,232 individuals (54.9%) preferred annual FOBT whereas 900 individuals (40.1%) preferred to undertake colonoscopy every 10 years. Only 113 participants (5.0%) chose ‘opt-out’. Participants who resided in rural regions and female were significantly more likely to prefer annual FOBT. Also, those who responded as high school graduates and ever received colonoscopy were significantly more likely to undergo colonoscopy every 10 years. Those who never underwent any CRC screening tests were the strongest predictor of preference of colonoscopy. Conclusion: Understanding and offering the most proper CRC screening test based on participants’ preference may increase the likelihood of CRC screening uptake rate. Future studies on how offering choices for CRC screening influence the CRC screening uptake rate will be required.

S/P indicates work done while a student/postdoc
THE RELATIONSHIP BETWEEN ADIPOSITY AND PROSTATE CANCER IN A WEST AFRICAN POPULATION: AN ANALYSIS OF THE GHANA PROSTATE STUDY


Introduction: Greater body fatness has been associated with increased risk of advanced prostate cancer. However, most studies have been conducted among North American and European populations. Mortality rates for prostate cancer appear elevated in West Africa, yet the risk factor profile for prostate cancer in this region is unknown. We examined the relationship between body fatness and prostate cancer among West African men.

Methods: A case-control study was conducted in Accra, Ghana in 2004–2012. Cases and controls were drawn from a population-based sample of 1,037 men screened for prostate cancer, yielding 73 cases and 964 controls. An additional 493 incident cases were recruited from the Korle-Bu Teaching Hospital. At enrollment, height, weight, waist circumference (WC), and hip circumference were measured. Logistic regression was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for associations between body mass index (BMI), WC, waist-hip ratio (WHR) and prostate cancer, adjusting for potential confounders. Results: Among cases, the mean age was 70 years and the mean BMI was 25.2 kg/m². Among controls, the mean age was 61 years and the mean BMI was 24.3 kg/m². The majority (69%) of cases were diagnosed with Gleason score ≥7 cancer. After adjustment, men with BMI ≥30 kg/m² had an increased risk of prostate cancer relative to men with BMI 94 cm² (OR 1.81, 95% CI 1.28-2.58) and WHR >0.90 (OR 1.49, 95% CI 1.01-2.20) were also associated with prostate cancer. In a mutually adjusted model, WC remained significantly associated with prostate cancer while BMI attenuated to the null. Associations were not modified by smoking status or health insurance coverage.

Conclusion: Greater total and central adiposity were positively associated with prostate cancer among men in Ghana. These findings implicate body fatness as a potentially modifiable risk factor for clinically-relevant prostate cancer in this region.
TRENDS IN INCIDENCE OF FEMALE BREAST, PROSTATE, LUNG AND BRONCHUS, AND COLORECTAL CANCERS IN THE UNITED STATES FROM 1999 TO 2015

Sameer V. Gopalani*
Sameer V. Gopalani, Amanda E. Janitz, Janis E. Campbell, (Department of Biostatistics and Epidemiology, Hudson College of Public Health, University of Oklahoma Health Sciences Center)

Objective: Cancer is the second leading cause of death among non-Hispanic Whites (NHW) and American Indians/Alaska Natives (AI/AN) in the US. We examined long-term trends, from 1999 to 2015, for female breast, prostate, lung and bronchus, and colorectal cancer incidence by race. We also assessed differences in incidence rates by Indian Health Service regions (Alaska, Northern Plains, Southern Plains, Southwest, Pacific Coast, and East). Methods: We obtained age-adjusted incidence rates from CDC WONDER. We calculated standardized rate ratios (RRs) and 95% confidence intervals (CI) to determine whether incidence rates differed by race. We also estimated age-adjusted incidence trends for these cancers from 1999 to 2015 using Joinpoint Regression. Incidence trends were characterized using average annual percent change (AAPC). AAPC estimates were reported to increase or decrease if the slope of the trend was significantly different from zero at alpha of 0.05; otherwise, the trend was reported as stable. Results: AI/ANs had significantly lower incidence rates than NHWs for female breast (RR: 0.56; 95% CI: 0.55, 0.57), prostate (RR: 0.58; 95% CI: 0.57, 0.59), lung and bronchus (RR: 0.67; 95% CI: 0.66, 0.68), and colorectal (RR: 0.74; 95% CI: 0.72, 0.75) cancers. In Alaska, Northern and Southern Plains, AI/ANs had significantly higher incidence rates than NHWs for lung and bronchus and colorectal cancers. For AI/ANs, the AAPC from 1999 to 2015 was significantly lower for prostate (-4.7; 95% CI: -5.7, -3.7) and colorectal (-1.8; 95% CI: -2.1, -1.5) cancers, but stable for female breast and lung and bronchus cancers. In the same time period, the AAPC for the four leading cancers decreased significantly in NHWs. Conclusion: Although AI/ANs had lower cancer incidence than NHWs, this may signal screening disparities. Also, female breast and lung and bronchus cancers for AI/ANs did not decrease significantly, indicating the need to enhance screening and early diagnosis efforts.
Background: The risk of pancreatic cancer related to baseline fasting blood glucose (FBG) has been estimated, however, few studies have examined the association between changes in FBG and pancreatic cancer risk. Therefore, we conducted the current study in a large male cohort. Methods: A total of 86,941 males from Kailuan cohort study who participated in biennial examinations at least twice since May 2006 were recruited in the present study. The second examination was taken as baseline of the current analysis, and the changes in FBG were calculated as percent change from the first examination to the second examination. Cox proportional hazards regression models were used to evaluate the association between baseline FBG and its changes and the risk of pancreatic cancer. Results: By December 31, 2015, a total of 59 newly diagnosed pancreatic cancer cases were accumulated in this study. Males with diabetic fasting glucose (DFG, ≥7.0 mmol/L) had a 111% (95% confidence interval (CI): 1.01 to 4.39) higher risk of incident pancreatic cancer than subjects with normal fasting glucose (NFG, <5.6 mmol/L). Compared with stable FBG (FBG change 15% (HR =3.87, 95% CI: 1.46 to 10.27) were observed to be independently related to a higher risk of pancreatic cancer with the adjustment for age, smoking status, alcohol drinking status, education levels, total cholesterol (TC), total glyceride (TG), body mass index (BMI), FBG at first examination, and duration of changes in FBG. Conclusion: This study provided further evidence about the impact of elevated baseline FBG on pancreatic cancer. More importantly, it highlighted the risk of increases in FBG for pancreatic cancer. Changes in FBG might be considered useful additional monitoring parameters during routine health evaluations. Funding This work was supported by National Key R&D Program (2018YFC1315000), National Natural Science Foundation of China (81673265), and Training Programme Foundation for the Talents in Beijing City (Grant no: 2017000021223TD05).
EXAMINING CANCER SCREENING DISPARITIES BETWEEN AFRICAN AMERICAN AND NON-AFRICAN AMERICAN FIREFIGHTERS IN FLORIDA
Kemi Ogunsina*, Kemi Ogunsina, Alberto J Caban Martinez, Natasha Schaefer solle, David J. Lee, Tulay Koru-Sengul, Erin Kobetz, (University of Miami)

Background: Firefighters have an increased risk of developing and dying from cancer when compared to the general US population. Race/ethnic disparities may exist in cancer screening. This epidemiologic study is aimed at examining race/ethnic differences in cancer screening rate among Florida firefighters. Method: We use health survey data collected from a non-probabilistic sample of Florida firefighters during baseline administration of the annual cancer survey (ACS), a longitudinal occupational cohort project of the Florida Firefighter Cancer Initiative. A cross-sectional study design using baseline ACS data was used to examine the associations between race/ethnicity, sociodemographic factors and cancer screening behavior among the study population was examined using Chi-square and logistic regression. Results: Of 3,571 firefighters with baseline ACS data, there were 268 (7.5%) African Americans (AA) firefighters, and over half (59%) were within the age group 40 to 64 years. Health insurance coverage or visit to the doctor's office in the past 12 months was not significantly different between the AA and non-AA firefighters. Compared to the non-AA, AA firefighters had significantly fewer skin exams for skin cancer (12.4% vs 51.4%, p-value <.0001), Human papilloma virus test (33.3% vs 52.8%, p-value .0001), colonoscopy (24.3% vs 26.9%, p-value 0.0032) or endoscopy (10.9% vs 18.0%, p-value <.0001). The odds of getting a skin check (Adjusted Odds Ratio (AOR) =5.3; 95% CI: 3.9-7.3), prostate cancer screening (AOR 1.4; 95% CI: 1.0-1.9), and endoscopy to screen for gastric cancer (AOR 2.3 95% CI: 1.5-3.4) was higher among non-AA firefighters compared to those of AA descent, after adjusting for other significant covariates. Conclusion: There are significant racial/ethnic cancer screening differences among Florida firefighters who identified as AA. Targeted worksite-based interventions addressing cancer screening disparities may be necessary in AA firefighters.
Background: Children with high blood pressure (HBP) are at increased risk of developing cardiovascular disease. However, data on the prevalence and predictors of HBP in school-age children (SAC) are sparse. Methods: We analyzed the prevalence and predictors of HBP in 1,049 Guatemalan SAC 6-14 years who participated in a cross-sectional, nationally representative household survey in 2017. Blood pressure (BP) was measured in a seated position using a digital monitor; the second and third BP measurements were averaged. HBP was defined as systolic or diastolic BP ≥95th percentile for age, sex, and height (referent: normal weight children, Pediatric Task Force database), systolic BP ≥130 mmHg, or diastolic BP ≥80 mmHg. We used multivariable logistic regression to identify predictors of HBP (P +1 to +2 SD) and obesity (BMI Z > +2) were 11.7% (9.2%–14.2%) and 6.3% (4.4%–8.1%). In multivariable models, significant predictors of HBP were obesity (adjusted odds ratio [AOR] 5.9 [3.5–10.0], Z > +2 vs. +1 to +2 vs. <-1). In children 10-14 years, predictors of HBP were obesity (AOR 9.1 [4.1–20.2]), overweight (AOR 4.4 [2.0–9.9]), and indigenous status (AOR 2.2 [1.3–3.8]); PA was not associated with HBP. Conclusions: The prevalence of HBP was high in Guatemalan children. Overweight and obesity were strong risk factors for HBP. Obesity prevention and control programs might help reduce HBP prevalence in Guatemalan schoolchildren.
Exposure to ionizing radiation can cause direct damage to heart and vascular tissue and increase the risk of circulatory disease (CD). Risk of CD is also influenced by an individual’s social environment, and this may modify the effect of other environmental and occupational exposures like ionizing radiation. We examined the effect of neighborhood socioeconomic status (nSES) on CD mortality as well as whether nSES modifies the relationship between occupational radiation exposure and CD mortality in the US Radiologic Technologists Study (USRT), a nationwide cohort with low-dose protracted radiation exposure. We created an nSES index for each census block-group in the U.S. using 6 components from the 1990 U.S. Census: regionally-adjusted median household income and median housing value, % households with interest/income, % adults who completed high school, % adults who completed college, and % employed persons in managerial occupations. An nSES index was assigned to each participant by geocoding their 1990 mailing address using ESRI’s USA Composite Geocoding service in ArcGIS to a block-group. USRT participants alive in 1993 (N=135,818) were followed for mortality through 2012. People living in the lowest nSES quintile had higher cumulative radiation doses (mean=81.6, SD=130.3mSv) than in the highest nSES quintile (mean=71.6, SD=106.6mSv). People living in most affluent quintile had a 17% reduction in the risk of CD mortality compared to participants who lived in the poorest neighborhoods in 1990 (adjusted HR: 0.83, 95%CI: 0.73, 0.95). Preliminary analysis did not find evidence of a relationship between cumulative radiation and CD mortality (adjusted HR: 1.00, 95%CI: 0.99, 1.00 for a 10mSv increase). Stratum-specific hazard ratios between radiation and CD did not change considerably across nSES quintile (top quintile: HR: 1.00, 95%CI: 0.99, 1.00; bottom quintile: HR: 1.00, 95%CI: 1.00, 1.00 for a 10mSv increase).
PERFORMANCE OF RISK PREDICTION SCORES FOR CARDIOVASCULAR MORTALITY IN PEOPLE 70 YEARS OR OLDER: EXTERNAL VALIDATION AND IMPLICATIONS

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Aim/Rationale: In this study, we externally validated two well-known risk scores for fatal cardiovascular events in an elderly cohort: the Systematic COronary Risk Evaluation (SCORE, recommended by European guidelines for people aged 40-65) and SCORE in Older Persons (SCORE OP, introduced in 2015 for ages ≥65, not yet validated in external longitudinal data). Methods: Data from the Berlin Initiative Study, a prospective, population-based study of elderly individuals recruited using age and sex stratified random sampling were used. We computed ten-year cardiovascular mortality risks for individuals without previous myocardial infarction (N=1,657) using baseline information. We assessed discrimination on observed follow-up and calibration by comparing predicted risks and 10-year projected probabilities using calibration plots and Nam-D’Agostino chi-square tests. Results: 118 cardiovascular deaths occurred during follow-up (median 4.8 years). The SCORE OP showed better discrimination in high- (C-index: 0.79; 95%CI, 0.75 to 0.83) and low-risk (0.80; 0.75 to 0.83) versions compared to the SCORE (respective C-indices: 0.72; 0.67 to 0.76 and 0.72; 0.67 to 0.77). However, SCORE OP overestimated risks of fatal cardiovascular events: 397 to 399 actual events were projected based on the Berlin Initiative Study follow-up data, whereas 519 (+31%) and 677 (+70%) events were predicted using the low-risk and high-risk region SCORE OP equations. The SCORE showed better calibration; the high-risk version only underestimated the true number of events by 2.6%. Conclusions: Although developed to overcome a suspected overestimation of risk in the elderly by the SCORE, the SCORE OP was found to consistently overestimate cardiovascular mortality risk in elderly Germans. In populations with elevated baseline risk, such as the elderly, use of the original SCORE equation with a slight correction to avoid probabilities exceeding 100% is preferable to the SCORE OP, which should be recalibrated.
SOCIAL SUPPORT AND RISK FACTORS FOR CARDIOVASCULAR DISEASE AMONG WOMEN ACCESSING CARE IN AN URBAN PUBLIC HEALTH CARE SYSTEM Jessica M. Madrigal, Jessica M. Madrigal, Juan Aparicio, Ashlesha Patel, (University of Illinois at Chicago, School of Public Health)

Background: Understanding factors related to disparities in cardiovascular health outcomes is critical to improve women’s health. Social support has been linked to cardiovascular disease (CVD) risk factors among women. Our aim was to examine perceived social support and to determine if it was associated with the prevalence of CVD risk factors among women presenting for reproductive health services in an urban public health care system.

Methods: Chart review was completed for 460 women who consented to participate and completed a short 7-item survey rating their social/emotional support needs. We abstracted information on demographics, body mass index (BMI), systolic and diastolic blood pressure, and smoking. BMI ≥ 30 kg/m2 was categorized as obese, and elevated blood pressure was defined as ≥ 120/80 mmHg. Prevalence estimates were calculated and logistic regression was used to model the association between social support and CVD risk factors. Results: The median age was 25 (IQR=6) and 84% were African American. Most (81%) indicated they could count on someone to provide emotional support, however, 47% indicated they could use more support. Overall, 42% were obese, 30% had elevated blood pressure, and 22% reported current smoking. Prevalence of all factors varied by age. Smoking status also varied by education and need for additional support. After adjustment, women who lived with a friend or relative had decreased odds of obesity (OR=0.60, 95% CI 0.39 to 0.92) when compared to women who did not. Odds of obesity (OR=1.44, 95% CI 0.98 to 2.14) and smoking (OR=2.16, 95% CI 1.33 to 3.48) were higher among women who reported needing more support compared to those that did not.

Conclusions: Social support may be an important determinant of health among women who use safety-net health care systems. In addition to counseling women regarding CVD risk, the reproductive health care setting may benefit women by assessing unmet social needs and providing links to social supports and community groups.
ASSOCIATIONS BETWEEN ENVIRONMENTAL QUALITY AND CARDIOVASCULAR HOSPITAL ADMISSIONS WITHIN THE MEDICARE POPULATION


Cardiovascular disease (CVD) and diabetes have been identified as conditions that may be associated with environmental factors through a variety of pathways. Air pollution in particular has been demonstrated to be associated with atherosclerosis, which can increase the likelihood of CVD events. Having diabetes can also accelerate the progression of atherosclerosis. We examined the relationship between environmental quality and major cardiovascular event (MACE) hospitalizations among Medicare recipients 65 and older from 2006-2010 with and without diagnosed diabetes. Cumulative environmental quality for 2000-2005 was characterized by five domain indices of the Environmental Quality Index (EQI): air, water, land, built, and sociodemographic domains. We used multilevel logistic models to estimate odds ratios (ORs) and 95% confidence intervals (CI) for quintiles of cumulative EQI, as well as domain-specific EQI indices. All models controlled for age, sex, race, and climate region, and accounted for clustering at the county level. We observed no association between overall environmental quality and MACE hospitalizations. However, there were positive associations for MACE hospitalizations for the air domain (OR=1.09 (95% CI: 1.07, 1.12)), the built domain (1.12 (1.09, 1.14)), and the sociodemographic domain (1.24 (1.22, 1.27)), when comparing the quintiles with the worst to the best environmental quality. Associations did not differ based on diabetes status. Hospitalizations for MACE among 65 and older may be associated with environmental quality. This abstract does not necessarily reflect EPA policy.
CURRENT LOW-TO MODERATE-LEVEL MERCURY EXPOSURE AND ITS ASSOCIATIONS WITH MORTALITY IN U.S. ADULTS: A POPULATION BASED COHORT STUDY


Background The associations of mercury exposure with health are controversial, possibly due to different mercury exposure levels. The current mercury exposure level and its associations with mortality in U.S. adults were unclear. We aimed to evaluate the current and time trends in mercury exposure level, and its associations with all-cause and cardiovascular disease (CVD) mortality in U.S. adults. Methods We included participants aged ≥ 20 years who were enrolled in the National Health and Nutrition Examination Survey 2003-2010 and followed up to Dec 31, 2011. We used multivariable Cox proportional hazards regression to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) of all-cause and CVD mortality in relation to blood mercury concentration quartiles. Results We included 16,266 participants with an average age of 43.8 years (standard error [SE]=0.24), and an average blood total mercury concentration of 1.69 ug/L (SE=0.05). During 75,152 person-years of follow-up, 551 deaths occurred, including 133 CVD deaths. Blood mercury was not associated with all-cause or CVD mortality. Comparing the fourth quartile of blood mercury concentration with the first quartile, the multivariable-adjusted HRs (95% CIs) were 0.81 (0.60, 1.09) for all-cause mortality, and 0.72 (0.40, 1.28) for CVD mortality. Conclusions In this large nationally representative population, we did not find evidence of adverse effects of mercury exposure on all-cause or CVD mortality at the currently low- to moderate-level of environmental mercury exposure in U.S. adults.
EFFECTS OF OBESITY ON PROGRESSION OF DIABETES STATUS IN YOUNG AND OLD HIGH-RISK JAPANESE MALE WORKERS: MULTISTATE ANALYSIS Akihiko Narisada* Akihiko Narisada, Kohta Suzuki, (Aichi Medical University)

Background: For preventing future diabetes mellitus (DM), ‘at risk (HbA1c 5.6-5.9%)’ and ‘prediabetes (HbA1c 6.0-6.4%)’ are defined as high-risk people. Among high-risk people, it might be difficult to determine future outcome. Regarding the complex progressions to DM in high-risk young and old people, the role of obesity, which is the risk factor of DM, is not well known. Thus, the aim of this study is to assess the impact of obesity on progression process between high-risk status and DM among young and old Japanese male workers by using multistate analysis which can describe changes in a person’s health condition over time. Methods: Using 4-year health check-up data of young (aged 33-37 years, n = 582) and old (aged 58-62 years, n=1313) male workers who were at risk or prediabetes in Japan, we formulated a Markov 4-state (normal, at risk, prediabetes, or DM) model of DM progression. We evaluated the effects of obesity (BMI ≥ 25 or waist ≥ 85cm) on each state-to-state transition. On the basis of the model, we predicted a prevalence of DM in young and old workers. Results: Among young workers, obese workers were likely to progress from at risk to prediabetes (HR: 2.1, 95%CI: 1.5-3.0) and from prediabetes to DM (HR: 4.0, 95%CI: 1.2-13.8). They also were less likely to improve from at risk to normal (HR: 0.75, 0.57-0.99). On the other hand, old workers with obesity had no significant effects on progression from each status to DM, but less improvement from prediabetes to at risk (HR: 0.70, 95%CI: 0.58-0.86). Predicted prevalence of DM after 5 years was 4.5% in young workers and 16.6% in old workers. If all subjects were not obese at baseline, the prevalence of DM after 5 years was expected to be 1.3% in young workers and 11.9% in old workers. Conclusions: Our model and simulation indicate that obesity plays a different role in progression of DM state among between young and old high-risk Japanese male workers.
This study aims to evaluate the risk of developing different cancers in adults with newly diagnosed type 2 diabetes mellitus (T2DM), in a longitudinal open cohort, spanning 13 years (2005-2017; mean follow-up of 5.65 years), of nearly 2.9 million U.S. veterans utilizing the Veterans Health Administration (VHA). The cohort consisted of new VHA users, from 2004 through 2015, who were T2DM-free and cancer-free for at least one year in VHA. Follow-up was a minimum of one year for all adults, and began at the first visit after one year at VHA or the date of new T2DM onset, and ended at the date of first cancer diagnosis, death, or last VHA visit before 12/31/2017, whichever came first. Of nearly 2.9 million, we identified 254,099 adults with a new diagnosis of T2DM, who had a mean follow-up duration of 4.84 years. A total of 78,908 verified incident cancer cases were identified in the cohort. Hazard ratios (HR) adjusted for age and hospital visits were estimated by fitting time-to-event data into Cox proportional hazard model. We found that T2DM slightly increased the risk of any cancer (HR=1.23, 95% CI: 1.20-1.26). Among all adults, pancreatic cancer had the highest adjusted HR (HR = 2.31, 95% CI: 2.00-2.65).

The We Can Prevent Diabetes (WCPD) study was a pragmatic 3-arm cluster-randomized trial with Medicaid beneficiaries to evaluate the effectiveness of financial incentives on group-delivered DPP attendance and weight loss. We aim to identify participant and program level factors associated with program compliance, including attendance, self-monitoring behaviors - physical activity (PA) and food logs- and weight loss trajectories for the 16 core sessions among Medicaid participants attending at least 4 sessions. Self-monitoring behaviors and weight were measured at each session. Weight trajectories were identified using latent class trajectory analysis, using a 3 class cubic model. Program compliance was defined by attending 9 or more sessions, averaging more than 150 minutes of PA, or completing the food log at more than 2/3 of sessions attended. Individual level factors included demographics, obesity levels and medical conditions; program level factors included financial incentives, coach type, and group size. A path analysis approach and multivariable logistic and cumulative ordinal logistic regressions were used to evaluate associations of factors with program compliance and weight trajectories. Among the 657 participants, 72% complied with attendance, 18% with physical activity, 35% with reporting food logs; 24% had a sustained weight loss. Financial incentives was only associated with higher attendance, group size with self-monitoring, and coach type with better weight trajectory. English as primary language was positive associated with self-monitoring outcomes and inversely associated with weight trajectories. All three compliance outcomes were highly associated with sustained weight loss. Incentives increased attendance but did not translate into sustained weight loss. Strategies implemented to tailor the DPP curriculum to specific cultures and members of the community as lifestyle coaches were effective in improving sustained weight loss.
Public housing provides affordable housing and housing stability for low income families. The health benefits of public housing residency have been rarely studied. We aimed to test the hypothesis that public housing residency is associated with housing stability and reduced risk of diabetes. Data came from World Trade Center Health Registry, a longitudinal study of individuals exposed to the 9/11 World Trade Center attacks. We focused on 730 adult enrollees who lived in the New York City Housing Authority (NYCHA; public housing) and had no history of prevalent diabetes in 2004 (“baseline”). We performed propensity score matching to identify 730 non-NYCHA enrollees who were comparable to NYCHA enrollees at baseline. Outcomes were housing stability (defined as a pattern of residential immobility via sequence analysis of annual residential addresses for 2004-16) and self-reported diabetes diagnoses from 3 follow-up surveys (2006-7, 2010-11, 2015-16). Most 1460 enrollees reported household incomes < $50,000 and < college degree at baseline. Most were people of color with an average age of 46 years. Sequence analysis identified 3 mobility patterns among all 1460 enrollees, including stable housing (65%), limited mobility (26%), and unstable housing patterns (9%). Public housing residency was associated with housing stability over 12 years (70% of NYCHA enrollees vs. 60% of non-NYCHA enrollees; PR=1.17, 95% CI=1.09, 1.26). Diabetes risk was not associated with public housing residency, but among those experiencing housing instability, higher risk of diabetes was found among public housing versus non-public housing residents (RR=1.59, 95% CI=1.01, 2.50). Of those stably housed, the association remained insignificant. These findings highlight a positive impact of public housing on housing stability among urban residents with low socioeconomic status, and a health benefit of housing stability such as reduced diabetes risk.
ADVERSE HEALTH OUTCOMES IN EARLY CHILDHOOD (BIRTH-5 YEARS) AND AMBIENT AIR POLLUTANT EXPOSURES: A SYSTEMATIC REVIEW Douglas Mejia* Douglas Mejia, Stephnie Dennis, Kristie Nhuyen, Shahnaj Safi, Manisa Bhuyan, Rhonda Spencer, (Loma Linda University School of Public Health)

The purpose of the study revolves around traffic-related air pollutant (TRAP) exposure levels and how they compare to guidelines provided by the World Health Organization (WHO) and Environmental Protection Agency (EPA). These guidelines are not sufficiently stringent for children from the fetal stages to the fifth year of life. An electronic systematic literature review was conducted from Jan. 1999 up to Sept. 2018 in order to determine common TRAPs and their effects on children. The inclusion-exclusion criteria include “air pollution and children” and diseases categorized into 7 groups. The search was limited to include studies with stated exposure windows from the mother’s pregnancy up to the 5th year of life. Average exposure windows included pregnancy, 1st, or 2nd year of life. All were found to have negative respiratory outcomes. The strongest correlation was between PM10, PM2.5, NO2. Studies commonly assessed correlation of TRAP and respiratory, especially asthma, but little information on diabetes, obesity, or thyroid. TRAP exposure resulted in decrease of lung capacity, increase in lung infections, and development of many chronic diseases. Most common association of mental disorders was autism, correlating with PM2.5 and NO2. Difficulties: to assign accurate exposure estimates due to factors that include; no biological markers, weather, daily commutes, time outdoors. Others were to identify the disease, since the children are too young to develop chronic diseases, and most developmental disorders are identified at later stages of childhood. No study adjusted for socioecological factors, over-estimating the association between TRAP and adverse health outcomes, creating effect modifiers, synergism, or other confounders. Stress-filled homes elevate the potential of increased exposure, further promoting biological changes. Another unaccounted variable was that minorities and low-income families live near hubs, increasing the likelihood of greater exposure.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Exposure Window</th>
<th>Mean Exposure (ppb)</th>
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<tr>
<td>NO</td>
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<td>39.2</td>
</tr>
<tr>
<td>NO2</td>
<td>Entire Pregnancy</td>
<td>30.8</td>
</tr>
<tr>
<td>NO2</td>
<td>Entire Pregnancy</td>
<td>53.19</td>
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<tr>
<td>NO2</td>
<td>Entire Pregnancy</td>
<td>31.1</td>
</tr>
<tr>
<td>NO2</td>
<td>First Year of Life</td>
<td>17</td>
</tr>
<tr>
<td>NO2</td>
<td>Postnatal</td>
<td>25.7</td>
</tr>
<tr>
<td>NO2</td>
<td>Pregnancy &amp; First Year</td>
<td>14.2</td>
</tr>
<tr>
<td>O3</td>
<td>Entire Pregnancy</td>
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</tr>
<tr>
<td>O3</td>
<td>Entire Pregnancy</td>
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<tr>
<td>PM10</td>
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<tr>
<td>PM10</td>
<td>First Year of Life</td>
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</tr>
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<td>PM2.5</td>
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</tr>
<tr>
<td>PM2.5</td>
<td>First Year of Life</td>
<td>14</td>
</tr>
<tr>
<td>SO2</td>
<td>Pregnancy &amp; First Year</td>
<td>4.72</td>
</tr>
</tbody>
</table>

S/P indicates work done while a student/postdoc
Background: Previous animal studies reported that pyrethroid pesticide exposure can cause dopamine system abnormalities and attention-deficit/hyperactivity disorder (ADHD) phenotypes. However, epidemiological studies investigating the associations between pyrethroid pesticide exposure and ADHD-related outcomes, especially among children, are limited. Methods: We used data of 385 mother-child pairs participating in the Environment and Development of Children (EDC) study. We measured 3-phenoxybenzoic acid (3-PBA) concentrations in the urine of pregnant mothers and their children at 2 and 4 years of age. We assessed the association between urinary 3-PBA concentration and using pyrethroid insecticides from living environment questionnaire. We also assessed the association between urinary 3-PBA concentration at 4 years of age and ADHD symptom through Poisson regression. Results: The mean 3-PBA concentration in children’s urine at 4 years of age was 2.267 μg/g creatinine. 2-fold increase in urinary 3-PBA exposure was significantly associated with children’s ADHD symptoms (4.0%, 95% confidence interval [CI], 1.4% to 6.7%). When stratified by gender, it was significant in boys but not in girls. Higher urinary 3-PBA was significantly associated with using pyrethroid pesticide (β = 0.1104, P = 0.0222). Conclusion: Our study results indicate that urinary 3-PBA concentration in 4-year old children increases the risk of developing ADHD. As the use of pyrethroid pesticides is increasing, more attention should be paid to their health effects.
PREDICTION OF URINARY PHTHALATE METABOLITE CONCENTRATIONS WITH MEDICATION AND DIETARY SUPPLEMENT EXPOSURES Thomas P. Ahern*, Thomas P. Ahern, Bernard F. Cole, Mary Diaz Santana, JoAnn E. Manson, Katherine W. Reeves, (University of Vermont)

Background: Epidemiologic studies of phthalates and health outcomes are hampered by the logistics and expense of measuring urinary metabolites. Many pharmaceuticals and dietary supplements are formulated with phthalates, and are sources of particularly high human exposure. We hypothesized that medication and supplement information—which is captured by many existing epidemiologic cohorts—could accurately predict phthalate exposure. Methods: We evaluated the utility of medication and supplement exposures in predicting levels of 13 urinary phthalate metabolites in 1,173 Women's Health Initiative participants. Medications and supplements were ascertained the same year as urine specimen collection, based on interview or inventories of pill bottles brought to the clinic. Phthalate metabolites were measured by tandem liquid chromatography/mass spectrometry at the Centers for Disease Control. We regressed log-transformed, creatinine-adjusted metabolite levels on medication and supplement exposure in both univariable and multivariable models. We derived parsimonious predictive models for each metabolite using a forward selection algorithm based on changes in adjusted r-squared values. Results: 46 medication and supplement classes were used for model development. Across all predictors, maximum r-squared values from metabolite-specific univariable models were poor, ranging from 0.55% for monocarboxyisooctyl phthalate to 1.56% for monobenzyl phthalate. Adjusted r-squared values from multivariable models were only modestly improved (minimum=2.86% for monobutyl phthalate; maximum=13% for monocarboxyisooctyl phthalate). Correlation coefficients between predicted and observed metabolite levels ranged from 0.15 to 0.29, suggesting that ranked predicted values could at best weakly classify actual phthalate metabolite levels. Conclusions: Broadly classified medication and supplement exposures are not useful for prediction of phthalate exposure in typical epidemiologic data sets.
Background: Ambient air pollution has been associated with sleep duration and wakefulness in a few previous studies. However, most studies assessed sleep using self-reported sleep characteristics, single-night in-laboratory or in-home polysomnography, or prospectively collected data up to one week only. Methods: In this cohort study in the Greater Boston Area (2016-2017), we prospectively collected daily objective sleep data on 98 patients with episodic migraine using wrist actigraphy for an average of 45 days. We recorded 4406 days of data on nightly sleep duration (minutes) and wake after sleep onset (WASO; minutes). Concentrations of fine particulate matter (PM2.5), nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), and carbon monoxide (CO) were from local air quality monitors. We used linear mixed effects models with participant-specific random intercepts, and adjusted for age, sex, ethnicity, temperature, relative humidity, season, and day-of-week. Results: The mean age was 35 (SD: 12) years and 86 were women. Higher daily maximum 8-hour O3 was associated with longer nightly sleep duration and modest higher wake after sleep onset: a 15 ppb (interquartile range) higher daily maximum 8-hour O3 was associated with 7.7 minutes (95% confidence interval: 3.1, 12.3) longer duration, and with 1.1 minutes (95% confidence interval: 0.0, 2.3) higher wake after sleep onset. Daily average PM2.5, daily maximum 1-hour NO2, daily maximum 1-hour SO2 and daily maximum 8-hour CO were not associated with sleep duration or wake after sleep onset. Conclusions: In this region with relatively low levels of air pollution, exposure to higher levels of daily maximum 8-hour O3 was associated with longer nightly sleep duration and modest higher wake after sleep onset during the night.
ASSOCIATIONS OF MATERNAL BLOOD PRESSURE POLYGENIC RISK SCORE WITH FETAL GROWTH
Tsegaselassie Workalemahu* Tsegaselassie Workalemahu, Marion Ouidir, Jing Wu, Cuilin Zhang, Fasil Tekola-Ayele, (The National Institute of Child Health and Human Development (NICHD))

Background: Maternal pre-pregnancy blood pressure and the trajectory of blood pressure during gestation are associated with variations in fetal weight. However, the association of maternal genetic propensity for elevated blood pressure with fetal weight is unknown. Objective: We performed polygenic risk score (PRS) analysis to evaluate the association of maternal genetic propensity for elevated blood pressure with estimated fetal weight (EFW) among four racial/ethnic populations in the U.S. Methods: The study was based on singleton pregnancies (n=2065) recruited through the NICHD Fetal Growth Studies. EFWs at approximately 13, 20, 27, and 40 weeks gestation were calculated from five standardized ultrasound measures. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) PRSs for each participant were calculated using the largest genome-wide association study on SBP and DPB. Linear regression models tested the associations between PRS tertile groups and EFWs, adjusting for maternal age, education, parity, genetic structure and fetal sex. Results: Hispanics in highest tertile of DBP PRS had 1.9g (95%CI:-3.5, -0.2), 6.8g (95%CI:-13.9, 0.2), 30.1g (95%CI:-55.6, -4.6) and 124.9g (95%CI:-221.7, -28.2) lower EFWs at 13, 20, 27 and 40 weeks gestation compared with those in the lowest tertile groups, respectively (p-trend<0.05 at each gestation week tested). Blacks in the highest tertile of SBP PRSs had 28.7g (95%CI:-51.4, -6.0) and 112.8g (95%CI:-196.3, -29.4) lower EFWs at 27 and 40 weeks gestation, respectively (p-trend<0.05 for SBP PRS at week 40). PRS was not significantly associated with EFW among Asians and Whites. Conclusion: Polygenic risk for elevated diastolic and systolic blood pressure was associated with reduced fetal weight in Hispanics and Blacks, respectively. Improved prediction of adverse pregnancy outcomes based on maternal genetic risk for elevated blood pressure may provide opportunities for intervention.

S/P indicates work done while a student/postdoc
EVALUATION OF A SCHOOL BASED COMPREHENSIVE SEXUALITY EDUCATION PROGRAM AMONG VERY YOUNG ADOLESCENTS IN RURAL UGANDA

Katharine Bruce*, Katharine Bruce, Elizabeth Kemigisha, Olena Ivanova, Els Leye, Gily Coene, Gad N Ruzaaza, Anna B Ninsiima, Wendo Mlahagwa, Viola N Nyakato, Kristien Michielsen, (CDC/CSTE Applied Epidemiology Fellow)

Background: Limited research has explored the effectiveness of comprehensive sexuality education (CSE) for very young adolescents (VYAs) ages 10-14 in Uganda. Evaluations of sexuality education programs often study outcomes of risky sexual practices, yet positive aspects of sexuality are hardly reported. This study evaluates the effectiveness of a CSE intervention for VYAs in Uganda, analyzing both positive and negative outcome indicators. Methods: We conducted a mixed methods study, including a cluster randomized trial followed by a qualitative evaluation among pupils in 33 randomly selected primary schools in Mbarara district. Quantitative data were analyzed using ordered logistic regression comparing the change from baseline to endline between intervention and control arms. We conducted multivariate analysis controlling for key covariates, including age, gender, school setting, truancy, and orphanhood. Qualitative data was analyzed by manual coding and deductive synthesis using pre-determined themes. Results: In July 2016, we recruited 1096 pupils; outcomes were studied among 380 pupils in the intervention arm and 484 in the control arm. We found greater improvements in sexual and reproductive health (SRH) knowledge among intervention pupils (AOR: 2.18, 95% CI: 1.66-2.86) and no significant differences in self-esteem, body image, gender equitable norms or sexual behavior. Qualitative evidence echoes perceived SRH knowledge acquisition and minimal changes in sexual behavior. Furthermore, qualitative data highlighted other relevant SRH outcomes that were not explored quantitatively, including reporting of sexual abuse and improved behavioral intentions. Conclusion: This study demonstrates that CSE can improve SRH knowledge and behavioral intentions among VYAs in Uganda. These results emphasize the importance of initiating sexuality education before most adolescents have started engaging in sexual activity, enabling them to make informed decisions in the future.
CULTURAL POSTPARTUM PRACTICES AND DEPRESSION IN RURAL PAKISTAN Katherine LeMasters* Katherine LeMasters, Lauren Zalla, Nafeesa Andrabi, John Gallis, Elizabeth Turner, Siham Sikander, Joanna Maselko, (University of North Carolina at Chapel Hill)

Background: Traditional postpartum practices in South Asia intended to provide care to mothers may have long term benefits on maternal mental health. Yet, there is mixed evidence concerning their impact on postpartum depression (PPD). Prior work has used postpartum practices as a proxy for social support, but none have examined the impact of such practices on PPD beyond such support. This study aims to understand if chilla (a traditional practice in Pakistan defined by receiving supplemental food, additional familial support, and relief from household work for up to 40 days postpartum) protects against PPD above and beyond social support.

Methods: Data come from the Bachpan birth-cohort in rural Pakistan. Chilla participation (yes/no) and social support (Multidimensional Scale of Perceived Social Support) were assessed at 3 months (mo) postpartum. Women were assessed in their third trimester and at 6mo postpartum for depression symptom severity (Patient Health Questionnaire (PHQ-9)) and diagnostic depressive levels (Structured Clinical Interview for DSM-5 (SCID)). Results: Ninety-five percent of the sample (N=786) participated in chilla. Chilla is protective against PPD at 6mo after controlling for perceived social support, maternal education, socioeconomic status, prenatal depression score, and variables associated with missingness (PHQ-9: B=-1.54, 95% CI: -2.93, -0.16; SCID: Odds Ratio=0.56, 95% CI: 0.30, 0.95). Among those non-depressed at baseline, chilla is protective against developing PPD (Odds Ratio=0.43, 95% CI: 0.19, 0.95). Among women depressed at baseline, severity of their depressive symptoms decreases among chilla participants compared to non-participants at 6mo (B=-2.16, 95% CI: -3.83, -0.50). Conclusions: Chilla is protective against both depression diagnosis and severity at 6mo postpartum. Interventions aimed at preventing and treating PPD in this region should consider the potential benefits of chilla and similar traditional postpartum practices.

### Table 1: Chilla Participation and PPD at 6mo

<table>
<thead>
<tr>
<th>Model 1: SCID*</th>
<th>Panel A: Full Sample</th>
<th>Panel B: Non-Depressed</th>
<th>Panel C: Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds Ratio</td>
<td>95% C.I.</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>Chilla</td>
<td>0.56</td>
<td>(0.30-1.05)</td>
<td>0.43*</td>
</tr>
<tr>
<td>Perceived Social Support</td>
<td>0.72*</td>
<td>(0.61-0.85)</td>
<td>0.68**</td>
</tr>
<tr>
<td>SCID Baseline</td>
<td>1.60</td>
<td>(0.98-2.61)</td>
<td>1.00</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td>0.94</td>
<td>(0.77-1.14)</td>
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<tr>
<td>Live with Mother-in-Law</td>
<td>0.81**</td>
<td>(0.70-0.94)</td>
<td>0.82</td>
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<tr>
<td>Maternal Education</td>
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<td>(0.92-1.11)</td>
<td>1.07</td>
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<tr>
<td>Number of People in Room</td>
<td>0.70</td>
<td>(0.36-1.38)</td>
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<tr>
<td>Grandmother Lives in Home</td>
<td>0.99</td>
<td>(0.69-1.41)</td>
<td>1.16</td>
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<tr>
<td>Number of Living Children</td>
<td>0.68*</td>
<td>(0.50-0.93)</td>
<td>0.55***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2: PHQ-9**</th>
<th>Panel A: Full Sample</th>
<th>Panel B: Non-Depressed</th>
<th>Panel C: Depressed</th>
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<tr>
<td></td>
<td>β</td>
<td>95% C.I.</td>
<td>β</td>
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<td>Chilla</td>
<td>-1.54</td>
<td>(-2.93-0.16)</td>
<td>-0.69</td>
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<tr>
<td>Perceived Social Support</td>
<td>-0.86***</td>
<td>(-1.18-0.54)</td>
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<td>PHQ-9 Baseline</td>
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<td>(0.15-0.33)</td>
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<td>Maternal Education</td>
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<td>-0.07</td>
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<td>-0.51</td>
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*p<0.05, **p<0.01, ***p<0.001.

* Model 1 used multilevel mixed-effects logistic regression with random effects to account for clustering.

** Model 2 used generalized linear mixed models with random effects to account for clustering.
THE EFFECT OF HOUSEHOLD-BASED SCREENING ON BLOOD PRESSURE CHANGES IN SOUTH AFRICA: A POPULATION-BASED REGRESSION DISCONTINUITY STUDY

Michael Garber*, Nikkil Sudharsanan, Simiao Chen, Pascal Geldsetzer, Michael Garber, (Heidelberg Institute of Global Health, Heidelberg University)

Hypertension carries a large mortality burden yet is widely undetected and uncontrolled in many low- and middle-income countries. In this study, we use a quasi-experimental regression discontinuity study design to evaluate the effect of household-based screening for blood pressure on blood pressure outcomes in South Africa. Data are from the 2008, 2010, 2012, 2014, and 2017 waves of the National Income Dynamics Study—a nationally representative, household-based, survey of South Africans. The sample included all individuals aged 30+ with valid blood pressure measurements and excluded those who reported a prior diagnosis of hypertension (N=19,591). The primary outcome was two-year change in measured systolic blood pressure. Secondary outcomes were hypertension awareness and treatment. “Intervention” Individuals had their blood pressure measured as part of the data collection. If they had a measured blood pressure > 140 mmHg, they were told they had elevated blood pressure, that hypertension can lead to life threatening consequences, and encouraged to seek care. We estimated the causal effect of the intervention using a regression discontinuity design that compares outcomes between individuals with a baseline blood pressure just above and below the 140-mmHg cutoff. This study was pre-registered on ClinicalTrials.gov (NCT03762304). Results We did not find evidence that household-based screening and care referral had a causal effect on two-year change in blood pressure (-0.95 mmHg, 95% CI: [-5.16, 0.54]), diagnosis of hypertension (0.009 % points, 95% CI: [-0.035, 0.051]), or treatment (0.016 % points, 95% CI: [-0.020, 0.055], Fig. 1). Interpretation Household-based screening for hypertension did not result in improvements in hypertension diagnosis, treatment, nor blood pressure levels in South Africa. Interventions that additionally address behavioral and social barriers to healthcare utilization may be needed for screening to result in population health improvements.

Figure 1 Regression discontinuity estimates of the local causal effect of household-based blood pressure screening and referral to further care on two-year change in systolic blood pressure, awareness of hypertension, and treatment of hypertension, National Income Dynamics Study, 2008-2017, South Africa, N = 19,591.

Notes: The “intervention” was information about the negative consequences of hypertension and encouragement to seek further care. The intervention was given to all individuals with a baseline max systolic blood pressure greater than 140 mmHg (this point was used as the primary discontinuity). The treatment effects were estimated using mean-square error optimal bandwidths (separately for each outcome), triangular kernel weights, and a local linear regression specification. Standard errors were estimated using a robust procedure that accounts for both sampling and smoothing error.
Background: Rural areas face unique challenges, including fewer options for chronic pain management. Understanding the extent to which there are urban-rural inequalities in chronic pain in the midst of the opioid epidemic is important. We evaluated inequalities in chronic pain by rural residence in middle-aged US residents and whether inequalities evolved between 1998 and 2012. Methods: We included US-born adults ages 50-57 years who enrolled in the Health and Retirement Study in 1998, 2004, or 2010 (N=7,955). We used the participant's residential Census tract at enrollment to categorize their location as all rural (100% rural tracts), rural mixed (99.9%-25.1%), urban mixed (25%-0.1%), and all urban (0%). Chronic pain was defined as reporting trouble with moderate or severe pain at both enrollment and first follow-up visit (2 years later). To assess rural-urban inequalities in midlife chronic pain, we fit weighted logistic regressions adjusted for age, gender, race/ethnicity, enrollment wave, southern birth, and parental education. We included interactions between residence location and enrollment wave to evaluate period/cohort effects (which are not distinguishable in these data). Results: Mean age at enrollment was 53.2 years; 11.4% of the sample resided in all rural, 13.9% rural mixed, 15.9% urban mixed, and 58.9% all urban tracts. Prevalence of chronic pain was 12.2% in 1998-2000, 13.8% in 2004-2006, and 18.3% in 2010-2012. Urban-rural differences in chronic pain among middle-aged US residents were inconsistent across study waves, with substantial urban advantage in 1998-2000, substantial rural advantage in 2004-2006, and no association 2010-2012 (Figure). Conclusions: Urban-rural differences in chronic pain among middle-aged US residents changed non-monotonically between 1998 and 2012. Further research is needed to elucidate the drivers of these patterns, which will shape projected urban-rural differences in health of older adults.
NEIGHBORHOOD SOCIOECONOMIC STATUS TRAJECTORY AND EXTREME WEIGHT CHANGES Dong Zhang* Dong Zhang, Qian Xiao, (University of Iowa)

During the past decades, a growing body of literature has linked more severe socioeconomic deprivation in the neighborhood with obesity and weight gain. However, it remains unclear how long-term trajectories of neighborhood socioeconomic status (nSES) are associated with weight change. Moreover, few studies have examined nSES in relation to weight gain and weight loss as separate outcomes. In the NIH-AARP Diet and Health Study, we examined nSES trajectories over 20 years in relation to excessive weight gain and weight loss (>10% of baseline weight) in 130,646 participants (age 51-70) who reported living in the same neighborhood in both baseline (1995-1996) and follow-up (2004-2006) surveys. Long-term nSES trajectories were derived using census data from 1990, 2000 and 2010. We found that when compared to the high stable (high-high-high) trajectory, the early decline trajectory (high-low-low) was associated with higher risks of both excessive weight gain (OR (95% CI), 1.21 (1.06, 1.37)) and weight loss (1.25 (1.09, 1.43)) in men; while in women, both early and late decline (high-high-low) trajectories were associated with excessive weight gain (1.17 (1.04, 1.31) and 1.15 (1.02, 1.30) for early and late decline, respectively), but not weight loss. In contrast, when compared with the low stable (low-low-low) trajectory, the early increase trajectory (low-high-high) was associated with a lower risk of excessive weight gain in men (0.76 (0.66, 0.87)). Fluctuating trajectories (low-high-low and high-low-high) were not associated with excessive weight gain or weight loss. Our findings suggest that deterioration and improvement in nSES were associated with excessive weight gain and weight loss in middle-to-old aged men and women.
ALGORITHMIC IDENTIFICATION OF DEMENTIA FOR USE IN RACE/ETHNICITY DISPARITIES RESEARCH IN THE NATIONALLY-REPRESENTATIVE HEALTH AND RETIREMENT STUDY Melinda Power*, Kan Z. Gianattasio, Adam Ciarleglio, Melinda C. Power, (George Washington University School of Public Health)

Background: Disparities research in dementia is limited by lack of large, representative samples with formal dementia ascertainment. Algorithmic diagnosis of dementia in existing data such as the Health and Retirement Study (HRS) offers a cost-effective alternative. However, naïve use of existing algorithms for dementia classification in HRS will lead to biased findings due to large differences in sensitivity and specificity across groups. Objective: To develop an algorithm appropriate for dementia race/ethnicity disparities research which achieves (a) <5 percentage point pairwise difference in sensitivity and specificity across race/ethnic groups, (b) ≥80% overall accuracy, and (c) ≥75% and ≥90% overall sensitivity and specificity. Methods: We used linked data from HRS and the Aging Demographics and Memory Study (ADAMS), an HRS sub-study with formal dementia ascertainment. We evaluated performance of existing algorithms after applying race/ethnicity-specific cut-offs to assign participant dementia status. Next, we derived and evaluated new algorithms based on expert knowledge (Expert Model) and machine-learning methods, using race/ethnicity-specific cut-offs for classification. All new models were evaluated using 10-fold cross-validation. Data were weighted to recover the U.S. age >70 population. Results: We identified five dementia classification algorithms that achieve our criteria: the existing Hurd model, the Expert Model, and three machine learning models. The Expert Model achieved 77%, 78%, and 75% sensitivity, and 93%, 89%, and 91% specificity respectively in non-Hispanic whites, non-Hispanic blacks, and Hispanics, estimates pairwise prevalence ratios that are closest to ADAMS prevalence ratios, and is the easiest to use. Conclusions: We recommend use of the Expert Model when investigating dementia disparities between non-Hispanic whites and blacks in the HRS to reduce concerns about spurious findings due to differential misclassification.

S/P indicates work done while a student/postdoc
IDENTIFYING POTENTIALLY PREVENTABLE ED VISIT HOTSPOTS AND ASSOCIATED FACTORS OF PRIMARY CARE ACCESS IN NEW YORK STATE Kirsten Weisbeck* Kirsten Weisbeck, Mary M. Ford, Louise Cohen, (Primary Care Development Corporation)

We identified potentially preventable Emergency Department (PPED) visit rate hotspots to explore their association with primary care access and socioeconomic factors across New York State (NYS). Clusters of ZIP Code Tabulated Areas (ZCTAs) in NYS with significantly high PPED visit rates in 2016 were identified using the local Moran’s I statistic. Univariate statistics were used to describe and map all measures in the analysis. Logistic regression was used to determine independent associations between PPED hotspots (high-high spatial autocorrelation) and primary care access and socioeconomic measures. Primary care access measures were used to categorize ZCTAs by Primary Care Provider (PCP) availability, Medicaid and Medicare acceptance, PCMH-recognized access point availability, and uninsured rates. Socioeconomic position measures included Rural-Urban Commuting Area code category, the percent of residents living below the Federal Poverty Level (FPL), Non-Hispanic Black residents, and ZCTA age distributions. Spatial and statistical analyses were performed in GeoDa 1.12.1.161 and SAS 9.4. We found statistically significant clustering of PPED visit rates (I=0.28, p<0.001) had 8.89 greater odds of being a PPED hotspot compared to low poverty ZCTAs (<6.4% below FPL), 95% CI [5.65, 14.01]. Small town ZCTAs had 6.14 greater odds of being a PPED hotspot compared to metropolitan ZCTAs, 95% CI [4.10, 9.22]. PPED hotspots were associated with low primary care access, high uninsured rates, and poverty. Targeting PPED hotspots for primary care resources may reduce unnecessary health care spending, and increased preventive care and chronic disease management, ultimately addressing key aspects of health equity in NYS.

![Figure 1. New York State Potentially Preventable Emergency Department (PPED) Visit Rates by ZIP Code, 2016](image_url)

S/P indicates work done while a student/postdoc
Kidney transplant is the optimal treatment for most US patients with end-stage renal disease (ESRD). Despite this, inequities in access to kidney transplant exist, with the Southeastern US having the lowest rates of kidney transplant in the nation. Patients are required to have a referral for an evaluation at a transplant center, which most often comes from dialysis providers. Referrals for transplant are not captured in national surveillance databases, and it is unknown how this step could be influencing access to the waitlist in this region. We collected 2012-2016 referral data from all 9 adult transplant centers in GA, NC, and SC. We merged these novel data with the US Renal Data System, which included data on all ESRD patients starting dialysis from 2012-2015 (followed through 2016) and facility characteristics. Patient-level data were collapsed to the facility-level, consisting of 741 Southeastern facilities. Facilities with ≤10 ESRD patients (n=98) and VA-affiliated facilities (n=5) were excluded from analyses. Descriptive statistics were used to describe the within-facility patient population and to categorize the proportion of patients referred for transplant evaluation within 1 year of ESRD start (over the entire study period) into tertiles. Facility addresses were geocoded, plotted via Tableau, and identified by referral tertile. Among the 638 facilities, there was a total of 29,428 incident dialysis patients with a mean within-facility age of 59.6 years and a within-facility population of majority male (mean: 54.9; 95% CI: 54.1-55.7) and black (mean: 55.3; 95% CI: 53.4-57.1) patients. Preliminary results show significant facility variation in referral (median: 33.3%; range: 0-94.7%), with one-fourth of facilities referring less than 25% of patients. Further analyses is needed to determine why certain facilities are lower performing and what interventions could be instrumental in improving facility referral rates, and in turn access to kidney transplant.
DISPARITIES IN FLU VACCINATIONS: THE CASE OF ARAB AMERICANS IN CALIFORNIA
Nadia N. Abuelezam* Nadia N. Abuelezam, Abdulrahman M. El-Sayed, Sandro Galea, (Boston College W.F. Connell School of Nursing)

Background: Influenza continues to cause preventable morbidity and mortality in the United States. We aimed to understand the patterns of flu vaccination uptake among Arab American adults in California, a key preventive measure to mitigate influenza. Methods: Using the California Health Interview Survey, a state-wide, household-based survey with a rigorous sampling frame, we characterize self-reported flu vaccination among Arab American adults (N=1163) from 2003-2016. Using chi-squared tests and survey-weighted logistic regression, we assessed differences in vaccination probabilities among Arab Americans by demographic characteristics with comparisons to non-Hispanic, non-Arab Whites in California (N=166955). Results: Across all years, 30.3% of Arab Americans self-reported getting a flu vaccine (vs. 40.5% for non-Hispanic, non-Arab Whites, p<0.05). Self-reported flu vaccination increased steadily for non-Hispanic, non-Arab Whites from 2003-2016 but decreased for Arab Americans with 23.1% of Arab Americans reporting vaccination from 2013-2016. The gender (62.7 vs. 45.3% male, p<0.05) and age distributions (56.9 vs. 83.2% 40+ years of age, p<0.05) of those reporting vaccination vary significantly between Arab American and non-Hispanic, non-Arab Whites, respectively. In unadjusted analyses, Arab Americans had 0.64 (95% CI: 0.49, 0.83) times the odds as non-Hispanic, non-Arab Whites to self-report flu vaccination. After adjustment by age, education, and insurance status no difference in odds of vaccination were observed (OR: 0.95, 95% CI: 0.69, 1.31). Discussion: Flu vaccination among Arab Americans in California was lower than the national average (41.7%, 95% CI: 41.3, 42.1%) and lower than any other race/ethnicity group for the 2015-2016 flu season. Understanding specific barriers to influenza vaccination in this ethnic minority group may improve morbidity and mortality of influenza in California.
SEXUAL ORIENTATION DIFFERENCES IN MENOPAUSE TIMING AND SYMPTOMS Nicole A. VanKim, Nicole A. VanKim, Nicole D. Fields, Brian W. Whitcomb, Susan E. Hankinson, Lynnette Leidy Sievert, Elizabeth R. Bertone-Johnson, (University of Massachusetts Amherst)

Menopause timing is associated with various cardiometabolic outcomes. Earlier menopause may increase risk for cardiovascular disease and early mortality. Further, menopause symptoms, such as hot flashes, can adversely impact quality of life. Smoking and other risk factors for earlier menopause and hot flashes are common among lesbian and bisexual women, but whether menopause experience varies by sexual orientation is unknown. Longitudinal questionnaire data (1989-2013) from 95,410 women (885 lesbian, 396 bisexual) in the Nurses’ Health Study 2 cohort were used. Women were 25-42 years old at baseline. They reported on their menopausal status, including reasons for cessation of menstrual periods, every 2 years. In 2009, women reported on their experience of hot flashes. Cigarette smoking based on number of cigarettes smoked per day was asked every 2 years. Sexual orientation was reported in 2009 and 1995. Age-adjusted Cox models and logistic regression models suggest lesbian women have earlier menopause [HR (95% CI): 1.09 (1.02, 1.17)] and greater likelihood of reporting menopausal hot flashes [OR (95% CI): 1.52 (1.22, 1.91)] than heterosexuals. Among women who experienced hot flashes, lesbian women were more likely to report severe hot flashes [1.08 (1.01, 1.15)] than heterosexuals. Adjustment for smoking substantially attenuated estimates for menopause timing [1.05 (0.98, 1.13)] and hot flash severity [1.05 (0.99, 1.12)] but not hot flashes [1.45 (1.16, 1.82)]. There were no apparent substantive differences, after adjustment for smoking, between bisexual and heterosexual women in menopause timing [0.94 (0.84)], hot flashes [1.04 (0.77, 1.43)], or hot flash severity [1.07 (0.97, 1.18)]. Our findings suggest no meaningful difference in menopause timing or hot flash severity once smoking is considered between lesbian and heterosexual women. However, experiencing hot flashes may be greater among lesbian women and warrants additional study.
EVALUATING THE EFFECTS OF SUNDAY LIQUOR SALES LEGALIZATION ON ALCOHOL POLICY ATTITUDES AND ALCOHOL PURCHASING BEHAVIOR

Collin Calvert, Collin Calvert, Darin Erickson, Kathleen Lenk, Rhonda Jones-Webb, Traci Toomey, Toben Nelson, (University of Minnesota School of Public Health)

Background: The state of Minnesota legalized Sunday liquor sales in July of 2017. No research has examined the effect this has had on attitudes regarding Sunday sales, or the purchase of alcohol on Sundays. Methods: We collected survey data from Minnesota state fair attendees in the summer of 2018 to measure attitudes regarding Sunday sales before and after legalization. We assessed what demographic and behavioral characteristics were associated with support of Sunday sales and the purchase of alcohol on Sundays in Minnesota. Results: The majority of participants (n=1083; 81%) had stable attitudes regarding the ban on Sunday sales, while 15% became more supportive of legalized Sunday sales. Participants who were in the highest level of education (OR: 2.43; CI: 1.33, 4.48), White (OR: 1.92; CI: 1.25, 2.95), had a higher quantity-frequency score (OR: 1.04; CI: 1.03, 1.06), and binge drank in the past thirty days (OR: 2.93; CI: 2.08, 4.14) had greater odds of purchasing alcohol on Sunday. Participants with the highest levels of education (OR: 2.41; CI: 0.98, 3.25), binge drank in the past thirty days (OR: 2.18; CI: 1.50, 3.16), and had a higher quantity frequency score (OR: 1.01; CI: 1.00, 1.02) were also more likely to support legalized Sunday sales. After adjusting for education, race, age, religiosity, and quantity frequency, participants who supported legalized Sunday sales had greater odds of binge drinking in the past 30 days (OR: 2.20; CI: 1.48, 3.26). Conclusion: A shift in attitudes towards greater support of Sunday sales is consistent with literature regarding how policy changes affect attitudes. People with less healthy drinking behaviors (e.g., binge drinking) are more likely to have taken advantage of open liquor stores on Sundays. Future research is needed to determine if legalization of Sunday sales has led to an increase in purchase of alcohol overall, as well as consumption and alcohol-related problems.
ANALYSIS OF THE RISK OF AVOIDABLE HOSPITALIZATIONS BY INDIVIDUAL- AND NEIGHBOURHOOD-LEVEL SOCIOECONOMIC STATUS IN CANADA Laura Rosella* Lauren Wallar, Laura Rosella, (University of Toronto)

Socioeconomic status has been linked to the risk of avoidable hospitalizations, however studies in Canada using longitudinal individual-level data and comprehensive measures of socioeconomic status have not been conducted. The objective of this study is to quantify the risk of avoidable hospitalizations by socioeconomic status among a representative national cohort using measures of individual- and neighbourhood-level socioeconomic status. The cohort pools eight cycles of the Canadian Community Health Survey (2001-2011) linked to fourteen years of hospital discharge records (1999-2013), excluding those younger than 18 years or older than 75 years of age at time of interview, Quebec residents, and pregnant women. Individual-level socioeconomic status measures including income and education will be ascertained from Canadian Community Health Survey variables. Neighbourhood-level socioeconomic status will be determined using the Canadian Marginalization Index, a national census- and area-based index of marginalization. Using respondent postal code information, index measures will be linked creating a novel dataset for analysis. Respondents who experienced at least one prospective avoidable hospitalization event will be identified using International Classification of Diseases-9 and -10 codes according to standard case definitions. Multilevel logistic regression models will be constructed to estimate the risk of avoidable hospitalizations according to individual- and neighbourhood-level socioeconomic status, while adjusting for other individual-level confounders. Results of minimally and fully adjusted models will be presented. This work will importantly delineate the impact of both individual- and neighbourhood-level socioeconomic status on avoidable hospitalizations across Canada using novel individual-level linked health survey and administrative data on a large population-based cohort.
KNOWLEDGE AND ATTITUDES ON EXPEDITED PARTNER THERAPY FOR CHLAMYDIA AMONG REPRODUCTIVE-AGED WOMEN IN MINNESOTA Ashley Oglesby*, Ashley Oglesby, Victoria Doll, Grace Lynden, Alyssa Mason, Isabel Ricke, Stacey Moe, Ruby Nguyen, (University of Minnesota)

Background: Despite effective, safe, and low-cost curative treatment for chlamydia, national rates of chlamydia have never been higher. States such as Minnesota have enacted policies to treat sex partners of infected patients through expedited partner therapy (EPT). However, there is little evidence of women’s knowledge and/or acceptance of such programs. Objective: To assess knowledge and attitudes regarding EPT among reproductive-aged women. Design/methods: Females aged 18-44 years were recruited at the 2018 Minnesota State Fair, a venue intended to be representative of the state of Minnesota. Chi-square and logistic regression models were determined; odds ratios were adjusted for women’s age and education level. Results: A total of 871 women completed the survey. 64% of respondents strongly agreed with the theoretical use of EPT. In univariate analyses, there were significant differences in EPT acceptance by age, relationship status, education level, belief in the importance of regularly testing for STIs, level of comfort discussing sexual health issues, knowledge of STIs, and knowledge of the prevalence of chlamydia. In separate models, adjusting for covariates, the odds of strong agreement with theoretical use of EPT was associated with the belief that testing for STIs is extremely important (aOR 1.61, 95% CI 1.20, 2.16), increased comfort in discussing sexual health issues (aOR 1.89, 95% CI 1.42, 2.53), greater knowledge of STIs (aOR 1.34, 95% CI 1.01, 1.78), and knowledge of the prevalence of chlamydia (aOR 1.47, 95% CI 1.08, 2.01). Conclusion: We found that women’s increased knowledge of STIs is associated with greater acceptance of EPT, an important public health intervention in reducing the risk of re-infection in women and reducing overall population burden. Our data suggest that addressing women’s knowledge of STIs in general may be an important upstream factor in generating support for EPT programs.
The HIV epidemic among adolescents in sub-Saharan Africa is a critical public health problem. Adolescent girls and young women (AGYW) are at especially high risk—they become infected at a rate of 3:1 compared to their male counterparts. Identification of HIV risk factors for AGYW is crucial to inform prevention strategies. We sought to determine whether depressive symptoms in AGYW were associated with incident HIV, and to identify social and behavioral mediators of this relationship. Data came from HPTN 068, a randomized trial of a cash transfer conditional on school attendance among AGYW (ages 13 – 21) in rural Mpumalanga Province, South Africa (N=2,533). Depressive symptoms were measured at baseline using the Children's Depression Inventory. Mediators included sexual behaviors, parental monitoring, community involvement, and school attendance, and were measured at the first follow-up visit. HIV incidence was determined via blood tests performed over four subsequent follow-up visits. We calculated risk differences in HIV incidence by depressive symptoms using G-computation with logistic regression, and assessed mediation using inverse odds ratio weighting. Inference was calculated using the non-parametric bootstrap. AGYW with depressive symptoms had significantly higher cumulative incidence of HIV compared to those without (risk difference = 4.1% [95% CI 0.8%, 7.3%]). The strongest individual mediators of this association were parental monitoring and involvement (indirect effect (IDE)=1.3% [95% CI -0.2%, 2.9%]) and the number of sexual partners in the past 12 months (IDE = 1.1% [95% CI -0.5%, 2.6%]). All mediators jointly explained approximately half (IDE = 2.2% [95% CI 0.0%, 4.3%]) the association between depressive symptoms and HIV incidence. The findings from this study suggest that interventions addressing mental health and enhancing parental involvement for young women may reduce young women’s risk of acquiring HIV.
Background: Adolescent girls and young women aged 15-24 (AGYW) in sub-Saharan Africa are at high risk of HIV infection, in part due to relationships with older men. Methods: Survey staff of the Lesotho Population-Based HIV Impact Assessment (LePHIA) administered a questionnaire and household-based HIV testing to individuals aged 15-59 from 2016-2017. Survey data were weighted and characteristics of men who reported sexual activity with AGYW in the last 12 months were compared to non-partners, i.e. those who only reported partnerships with women older than 24. Multivariable logistic regression analysis assessed associations between reporting AGYW partnership(s), risk behaviors and HIV status among men. Risk behaviors assessed individually and as a composite were: reporting never having previously tested for HIV, having more than one sexual partner in past 12 months, non-consistent condom use with most recent partner in past 12 months, and not being circumcised. Results: Among 6765 men who were HIV tested in the survey, 3085 (median age 29.5 [IQR 22.6-38.6]) reported sexual activity in the last 12 months and the age of at least 1 female sexual partner. Of these, 1599 (52%) reported sexual partnerships with an AGYW. Of males aged 15-24, 25-34 and 35-59 y, 99%, 59% and 6% of men reported an AGYW partnership, respectively. Partners of AGYWs were less likely to be HIV positive than non-partners (9% vs 21%, adjusted Odds Ratio [aOR] 0.70, 95% CI [0.52-0.94]) but more likely to report >1 sexual partner (aOR 8.77, 95% CI [6.22-12.34]) and to have at least 1 risk behavior (aOR 1.82, 95% CI [1.27-2.60]). Older male partners (>34 years) of AGYW compared to non-partners were substantially more likely to report >1 sexual partner (aOR 10.80, 95% CI 5.89-19.83). Conclusion: Male partners of AGYW in Lesotho were not more likely to be HIV infected than non-partners but were more likely to report having multiple sexual partners, and the effect increased with the age of men.
LATENT CLASS ANALYSES FOR RETHINKING GENDER IDENTITY AND SEXUAL ORIENTATION IN MEN WHO HAVE SEX WITH MEN M Kumi Smith* M Kumi Smith, Chongyi Wei, Chuncheng Liu, Stephen W Pan, Jason J Ong, Joseph D Tucker, (University of Minnesota Twin Cities)

Background: Men who have sex with men (MSM) are a diverse population yet are often treated as a monolithic risk group. In settings like China, they have long been characterized as closeted men married to (or who will marry) women due to sociocultural pressure and thus acting as “bridge population” for transmitting HIV to lower risk individuals. Latent class models can inform a more nuanced and empirical understanding of the structure and traits of this population. Methods: 1424 eligible respondents provided behavioral data through an nationwide online survey. Nine items related to constructs including sexual behaviors, sexual orientation, and gender identity informed the latent class model. Optimal model fit was informed by the Akaike and Bayesian information criteria. Logistic regression was used to measure associations between latent class membership and HIV-related sexual and health-seeking behaviors. Results: Model fit indicated a population structure made up of four classes that we characterized as “Gender nonconforming” (4.3%), “Closeted-unmarried” (29.9%), “Closeted-married” (24.6%), and “Out” (41.2%). Members of the “gender nonconforming” class reported more HIV-related risk behaviors and “Closeted-unmarried” class members report the least health-seeking behaviors, both relative to “Out” members. Discussion: The largest latent class was made up of “Out” class members, an enlightening revision of a population traditionally viewed as largely closeted men. Two types of “closeted” classes emerged, distinguished by their divergent tendencies to marry and seek HIV related health services. Findings suggest that current conceptions of Chinese MSM are inaccurate (regarding closeted behaviors) and too narrow (in its definition of MSM as cisgender men). A more nuanced understanding of MSM subgroups and their heterogeneous risk behaviors will be critical for provision of more meaningful HIV prevention services.
COINFECTION WITH SCHISTOSOMIASIS AND HEPATITIS C: A SYNERGISTIC ASSOCIATION? Amy E. Abruzzi* Amy E. Abruzzi, Bernard Fried, Sukaina Alikhan, (Rutgers University -Edward J. Bloustein School of Policy and Public Planning)

Although many clinical studies have been undertaken it is still controversial as to whether or not coinfection with schistosomiasis and Hepatitis C increases the susceptibility to or progression from either disease. This work is an update to Abruzzi, Fried and Alikahn 2016 and presents a systematic review of key findings from studies conducted on human populations with adequate evidence to make this assessment. Considerations include but are not limited to: subject selection (i.e. asymptomatic cases vs. subjects presenting with clinical disease); study design, which directly impacts our ability to infer causality (i.e. case series, cross-sectional, case-control, cohort study); use and choice of control population (i.e. apparently healthy subjects vs other hospital patients vs none); sample size, which directly impacts statistical power and can result in a Type II error; geographic area (i.e. Egypt, Brazil, China), which may reflect differences in population genetics, public health history, environmental differences or any number of other important factors; method of testing for schistosomal infections (i.e. stool vs. antibody test) or if advanced schistosomal disease was present (i.e. ultrasound, liver biopsy vs. none); method of serological testing for HCV (i.e. use of anti-HCV alone or with RNA testing), and year of the study, which reflects among other things technological improvements between tests, as well as possible changes in the frequency of exposure in the populations under study (i.e. use of parenteral antischistosomal therapy vs. the oral antischistosomal medication). Particular attention will be given to clinical studies that allow us to evaluate whether or not a synergistic association exists.
Background. Serratia spp. are opportunistic pathogens which can cause serious bloodstream infections (BSIs) in pediatric patients. However, no national studies have characterized trends in Serratia spp. BSIs epidemiology among hospitalized children. Methods. We conducted a retrospective study using the Premier Healthcare Database including inpatient encounters among patients <19 years of age from 162 hospitals contributing microbiology data from 2009-2016. Serratia spp. BSIs were documented positive blood cultures and hospitalization rate was number of Serratia spp. BSI encounters per 1,000 admissions. Serratia spp. BSI and non-BSI patients were compared, as were neonates and non-neonates with Serratia spp. BSIs. Differences were analyzed using χ² and Cochran-Armitage trend tests. Results. Among 1,804,494 inpatient encounters meeting inclusion criteria, 83 (0.005%) had a Serratia spp. BSI; 55% were neonates. Serratia spp. BSI patients more often had complex chronic conditions (54% vs. 5%, p<0.001) or central lines (58% vs. 2%, p<0.001) compared to non-BSI patients. The hospitalization rate increased from 0.04 in 2009 to 0.10 in 2016 (p=0.048). Serratia spp. lead to longer hospital stays (median 42 vs. 2 days, p<0.001) and intensive care unit encounters (77% vs. 10%, p<0.001) compared to non-BSI patients. Outcomes were more severe for neonates than non-neonates with Serratia spp. BSI. Nine of 59 patients tested (15%) were resistant to ≥1 antibiotic classes of interest. Conclusions. Serratia spp. BSIs lead to severe outcomes for neonates and non-neonates. With the hospitalization rate increasing, it is important to increase awareness of this serious infection.
APPLICATION OF METHODS TO CONTROL FOR TIME-DEPENDENT CONFOUNDERS AFFECTED BY PREVIOUS EXPOSURE IN TUBERCULOSIS RESEARCH: A SYSTEMATIC REVIEW

Carly A Rodriguez* Carly Rodriguez, Molly F Franke, (Dept of Epidemiology, Boston University School of Public Health)

Time-dependent confounders affected by previous exposure can introduce bias if not accounted for. Time dependent confounding is likely a concern in observational studies of tuberculosis (TB) treatment. TB treatment requires multiple drugs over at least 6 months; drug-resistant TB entails treatment over longer durations with considerable toxicity. Toxicity is a risk factor for poor outcome, is an important factor in deciding to change a treatment regimen and is affected by prior treatment. We examined if methods to account for time-dependent confounding were used in TB. We conducted a systematic search in Pubmed of terms related to TB AND time-varying confounding, causal inference, marginal structural models, inverse probability weighting OR structural nested models. We screened abstracts, excluding those that were not on TB, included TB but were principally on HIV or did not reference methodologies of interest. We assessed full texts for whether the methodologies were applied to control for time-dependent confounding. Our search yielded 56 papers. We excluded 38 (68%) abstracts, nearly half of which used marginal structural models related to HIV-centric research questions. We assessed the full text of 18 (32%) papers. The use of propensity scores was common (n=6) but their use was restricted to baseline covariates. We did not find any papers implementing analyses to control for time-dependent confounding in TB. Methods to contend with time-dependent confounding have not been applied in TB, which may be due to a dearth of cohorts collecting longitudinal data on potential confounders throughout treatment, thus precluding the ability to do these analyses. The repercussions of this bias would be substantial: observational data has provided much of the guidance for drug-resistant TB, which affects 550,000 people annually. Cohorts must collect data on confounders longitudinally; analyses must be conducted to assess bias averted when methods to account for time-dependent confounding are used.
EARLY WEIGHT LOSS AND POOR TREATMENT OUTCOMES AMONG PATIENTS WITH TUBERCULOSIS AND HIV

Lauren Saag* Lauren Saag, Peter Rebeiro, Marcelo Cordeiro-Santos, Afranio Kriski, Bruno Andrade, Betina Durovni, Solange Calvacante, Megan Turner, Marina Figueiredo, Timothy Sterling, (Vanderbilt University School of Medicine)

Background: Previous research suggests that weight loss during early tuberculosis (TB) treatment is a predictor of poor TB treatment outcomes among HIV-negative populations, but the relationship has not been well studied in the context of HIV. We examined the association between HIV and weight change during the first two months of anti-TB treatment, and assessed the effects of weight change and HIV on TB treatment outcomes. Methods: Adults with culture-confirmed, drug-susceptible, pulmonary TB were enrolled into the Regional Prospective Observational Research for Tuberculosis (RePORT)-Brazil cohort. For primary analysis, we compared weight change in persons living with HIV (PLWH) and HIV-negative patients between baseline and two months using multivariable bootstrapped quantile regression and modified Poisson regression. For secondary analysis, we examined the separate effects of HIV and weight change on poor TB treatment outcome (treatment failure, TB recurrence, or death) with Cox proportional hazards regression. Results: Among 323 participants, 45 (14%) had HIV. On average, persons living with HIV (PLWH) lost 0.7% of their baseline body weight between baseline and two months; those without HIV gained 3.5%. After adjusting for age, sex, and baseline BMI, PLWH lost a median of 4.1% (95% CI: -6.5%, -1.6%) more weight during the first two months of anti-TB treatment than HIV-negative individuals. HIV infection was associated with weight loss ≥5% (adjusted RR=9.3; 95% CI: 4.2-20.6). Regarding the secondary analysis, 14 patients (8 (57%) with HIV) had a poor TB treatment outcome: 2 treatment failures, 4 cases of recurrent TB, and 8 deaths. PLWH and patients who lost ≥5% weight had significantly increased risk of poor TB treatment outcome with hazard ratios of 8.77 (95% CI: 2.96-25.94) and 4.09 (95% CI: 1.11-15.14), respectively. Conclusions: In our cohort, HIV was associated with weight loss during early TB treatment, and weight loss and HIV were associated with poor TB treatment outcome.
EVALUATION OF THE ELIXHAUSER COMORBIDITY INDEX TO PREDICT RISK OF HOSPITAL-ONSET CLOSTRIDIUM DIFFICILE INFECTION FOR APPLICATION IN AN AGENT-BASED MODEL OF A REGIONAL HEALTHCARE SYSTEM Sarah Rhea* Sarah Rhea, Breda Munoz, Lauren DiBiase, Emily Sickbert-Bennett, Georgiy Bobashev, Rainer Hilscher, Kasey Jones, James Rineer, Stacy Endres-Dighe, David J. Weber, (RTI International)

Electronic health records (EHRs) contain information on established risk factors (e.g., exposure to antibiotics and gastric acid suppression therapy, patient age, comorbidities) for Clostridium difficile infection (CDI), the most common healthcare-associated infection in the United States (US). These data can inform parameterization of agent-based models (ABMs) of CDI. ABMs can simulate complete systems (e.g., regional healthcare systems) comprised of discrete, unique agents (e.g., patients) which can be represented using a synthetic population, or model-generated representation of the actual population. Patient comorbidities can be captured from International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes in EHRs and categorized using the Elixhauser Comorbidity Index. Although the Elixhauser Comorbidity Index is being explored for risk adjustment in hospital-onset (HO)-CDI surveillance, it has not been assessed for HO-CDI risk prediction across different hospital types within a regional healthcare system with findings applied to ABMs. We evaluated the Elixhauser Comorbidity Index for HO-CDI risk prediction using comorbid conditions captured by ICD-10-CM codes in EHR data from patients admitted during July 1, 2016–June 30, 2017 to a major regional healthcare system in the southeastern US. On univariate analysis, the Elixhauser Comorbidity Index was a risk factor for CDI (risk ratio 1.18 (95% confidence interval 1.17-1.19). We used logistic regression, controlling for other CDI risk factors, to evaluate the results across different hospital types according to bed size. We discuss these results to inform parameterization of a CDI ABM of the regional healthcare system. Findings may be relevant to CDI risk prediction models for ABM parameterization and provide new insight to the use of the Elixhauser Comorbidity Index for HO-CDI risk prediction across different hospital types.

S/P indicates work done while a student/postdoc
THE ASSOCIATIONS BETWEEN TICK-BORNE DISEASES PERSONAL PROTECTIVE BEHAVIORS AND TICK-BORNE DISEASES  Sina Kianersi* Sina Kianersi, Oghenekaro Omodior, Maya Luetke, (Department of Epidemiology and Biostatistics, Indiana University School of Public Health-Bloomington)

Introduction: Tick-Borne Diseases (TBD) cause harmful health and financial consequences to humans. To prevent TBDs, CDC recommends seven TBD personal protective behaviors. However, few studies have evaluated these protective behaviors, the pathways that they affect TBD outcome, and their protective magnitude. The results of these studies were mixed. Methods: In July 2018, we surveyed 2920 adults who were residents of Indiana state at least 6 months prior to the study recruitment. All information, including the outcome, were self-reported. We evaluated the associations between the seven CDC-recommended TBD personal protective behaviors (yes vs. no) and TBD outcome (yes vs. no). We identified potential confounders and fitted propensity score models (one for each protective behavior). To obtain the prevalence ratios (PR) of each TBD personal Protective behavior and TBD outcome, we used a double robust approach of stabilized inverse probability weighting and propensity score adjustment. We further assessed the mentioned associations in sub-groups of high or low TBD knowledge. Results: Approximately 5% of participants (n=140) had been diagnosed with a TBD. Those who used “insect repellent on exposed skin” were 63% less likely to get a TBD, in comparison to those who did not practice this protective behavior [PR (95% CI): 0.37 (0.21, 0.63)]. Participants who conducted a “thorough body/clothes check after being outdoors” were 71% less likely to get a TBD, compared to those who did not practice this protective behavior [PR (95% CI): 0.29 (0.15, 0.55)]. Additionally, among those with high TBD knowledge, “tucking shirt into pants and pants into socks” was significantly protective against TBD [PR (95% CI): 0.42 (0.19, 0.94)]. Conclusions: We conclude that “through body/clothes check” and “use of insect repellent on exposed skin” were effective in preventing TBD. Moreover, high TBD knowledge strengthened the protective magnitude of some protective behaviors.

*S/P indicates work done while a student/postdoc

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**Figure. Prevalence Ratios (PR) and 95% CIs of associations between TBD personal protective behaviors and TBD outcome.**

- **Legend:**
  - PR Point estimate
  - Null line

- **Significant associations (p <.05):**
  1. List of TBD personal protective behaviors:
     1. Walk on established trails and avoid contact with adjacent vegetation
     2. Use insect repellent on exposed skin
     3. Tuck shirt into pants and tuck pants into socks
     4. Use insect repellent on exposed skin
     5. Treat outdoor clothing with special bug spray
     6. Conduct a thorough body/clothes check after returning from the outdoors
     7. Shower immediately after returning from the outdoors

S/P indicates work done while a student/postdoc
AN OUTBREAK OF CHOLERA DUE TO CONSUMPTION OF “ABACHA” IN OSHODI ISOLO
LAGOS STATE – AUGUST 2018. Tosin Onasanya* Tosin Onasanya, AdewoI Adefisoye,
(NFELTP/AFENET)

Background: On 19th of August suspected outbreak of cholera was reported in Oshodi Local Government, Lagos
State. We investigated the outbreak and determined the risk factors. A case control study was done to identify
source of infection and institute prevention and control measures. Methods: A suspected case was defined as any
person living in Lagos State with three or more episodes of acute watery diarrhoea from 19th of August to 30th
September, 2017. Medical record was reviewed to identify cases. A semi-structured questionnaire was used to
obtain information on demography, clinical history and exposure factors from 37 cases and 74 controls. Stool
specimens were collected from suspected cases, Abacha from food vendors and well water samples across the
state. The presence of Vibrio cholerae was analyzed. Bivariate and multivariable analysis was calculated to assess
the association of risk factors Results: A total of 37 cases were identified with 5 deaths (attack rate of
7.32/100,000 and case fatality rate of 11.4%). Of the 37 cases and 74 controls, 21 (52.3%) and 46 (62.2%) were
females. Mean age for cases and controls was 20.5years (SD=19) and 38.8years (SD=15.6), respectively. Vibrio
cholerae was isolated from two of the stool samples and heavy growth of E. coli was found in the water
specimens. Protective factors were hand washing with soap and water before eating (OR= 0.3; Confidence
Interval 95%: 0.12-0.74) and hand washing with soap and water after using the toilet (OR=0.25, CI 95%:
0.11-0.59). However, cases were more likely to have drank sachet water (OR= 40.7; CI 95%: 12.9-129.9]) or
had contact with diarrhoea case (OR= 6.7; CI 95%: 2.70-16.80). Conclusion Hand washing with soap and water
was protective against cholera. Health education with emphasis on hand washing and environmental hygiene
were conducted.
FACTORS RELATED WITH ISS-75 CALCULATED FROM AUTOPSY RECORDS

Aníbal A. Teherán*
Aníbal A. Teherán, Mancel E. Martínez, (Fundación Universitaria Juan N. Corpas)

Background: Colombia has an immature trauma system that could result in the presence of factors related to death due to severe injury (Injury Severity Score-ISS>15) or with highest ISS score (75 points); we determined the probability of death with ISS-75 and related factors. Methods: A retrospective descriptive design was carried out, using data obtained from autopsy records of violent deaths, by the National Institute of Legal Medicine and Forensic Sciences during the year 2013, in Bogotá. Frequency of ISS-75 or lower was determined and differences among socio-demographics and clinical factor were evaluated (X2, p<0.05). A Naïve-Bayesian-Model (BM) was applied to calculate the probability of ISS-75 among all factors evaluated. Results: 443/557 autopsy records were selected after applying the eligibility criteria; the median age was 33.8 years, 86.7% were male; homicide and penetrating injury manner of death were present in 62.8% and 61.6%, respectively; injury occurred at night in 55.5% (CI95%,49.6-61.3%) and death at night in 66.9% (CI95%,61.2-72.2%) of victims. Firearm projectile injuries (42.4%), blunt trauma (35.9%) and cutting-stabbing (18.5%) were the main causes of the deaths. According to BM, the probability of death with an ISS-75 was 90%; the factors positively related to ISS-75 were: cause of death (firearm projectile, cutting-stabbing), manner of death (homicide), penetrating injury type, age (28.5 and 38.5 years old) time before decease (death occurred in <0.5 hours after the injury).

Conclusions: Using autopsy records to calculate ISS, we identified that most victims had the highest ISS score, probably because of the nature of the injury, or because we could identify the real severity of the injury with an autopsy, including hidden or missed injuries prior to autopsy. Nevertheless, the proportion of victims with ISS-75 is very high. Factors related to this threshold may imply an adjustment in the control measures of the social determinants of trauma.

Annual opioid-involved overdose mortality increased in Idaho during 2010–2017 from 2.2 deaths to 7.4 deaths per 100,000 persons. We sought to strengthen opioid overdose epidemic response by identifying and characterizing census tracts experiencing elevated opioid overdoses. We included opioid-involved overdose deaths, as classified by International Classification of Diseases, Tenth Revision underlying (X40–44, X60–64, X85, or Y10–14) and multiple cause-of-death codes (T40.0–40.4, or T40.6), and emergency medical services (EMS) responses involving ≥1 naloxone administration and evidence of drug ingestion or poisoning (EMS-NA). We geocoded 2010–2017 Idaho Department of Health and Welfare death certificate decedent address and EMS incident response location to census tracts. To identify statistically significant (P <0.05) census tract clusters of higher rate opioid overdoses, we used spatiotemporal Poisson models in SaTScan. To characterize associations between opioid overdoses and 2011–2015 American Community Survey census tract characteristics, we jointly modeled deaths and EMS-NA with Poisson-distributed age- and sex-adjusted GLMM. GLMM included census tract-level random intercepts and accounted for spatial autocorrelation. We identified 746 opioid-involved overdose deaths among Idaho residents, and 2,235 EMS-NA. Of 7 census tract clusters, 5 exhibited elevated opioid-involved overdoses during 2016 or 2017. For each 5% increase in renter-occupied housing and uninsured population, opioid-involved overdose mortality increased by a factor of 1.06 (95% CI: 1.03–1.10) and 1.14 (95% CI: 1.06–1.22), respectively. Urban tracts had 1.64 (95% CI: 1.37–1.97) times higher EMS-NA rates than rural tracts. For each $250 increase in median gross rent, EMS-NA increased by a factor of 1.18 (95% CI: 1.05–1.32). Joint spatiotemporal analyses identified areas with elevated opioid overdoses. Idaho health officials plan to strengthen opioid overdose epidemic prevention and response to these areas.

S/P indicates work done while a student/postdoc
Violence is the leading cause of death and nonfatal injuries in United States youth ages 10 to 24. We examined the association of Fit2Lead, an after-school park-based youth mental health promotion program and juvenile arrests (2015-2017) in Miami-Dade County, Florida. The primary predictor was presence or absence (binary variable) of the Fit2Lead program implemented at the park site in areas matched by (1) park serving the zip code, and (2) baseline youth arrest rates and sociodemographics (area-level gender, age, race/ethnicity, single-parent households, and poverty). The main outcome was change in arrest rates (all offenses) per year for youth within zip codes that offered/did not offer Fit2Lead within the program target area (2015-2017). A secondary analysis assessed change in arrest rates per year for youth ages 12-17 within a half-mile radius of parks where Fit2Lead was/was not offered. Fit2Lead was offered in areas comprised of 48% males, 60% Hispanics, 29% non-Hispanic blacks, 33% single-parent households, and 33% of residents living in poverty. After covariate adjustment, regression estimates showed that zip codes with Fit2Lead implementation showed a significant mean reduction (p<.001) in youth arrests per 10,000 youth ages 12-17 per year compared to zip codes without program implementation (β= -6.9; 95%CI -9.24, -4.63). Juvenile arrest rates declined by 166 arrests per 10,000 population over the two-year study period (mean decline 6.9 arrests per 10,000 youth ages 12-17 per Fit2Lead site per year) in zip codes where Fit2Lead was offered compared with zip codes where it was not offered, matched by baseline sociodemographics and youth arrest rates. Similar arrest rate declines were found within a half-mile radius for MDPROS park sites that implemented Fit2Lead versus other youth programs. Park-based programs may have the potential to promote mental health and resilience, and also prevent violence among at-risk youth.
Background: The burden of firearm homicide and suicide varies substantially across race/ethnicity. Black-white disparities have been widely studied through ecosocial frameworks. Little empirical work has focused on Latinxs, despite their distinct patterns of firearm mortality and rapid population growth. Aim: To examine and compare socio-contextual risk and protective factors for firearm homicide and suicide among Latinxs, non-Latinx blacks (blacks), and non-Latinx whites (whites) in California. Methods: Mortality data for 2000-2015 were obtained from the California Department of Public Health; socio-contextual data were obtained from publicly-available sources. Bayesian spatio-temporal Poisson regression models will be used to estimate and compare county-level race/ethnicity-specific associations between rates of firearm homicide (ICD-10 codes X93-X95, U01.4) and firearm suicide (X72-X74) and racial/ethnic residential segregation (the dissimilarity index) and an ecological measure of religiosity (density of religious organizations), conditional on other community-level predictors of homicide and suicide. Results: There were 22,168 firearm suicides and 23,268 firearm homicides included in the analysis. Age and sex-adjusted firearm suicide rates per 100,000 were, on average, highest among whites (6.34), followed by blacks (2.63) and Latinxs (1.70); firearm homicide rates were highest among blacks (22.50), followed by Latinxs (5.02) and whites (1.47). We will test the hypotheses that, among Latinxs and blacks, segregation is positively associated with homicide rates, and religiosity and segregation are negatively associated with suicide rates. Specificity of the associations will be examined with assessment of non-firearm homicide and suicide. Conclusions: The expected associations would suggest that racial/ethnic disparities in violent death, and in turn population rates, may be reduced by modifying attributes of the social environment.
THE ASSOCIATION BETWEEN WEATHER AND OTHER ECOLOGICAL VARIABLES AND THE NUMBER OF DAILY SHOOTINGS IN CHICAGO (2012-2016) Paul Reeping* Paul Reeping, David Hemenway, (Columbia Mailman School of Public Health)

Background: Previous studies have linked weather to crime/aggression but have not considered the causal structure of the variables they included in their model(s). Objective: This cross-sectional study used data from 2012-2016 to measure the association between ecological variables and the number of shootings in Chicago by considering the complex causal structure between all of the variables. Methods: Number of shootings per day was obtained via the Chicago Tribune (2012-2016). Daily high temperature, humidity, wind speed, difference in temperature from historical average, precipitation type and amount, were extracted via The Weather Underground. Weekend, holidays, full moon, and students out of school were also included. Causally-adjusted negative binomial regressions were used to evaluate the associations between the exposures of interest and daily number of shootings. Results: In the causally-adjusted model, every ten degree increase in temperature was significantly associated with 20.2% more shootings, while every inch in precipitation and ten mile-per-hour increase in wind speed was significantly associated with a -14.0% and -6.5% change in number of daily shootings, respectively. Students out of school, an increase in temperature from historical average and weekends were also significantly associated with an increase in the number of shootings. Failing to adjust for the minimally sufficient set of confounders can lead to false conclusions; for example, in our crude data, occurrence of a thunderstorm was associated with an increase in the number of shootings, but after adjusting for temperature, the direction of the association reversed. Conclusion: In recent years, shootings in Chicago were more likely to happen on warm days and when there was no school, and less likely on windy days or those with more precipitation. Using a causal structure (i.e. DAG) is important for understanding the true causes of increases in violence.

Figure 4: Directed Acyclic Graph of the causal structure between exposures of interest

S/P indicates work done while a student/postdoc
Background: Effective January 1, 2016, California’s Gun Violence Restraining Order (GVRO) law created a legal tool to temporarily remove firearms and ammunition, and the ability to purchase them, from individuals posing imminent risk of violence to themselves or others but not otherwise prohibited from owning firearms. GVROs are issued by judges in response to petitions from concerned family members or law enforcement. California's GVRO law is the first of its kind in the country. Aim: This study provides the first state-wide, comprehensive description of GVROs issued in California, characterizing petitioners, respondents, and orders by location and type. Methods: Descriptive analysis of individual-level GVRO data for 2016-2018, obtained from the California Department of Justice. Results: There were 610 GVROs issued to 410 respondents in the first 3 years of policy implementation. Emergency orders (42.5%), for use by law enforcement for rapid response in crisis situations, and temporary orders (41.8%), available to family or law enforcement, last for up to 3 weeks. Orders after a hearing (15.7%) last for up to one year. Nearly 70% of respondents had 1 order filed against them, and 3.7% had 4 or more orders. Nearly all orders (96.6%) were petitioned for by law enforcement. Annual GVRO counts increased by almost 400% in 3 years, largely driven by uptake in San Diego County, which issued half of all orders (221) in 2018. Conclusions: This study informs county and state stakeholders, law makers, and law enforcement officials in California and in other states that have enacted or are considering similar legislation. These early results also inform questions to be addressed in our more extensive research on California’s GVRO policy.
LONGITUDINAL RELATIONSHIPS BETWEEN MULTIMORBIDITY AND DEPRESSION IN OLDER MEN AND WOMEN: THE INTERNATIONAL MOBILITY IN AGING STUDY (IMIAS)
Afshin Vafaei* Afshin Vafaei, Roxanne Turuba, Emmanuelle Bélanger, Alban Ylli, Fernando Gomez, Catherine Pirkle, (Lakehead University, Thunder Bay, Canada)

Objectives: Our study aims to assess whether multimorbidity is an independent risk factor for the development of depression in older adults living in Canada, Brazil, Columbia, and Albania and also examines differences in incidence rates of depression in regard to social and psychosocial characteristics. Methods: The longitudinal International Mobility Aging Study collected information from adults between 65-74 years old regarding their physical and mental health, socioeconomic status, health behaviours, social supports, and health care utilization. Depression was defined by a 16 or higher score assessed by the Centre for Epidemiological Studies Depression Scale (CES-D). Multimorbidity was defined as having two or more chronic conditions, which were self-reported by participants using a list of eight physical conditions. Poisson regression was performed to estimate the relative risk of depression in older adults with multimorbidity compared to those to those living with 0-1 chronic conditions, adjusting for sex, age, education, number of doctor visits, degree of assistance needed, social support, and smoking status. The analysis was stratified by study region (Canada; Latin America; Albania). Results: Crude and adjusted models showed no statistically significant associations between multimorbidity and the incidence of depression in any of the study regions, confirmed by sensitivity analyses. However, the incidence of depression varied across study regions, confirmed by the intra-class correlation coefficient which indicated that 13% of variations in depression incidence rates could be explained by geographic differences only. Discussion: Multimorbidity does not appear to increase the risk of developing depression in older adults between 65-74. Higher rates of depression in Latin America and Albania (compared to Canada) may be attributed to lifecourse exposures to social and economic adversity in these regions.
SCREEN TIME USE IN CHILDREN WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER IN THE UNITED STATES Vijaya Kancherla* Amrita Kumar, Amrita Kumar, Michael Kramer, Vijaya Kancherla, (Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, GA, 30333)

Objective Children are engaging in longer duration of screen time use which includes activities done in front of a smartphone, television, computers, tablet, or game console. Screen time use can affect the health of children both positively and negatively. Since, research on screen time use in children with attention deficit/hyperactivity disorder (ADD/ADHD) in the United States (US) is limited and conflicting, our objective was to examine if ADD/ADHD was associated with screen time use in children. Methods Parental/guardian reported responses for children between the ages of 6-17 years from the 2017 National Survey of Children’s Health were analyzed. Average duration of time the child spent on a weekday watching television/video programs, or playing video games was used as an indicator of daily screen time use, examined as a dichotomous variable (≤ 1 hour vs. > 1 hours). Multivariable regression models were used to examine the association between screen time use and parent/guardian-reported diagnosis of ADD/ADHD, adjusting for potential confounders. Unadjusted and adjusted prevalence odds ratios (uPOR and aPOR), 95% confidence intervals (CI) were estimated to quantify the association. Results The analytical sample was comprised of 34,564 children of which 4,085 (12%) were reported to currently have ADD/ADHD. Children with screen time use > 1 hours were likely to be males, non-Hispanic black, obese, from low income families with parent/guardians with less than high school education. After controlling for sex, race, age, body mass index, education of adult, poverty level, type of health insurance, hours of sleep-time, physical activity, and family structure, children with ADD/ADHD were more likely to engage in screen time use > 1 hours per weekday (aPOR=1.35, 95% CI=1.14-1.60) compared to their counterparts. Conclusion This study provides evidence that, among school-aged children, the total amount of screen time use per weekday differs significantly by ADD/ADHD status.
LONGITUDINAL ASSOCIATIONS BETWEEN SYMPTOM DOMAINS OF ATTENTION DEFICIT-HYPERACTIVITY DISORDER AND BODY MASS INDEX FROM LATE CHILDHOOD TO EARLY ADULTHOOD

Bezawit Eyob kase* Bezawit Eyob kase, Catharina A Hartman, Nanda Rommelse,
(Epidemiology Department, Arnold School of Public Health, University of South Carolina)

Introduction: Overweight and obesity are disproportionately affecting individuals with Attention Deficit Hyperactivity Disorder (ADHD) resulting in poor health outcomes. It is currently unknown how this co-occurrence develops. We examined if changes in ADHD symptom domains predict changes in Body Mass Index (BMI) and vice versa from late childhood across adolescence up to early adulthood. Methods: Participants were adolescents (n=2773, 52.5% males, mean age=11 years at baseline, 5 waves up to mean age 22) from the Tracking Adolescents’ Individual Lives Survey (TRAILS) cohort. ADHD symptom domains (hyperactivity/impulsivity & attention problems) and BMI from five measurement waves were used to examine their stable association as well as within-person reciprocal longitudinal effects, using the Random Intercept Cross-lagged Panel Model (RI-CLPM). We adjusted for medication effects, pubertal stage, and SES, examined the possible role of depressive symptoms and family functioning, as well as sex differences. Result: A modest stable association between hyperactivity/impulsivity & BMI was found in males and females (r = 0.102 in females and r = 0.086 in males, p < 0.05). At the within-person level, virtually no longitudinal effects were found between ADHD symptom domains and BMI over time. This was not due to depressive symptoms or poor family functioning being better predictors of ADHD and weight change. Conclusion: This study found no evidence of a causal cycle where ADHD symptoms led to greater BMI and/or high BMI leads to enhanced persistence or deterioration of ADHD symptoms during adolescence and young adulthood. Rather, the association between mostly hyperactive/impulsive symptoms and BMI was stable in this developmental period, pointing to a shared genetic or familial background and/or direct causal effects between hyperactivity/impulsivity and BMI already established earlier in childhood. Keywords: ADHD, BMI, Obesity, Overweight
EFFECT OF WORK-RELATED STRESS ON OBJECTIVE SLEEP QUALITY AND QUANTITY: A LONGITUDINAL STUDY AMONG POLICE OFFICERS Claudia C. Ma* Claudia C. Ma, Ja K. Gu, Desta Fekedulegn, John M. Violanti, Luenda E. Charles, Michael E. Andrew, (NIOSH, CDC, USA)

Objectives: Longitudinal studies have reported that work-related stress is associated with a higher risk of poor subjective sleep quality, but the effect on objective sleep quality is not clear. We aimed to investigate the effect of work-related stress on objectively measured sleep quality and quantity. Methods: Participants (N=130) were examined at the baseline (2004-2009) and first follow-up (2010-2014) examinations of the Buffalo Cardio-metabolic Occupational Police Stress Study. Work stress was assessed using the Spielberger Police Stress Survey questionnaire. A stress index for overall stress and the three stress subscales (i.e., administrative/organizational pressure, physical/psychological threats, and lack of support) was computed for participants at both exams. Changes in stress index (baseline to follow-up) were computed and categorized as high-to-high, high-to-low, low-to-high, and low-to-low. Use of sleep medications was self-reported. The actigraph sleep parameters were sleep duration, sleep efficiency, sleep onset latency, wake after sleep onset, and number of awakenings. Risk ratios for worsened sleep (i.e., on sleep medication or decreased quality) were computed across the four categories of change in stress index. Unadjusted risk ratio was estimated from log binomial regression while adjusted risk ratio (controlling for age, race/ethnicity, passive coping, and shiftwork) was estimated from Poisson regression using the high-to-low as referent. Results: For overall stress, officers in the low-to-high stress group had a higher risk of decreased sleep efficiency (RR=2.32, 95% CI: 0.99-5.43) and increased number of awakenings (RR=2.22, 95% CI: 0.99-5.43). Conclusion: Increased level of stress was a risk factor for poor sleep quality in this cohort. Stress management may be an effective strategy to improve sleep quality in police officers exposed to high job stress. Future longitudinal studies with larger sample sizes are warranted to confirm our results.
USING RANDOM FOREST TO IDENTIFY KEY RISK FACTORS FOR EARLY PSYCHIATRIC REHOSPITALIZATION
Jennifer Hoenig* Jennifer Hoenig, Yihong Zhao, Angeline Protacio, Sungwoo Lim, Christina Norman, (New York City Department of Health and Mental Hygiene)

Background: Given the high dimensionality of patient-level data in a psychiatric rehospitalization study, a machine learning approach can be useful for identifying leading risk factors for rehospitalization. We used Random Forest (RF), a novel machine learning approach, to identify risk factors associated with psychiatric rehospitalization within approximately 90 days of hospital discharge. Methods: In this prospective observational study, extensive baseline patient level characteristics were collected from 1,129 psychiatric inpatients at 8 New York City hospitals in 2013-2014. A binary variable indicating any psychiatric rehospitalization within 90 days of discharge was obtained from a follow-up study of 519 patients via phone interviews. RF was used to identify baseline characteristics that predicted rehospitalization. The odds ratios for the identified risk factors were estimated using a logistic regression. In post hoc analyses, indirect effects of some risk factors were tested via bootstrap-based mediation analysis. Results: Risk factors identified by RF were previous psychiatric hospitalizations, number of post-discharge needs, social isolation, and sense of belonging in one’s community. Follow-up analyses confirmed the association between EPR and number of previous psychiatric hospitalizations (OR= 1.04, 95% CI: 1.01-1.06) after adjusting for demographic variables. EPR was also associated with number of endorsed post-discharge needs (OR= 1.08, 95% CI: 1.01-1.14) and social isolation (OR= 0.81, 95% CI: 0.69-0.96) after adjusting for demographic variables. Social isolation partially mediated the effect of sense of belonging on EPR. Conclusions: Our results confirm previous research findings that prior hospitalizations are a risk factor for future hospitalizations. This study adds to the current literature with the findings that a greater number of perceived needs at discharge and lower social engagement are also risk factors for rehospitalization.
PREVALENCE & 30 YEAR TRENDS IN CHILD & YOUTH MENTAL HEALTH NEED: FINDINGS FROM THE 2014 ONTARIO CHILD HEALTH STUDY Laura Duncan* Laura Duncan, Michael Boyle, Kathy Georgiades, Jinette Comeau, (McMaster University)

The 2014 OCHS is a province-wide, cross-sectional, epidemiologic study of child mental health conducted in collaboration between a large Canada-wide research team and Statistics Canada. A probability sample of 6,537 households (50.8% response) with 10,802 4 to 17 year olds participated. We outline the 6-month prevalence estimates of 8 common mental disorders, (major depressive episode, generalized anxiety, separation anxiety, social phobia, specific phobia, attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder), assessed using the DSM-IV-TR version of the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID), their socio-demographic correlates and mental health service utilization patterns for children and youth in Ontario. Approximately one in every 5 children and youth in Ontario meet criteria for a mental disorder but less than one-third receive specialized mental health services. We also examine changes in the prevalence of child mental health need among 4-16 year olds between 1983 and 2014 in Ontario, and their association with urban-rural residency, poverty, and migrant background. Measures of mental health need are identical for 1983 and 2014 and estimates are based on dimensional measures of conduct disorder, hyperactivity, and emotional disorder assessed by parents, teachers, and youth using the Ontario Child Health Study Emotional-Behavioural Scales converted to binary classifications of disorder at threshold scores aligned with child psychiatrist diagnoses. Despite substantial government investments over the past 30 years in programs intended to improve child mental health, the prevalence of child psychiatric disorders has continued to increase, highlighting the need for more early prevention and intervention efforts. There have also been increases in perceptions of mental health need, potentially reflecting increased awareness of mental health problems.

S/P indicates work done while a student/postdoc
THE ASSOCIATION BETWEEN DISTANCE FROM LIVING PLACE TO ARTERIAL ROAD OR RAIL TRACK AND POSTPARTUM DEPRESSION IN WOMEN: THE TMM BIRTHREE COHORT STUDY

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Introduction: Several studies have shown the effect of traffic noise on mental health, however this association have not studied in mother after delivery. Maternal mental health associates with not only own health but also child development. Therefore, we examined the association between distance from living place to arterial road or rail track and postpartum depression in mother. Methods: We recruited pregnant women, 23,406 pregnancies from July 2013 to end of March 2017 in Miyagi, Japan. For the current analysis, 16,193 participants in one month after delivery and 5,674 participants in six months after delivery were analyzed after exclusion of participants who withdrew, had fetal death, lost to follow up of delivery, was not geocoded of residential addresses at the time of delivery by zone level within Miyagi Prefecture, had history of depression, and did not answer about Edinburgh Postnatal Depression Scale (EPDS). Participants were classified by distance from living place to arterial road or rail track: ≤100 m, 100-<200 m, 200-<300 m, and ≥300 m (reference) using geographic information system. Postpartum depression was defined EPDS ≥9. The odds ratios (ORs) and 95% confidence intervals were calculated by multilevel logistic regression analysis including delivered age, equivalent income, and relationship to each housemate in fixed effects and municipalities in random effects. Missing of covariates was imputed by multiple imputation with 20 datasets. Results: We observed no associations between distance from living place to arterial road or rail track and postpartum depression in both periods. In comparison with ≥300 m, multivariate ORs in ≤100 m were 0.92 (0.80-1.04) in one month after delivery and 0.86 (0.63-1.19) in six months after delivery. Conclusion: The distance from living place to arterial road or rail track did not associate with postpartum depression in one month and six months after delivery among Japanese mother.
SUBSYNDROMAL STRESS DISORDERS AND RISK OF ARTERIAL AND VENOUS CARDIOVASCULAR EVENTS

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Research has linked stress disorders with cardiovascular disease (CVD). In line with efforts to understand the full spectrum of psychopathology, we assessed whether subsyndromal stress disorders, defined as diagnosis of unspecified reaction to severe stress (RSS), were also associated with arterial and venous cardiovascular events. In a population-based cohort of Danish-born residents of Denmark between 1995-2012, we identified all individuals >16 years old with an incident ICD-10 diagnosis of unspecified RSS (F43.9) in the Danish Psychiatric Central Research Registry and/or the Danish National Patient Registry (DNPR). The DNPR was also used to identify patients with incident myocardial infarction (MI), stroke, ischemic stroke, and venous thromboembolism (VTE) during the study period (one or more years after RSS diagnosis). We calculated standardized incidence rates (SIR) as the ratio of observed cases among those with unspecified RSS to expected cases based on national incidence rates. We also conducted stratified analyses by demographic factors, comorbidities, and follow-up time. Among those with unspecified RSS, the risk of a CVD event by the end of the study period was 2.7% for MI, 2.9% for ischemic stroke, 3.3% for VTE, and 5.5% for stroke. Associations between unspecified RSS and CVD were overall consistent across event types, and ranged from an SIR of 1.5 (95% CI: 1.3, 1.7) for MI to an SIR of 1.9 (95% CI: 1.7, 2.1) for VTE. There were no or small differences in SIR based on sex, depression, or follow-up time, but SIRs were stronger for those with physical health comorbidities and those with alcohol use disorders compared to those without, and for younger compared to older individuals. Our results are consistent with observations for PTSD and adjustment disorder, and suggest that individuals with subsyndromal stress disorders should receive targeted intervention and prevention efforts similar to those who meet full diagnostic criteria for stress disorders.
Suicide is the 10th leading cause of death in the US and has increased markedly in midlife men. Less attention has been paid to midlife women whose suicide rates have also increased. Women are more than twice as likely to have serious mental illness or attempt suicide, though less likely to complete suicide compared to men. We examined gender differences in psychiatric diagnoses documented for midlife adults who died by suicide. Data for MN adults 50-64 who died by suicide (n=1,370) 2011-2017 were examined. Psychiatric diagnoses were defined using ICD10 codes: anxiety, depression, bipolar, schizophrenia, schizotypal, and psychoactive substance use disorders (SUD). Logistic regression was used to estimate adjusted odds of psychiatric diagnoses by gender controlling for race, marital status, education, and urban/rural residence. Among midlife adults, 3.4% of deaths were by suicide; 2% of women, 4% of men. Overall, 32% of midlife suicides had any psychiatric disorder with significant differences between women (43%) and men (29%). Over 47% of women had two or more diagnoses compared to 34% of men. Men were more likely to use firearms (54% vs. 18%, P<0.001), and women were more likely to use poisoning (49% vs. 17%, P<0.001). Over 21% of both women and men used hanging. Women were significantly more likely to have each disorder (depressive, anxiety, bipolar) with the exception of schiz and psychoactive SUD, which were no different by gender. After adjusting for race/ethnicity, education, marital status, and urban/rural residence, women who died by suicide had significantly higher odds of documented depressive disorder (AOR=1.8; 95% CI 1.3-2.2), anxiety (AOR=1.9; 95% CI 1.2-3.0), and bipolar disorder (AOR=3.5; 95% CI 1.8-7.1) than men. There are considerable gender differences in documented psychiatric diagnoses in midlife adults who died by suicide. While mental illness is not the sole cause of suicide, it may be a strong indicator in these potentially preventable deaths.
Introduction Recent research has found residents of disadvantaged neighborhoods at elevated risk for suicidality. However, few prospective studies have spanned adolescence and early adulthood, when suicide risk rises most steeply, and most examined respondent perceptions of neighborhoods. We prospectively examined associations of objectively measured neighborhood socioeconomic deprivation and violent crime with suicide ideation, plans or attempts over 7 annual waves of a nationally representative survey of adolescents. Methods The NEXT Generation Health Study enrolled 10th-grade students from 80 U.S. high schools in 2010. Lifetime suicide ideation, plans and attempts were assessed at Wave 7 using items from the Composite International Diagnostic Interview v3.0. Socioeconomic deprivation was measured at the census-tract level using geolinked data from the American Community Survey 5-year estimates. Violent crime was measured at the block group level using the ESRI Personal Crime Index. We used discrete-time survival analysis to relate time-varying neighborhood deprivation and violent crime to retrospectively reported first onset of ideation, plan or attempt adjusting for respondent sex, age, race/ethnicity, family affluence and household composition. Results Respondents (n=2242) were 58% female, 16 years old at Wave 1, and completed a mean of 6 annual assessments. Neither neighborhood exposure was related to suicidality. ORs (95% CIs) for the 2nd through 4th (vs. 1st) quartiles of socioeconomic deprivation were 1.3 (0.7-2.5), 1.2 (0.6-2.7) and 0.9 (0.4-2.3). ORs (95% CIs) for violent crime were 1.2 (0.6-2.3), 1.2 (0.5-2.8) and 0.9 (0.5-1.7). Conclusion The contrast between previously observed associations of suicidality with subjective measures and lack of association we found with objective measures of neighborhood disadvantage raises questions for future research about the meaning of subjective vs. objective measures of neighborhood effects on mental health outcomes.
Background: Early detection of postpartum depression may result in improved engagement in treatment and outcomes. Screening women for depression only at the 6-week postpartum obstetric visit may miss women who do not attend or whose depressive episode occurs earlier or later postpartum. We evaluated engagement with health services in the postpartum period to identify potential opportunities for postpartum depression screening. Methods: We used Pregnancy Risk Assessment Monitoring System (PRAMS) data, 2012-2015, from 8 jurisdictions (n=22,885, representing 1,820,000 women). We calculated percent attending a postpartum check-up, a well-baby visit, and having a postpartum home visit by postpartum depressive symptoms (PDS). PDS was assessed using the 2-item Patient Health Questionnaire. Adjusted prevalence ratios (aPR) and 95% confidence intervals (CI) were calculated to compare visit attendance by PDS status, adjusted for jurisdiction, maternal age, race, marital status, education, insurance status during pregnancy, previous live birth, pre-pregnancy stressors, and infant’s NICU status and gestational age. Analyses were conducted in SUDAAN, accounting for complex sampling. Results: Among women with and without PDS, respectively, almost all attended a postpartum check-up (85.8% and 91.9%; aPR=0.97, 95% CI= 0.94, 0.99) and well-baby visit (97.6% and 99.0%; aPR=0.99, 95% CI=0.98, 1.00); 13.6% and 11.0% had a home visit (aPR=1.16, 95% CI=1.00, 1.34). Of women with PDS who did not attend a postpartum visit, 91.5% attended a well-baby visit and 13.6% reported home visitation; representing over 27,000 women with PDS who could have been screened for depression, if provided at the other 2 venues. Conclusion: Many women with PDS who did not attend their postpartum visits engage in well-baby visits and home visitation services representing a potential opportunity for increasing early identification of PDS and referral for care.

Background Japan and Korea have among the highest suicide rates in the world. However, the age, sex, and time trends in each country differ substantially. We conducted APC analysis of suicide rates to better understand these differences.

Methods We used age- and sex-specific data on suicide between 1986 and 2015 in Japan and Korea. We implemented APC analysis to decompose the country-specific trends into age, calendar period, and birth cohort effects.

Results APC analysis revealed three trends: (1) there was a sharp increase in suicide around retirement age in Korea but not in Japan (age effect); (2) the post-War Baby Boom generation in Japan (born 1947-1949) had lower rates of suicide compared to generations born before or after (birth cohort effect), whereas suicide has increased linearly with each generation in Korea; and (3) there was a sharp increase in suicide during the three decades of observation in Korea (period effect) whereas rates were more stable in Japan.

Conclusion Although Japan and Korea share high suicide rates, our APC analysis suggests divergent causes underlying these trends. The post-War Baby Boom generation in Japan remains relatively protected due to a strong social safety net for this cohort, while suicide rates in Korea continue to rise with each generation and is particularly elevated in post-retirement age. Japan needs to pay more attention to suicide prevention in more recent birth cohorts and young adults in their 20s.

Figure. Local drift with net drift values for suicide in Japan and Korea. Age group specific annual percent changes (local drift) with the overall annual percent change (net drift) in suicide rates.
NEIGHBORHOOD SOCIOECONOMIC STATUS PREDICTS RISK OF SELF-HARM AMONG ADOLESCENT EMERGENCY DEPARTMENT PATIENTS WITH PSYCHIATRIC DISORDERS
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Research identifying factors that may put adolescents with psychiatric disorders at increased risk for self-harm is urgently needed. Although prior research suggests that neighborhood socioeconomic status may play a role in adolescents’ self-harm risk (e.g., Dupéré et al. 2009), this topic remains understudied. Our study examined the associations between area-level socioeconomic status (SES) and risk of an emergency department (ED) visit for self-harm in adolescents with different severe psychiatric disorders. Subjects were all adolescents who presented to a California ED in 2010 and received a diagnosis for a psychiatric disorder at their index visit (n=25,990). Psychiatric diagnosis groups were identified using Clinical Classification Software codes, and included mood, anxiety, psychotic, alcohol-related, and drug-related disorders. Zipcode-level SES characteristics were assessed using Census data and included median household income, unemployment rate and poverty level. Logistic regression analyses examined the risk of a subsequent visit for self-harm (ICD-9 codes E950–E959) associated with quartiles of zipcode SES among each psychiatric patient group. Living in a higher SES neighborhood (e.g., high median income, low unemployment rate, low poverty rate) was associated with significantly increased risk of self-harm among patients with mood disorders, anxiety disorders, and drug use disorders at index visit, even when controlling for a range of patient sociodemographic factors and ED utilization histories. Living in a high-SES neighborhood was associated with decreased risk of self-harm, however, among patients with schizophrenia/other psychotic disorder as well as those presenting with alcohol disorder. Our findings highlight the need for more research to investigate the mechanisms underlying how residential neighborhoods affect psychiatrically ill adolescents’ risk of serious self-harm.
METABOLOMIC MARKERS OF ANTEPARTUM DEPRESSION AND SUICIDAL IDEATION
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Background: Several recent analyses have described metabolomic markers associated with major depressive disorder (MDD) and suicidal ideation (SI) in non-pregnant adults. We examined the metabolomic profile of MDD and SI during mid-pregnancy, a time of high susceptibility to mood disorders. Methods: We collected fasting 2nd trimester blood samples from 100 pregnant Peruvian women. Three hundred and seven metabolites were profiled using liquid chromatography-mass spectrometry. We used the Patient Health Questionnaire 9 (PHQ-9) to define MDD (PHQ-9 score >=10) and SI (having thoughts that you would be better off dead, or of hurting yourself). Multivariate logistic regression was used to calculate odds ratios (ORs), adjusting for age, gestational age, and pre-pregnancy BMI. Results: Women with MDD (n=29) and women with SI (n=18) were significantly more likely to have poor sleep, higher anxiety, and greater perceived stress than women without MDD or without SI. In adjusted models, 3 triacylglycerol metabolites were associated with higher odds of MDD and 4 metabolites (betaine (OR=0.56; 95% confidence interval (CI): 0.33-0.95), citrulline (OR=0.58; 95%CI: 0.34-0.98), isovalerylcarnitine (OR=0.59; 95%CI: 0.36-0.99), tiglylcarnitine (OR=0.59; 95%CI: 0.35-0.99)) with lower odds of MDD. Twenty-six metabolites, including thiamine (OR=0.44; 95%CI: 0.22-0.85), choline (OR=0.29; 95%CI: 0.11-0.81), L-phenylalanine (OR=0.41; 95%CI: 0.19-0.91), and betaine (OR=0.52; 95%CI: 0.28-0.99), were associated with lower odds of SI and no metabolites with higher odds of SI. Only betaine was associated with both MDD and SI. No metabolites remained significant after false discovery rate correction. Conclusions: Some metabolites associated with MDD or SI in non-pregnant adults, such as betaine, choline, thiamine, and L-phenylalanine, were also associated with antenatal MDD or SI. These metabolites may be predictive markers for depression. Larger studies are needed to corroborate our findings.
Tinnitus, the sensation of ringing or buzzing in the ear, is the most prevalent disability among US Veterans. The impact of tinnitus on daily functioning can vary from mild to very severe. The interplay between tinnitus and mental health is poorly understood. We examined associations between self-reported tinnitus severity and symptoms of depression, anxiety, and post-traumatic stress disorder (PTSD) among US Veterans who used VA healthcare, and were diagnosed with tinnitus, from 2011-2016. A national, stratified random sample of 1,800 Veterans received a multimodal (mail/internet) survey. Tinnitus severity (none/mild, moderate, severe, very severe) was measured using the Tinnitus Functional Index. Mental health symptoms were measured using validated screening instruments. We used inverse probability weights to account for sample stratification by age and traumatic brain injury (TBI) diagnosis. A total of 893 surveys were completed. Almost 40% (95% CI: 32.8-43.9%) of respondents reported very severe tinnitus; 82.4% (95% CI: 78.0-86.7%) reported symptoms consistent with probable depression, 81.0% (95% CI: 76.4-85.5%) with anxiety, and 70.9% (95% CI: 65.7-76.2%) with PTSD. In bivariable logistic regression analyses, very severe tinnitus, compared to moderate tinnitus, was associated with greater odds of depression (OR=8.4; 95% CI: 3.1-23.2) and anxiety (OR=3.8; 95% CI: 1.6-9.1), but only marginally with PTSD. Results of multivariable analyses controlling for age, sex, time spent in the military, and TBI diagnosis were similar. Many Veterans diagnosed with tinnitus reported a severe impact on their daily functioning. Those with the most severe tinnitus had higher odds of probable depression and anxiety. These findings suggest that Veterans with severe tinnitus should also be assessed and potentially treated for mental health conditions. The VA healthcare system has the potential to integrate audiology and mental health services for those in need of coordinated care.
PROLACTIN LEVELS IN ANTIPSYCHOTIC-NAÏVE/DRUG-FREE PATIENTS WITH FIRST-EPISODE PSYCHOSIS VERSUS PATIENTS AT ULTRA-HIGH RISK FOR PSYCHOSIS IN TAIWAN

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Background: Recent studies indicated that prolactin levels might be elevated in antipsychotic-naïve patients with first-episode psychosis (FEP), even in patients at ultra-high risk (UHR) for psychosis. However, subsequent studies reported conflicting results. This study aims to examine whether there were aberrations in the plasma prolactin levels in patients with FEP as well as in patients at UHR for psychosis in comparison with age- and sex-matched healthy controls.

Methods: Patients diagnosed as either at UHR for psychosis or FEP at National Taiwan University Hospital were eligible for this study if they did not receive any antipsychotics or had only brief exposure to antipsychotics but underwent washout for 7 days before blood drawing. Patients’ symptoms were evaluated using the Positive and Negative Syndrome Scale (PANSS). For each patient, an age- and sex-matched healthy control was recruited from the community residents or hospital employees. A total of 20 UHR, 29 FEP, and 49 healthy controls were recruited, with prolactin levels being available for 18 UHR, 20 FEP, and 38 healthy controls.

Results: The prolactin levels (ng/ml) in the FEP (mean ± SD: 16.6 ± 11.0) was not different from its controls (18.7 ± 14.8; p = 0.6 for paired t-test), whereas the prolactin levels in the UHR (11.5 ± 5.7) was lower than its controls (17.0 ± 8.7; p = 0.01 for paired t-test). When two groups of patients were pooled, their prolactin levels were not different from that of the controls. However, when stratified by sex, the prolactin levels in male patients (n=18; 10.5 ± 7.6) were lower than male controls (15.4 ± 6.5; p=0.023 for paired t-test).

Conclusions: The prolactin level was lowered in patients at UHR for psychosis but not altered in patients with FEP, and male UHR and FEP patients as a whole also had lowered prolactin levels. These results help shed light on the connection between dysregulation of dopamine and prolactin in the genesis of psychosis.
Mental health symptoms are common among organ transplant recipients. Challenges such as complex medical regimens involving adherence to lifelong immunosuppressant medications, side effects, susceptibility to infection, and potential rejection of the transplanted organ may increase the risk of mental disorders and subsequently contribute to elevated suicide risk. Most studies that examined suicide risk among persons receiving organ transplants have used small clinical case series with few suicide deaths. Our study addresses this evidence gap by examining the rate of suicide deaths and non-fatal suicide attempts among recipients of a wide range of organ transplants (heart, lung, kidney, and liver) compared with the general population. Data were from a case-cohort study based in the Danish national healthcare and social registries covering the entire Danish population. Suicide cases were 14,103 persons who died by suicide 1995 to 2015 in Denmark; a second case group of 22,974 persons who made a non-fatal incident suicide attempt between 1995 and 2015 was also examined. The subcohort was 5% of the general population of Denmark, selected at random on January 1, 1995 (n = 265,183). Cox proportional hazards regression with time-dependent exposure was used to compare the rate of suicide and non-fatal suicide attempts among persons with organ transplants to the corresponding rates in the subcohort, while adjusting for sex, age, and time-varying depression, anxiety, and substance abuse diagnoses. Organ transplant recipients had 1.9 (95% confidence interval [CI]: 1.3, 3.0) times the rate of suicide death and 1.2 (95% CI: 0.76, 2.0) times the rate of non-fatal suicide attempts compared with persons in the subcohort. The increased rate of death from suicide, but not non-fatal suicide attempt, may be reflective of access to more lethal means of death among persons who receive an organ transplant. Implications for suicide intervention and prevention among these patients will be discussed.

Causal effect identification relies on untestable assumptions. In epidemiology, perhaps the most widely used set of such assumptions includes causal consistency and conditional exchangeability with positivity. Additional assumptions are needed when generalizing or transporting an effect to a target population, including conditional exchangeability with positivity between the study and target populations. Without exchangeability assumptions, only bounds for the causal effect can be identified; and in fact, the reduction in the width of the bounds attributable to a causal identification assumption is proportional to the number of potential outcomes identified by that assumption. We therefore propose a novel way to compare the strength of causal identification assumptions by comparing the reduction of the width of the bounds achieved by each. To demonstrate our approach, we compare the strength of the exchangeability assumptions for internal and external validity in randomized trials and observational studies. For a binary exposure, we find that when less than half of the target population is selected into the study, the strength of the exchangeability assumption for external validity in a randomized trial without random selection from the target population is stronger than the exchangeability assumption for internal validity in an observational study with random selection from the target population. Additionally, in an observational study without random sampling from the target population, if less than 2/3 of the target population is selected, the strength of the internal validity exchangeability assumption is stronger than the external validity exchangeability assumption. The relative of strength of these assumptions provides useful intuition that should be considered when designing, analyzing, and interpreting studies designed to estimate causal effects.
NON-DIFFERENTIAL MISCLASSIFICATION OF EXPOSURE WITH BIAS BEYOND THE NULL: A SIMULATION ANALYSIS

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While rare in practice, non-differential (ND) exposure misclassification can lead to bias beyond the null in extreme cases. Literature indicates bias beyond the null only occurs when the sum of sensitivity (Se) and specificity (Sp) of exposure classification is <100%, but this has not been empirically tested. It is also unknown if we can correct for bias beyond the null using quantitative bias analysis (QBA). Using simulation, we asked: (1) Does bias beyond the null only occur when Se and Sp is <100%? (2) Given intuition that ND misclassification biases towards the null, and thus mental correction would move estimates farther from the truth, can applying QBA to observations biased beyond the null approximate the truth? We simulated ND exposure misclassification using 72 different combinations of Se, Sp, risk difference, and disease/exposure prevalence. For each parameter combination, we simulated 1,000 datasets of 10,000 people, and determined the percent of the 1,000 misclassified estimates of the exposure-disease risk difference that were biased beyond the null. We then took combinations of Se and Sp that resulted in ≥50% of estimates biased beyond the null, simulated a single misclassified dataset of 10,000 people under 84 different parameter combinations, and conducted 1,000 QBAs on each using the true Se and Sp to obtain 1,000 corrected estimates. When the sum of Se and Sp was 100%, 0% to 11% of estimates were biased beyond the null (See Figure). 84% of our QBA-corrected estimates were <10% different from the true risk difference. In conclusion, ND exposure misclassification can bias estimates beyond the null when the sum of Se and Sp is ≥100%. In most cases, QBA can approximate the true estimate.

Figure. Percent of 1,000 misclassified estimates of exposure-disease risk difference that were biased beyond the null for 72 different combinations of sensitivity, specificity, risk difference, and disease and exposure prevalence. (Abbreviations: Se=Sensitivity, Sp=Specificity, Dis=Disease, Exp=Exposure)
RECENT SUBSTANCE USE AND PROBABILITY OF UNSUPPRESSED HIV VIRAL LOAD AMONG PERSONS ON ANTIRETROVIRAL THERAPY IN CONTINUITY CARE


Background: Illicit drug and hazardous alcohol use are associated with unsuppressed human immunodeficiency virus (HIV) viral load in persons with HIV, but accurate quantification of this association is difficult due to challenges in measuring substance use as part of routine clinical care. Methods: We estimated the association between recent opioid or heroin, cocaine and hazardous alcohol use, and unsuppressed viral load (>400 copies/mL) among 1,554 ART-initiated adults engaged in care in the Johns Hopkins HIV Clinic, 2013-2017. We relied on two imperfect measures of substance use: 1) information recorded in the medical record, including, primarily, physicians progress notes; and 2) self-report on a computer-assisted structured interview. We accounted for measurement error in those measures using Bayesian models and mildly informative prior estimates of their sensitivity and specificity derived from a previous analysis in this cohort. We contrast our results with an analysis that assumed substance use was present if appeared on either measure (the “naïve model”). Results: Using the naïve model, recent cocaine, opioid/heroin, and hazardous alcohol use was associated with a prevalence difference (PD) for unsuppressed viral load of 7.4%, 6.8%, and 5.2%, respectively. Accounting for measurement error led to PDs of 12.0% (95% credible interval [CrI]: 6.8%, 17.7%), 13.2% (95% CrI: 6.5%, 21.0%), and 9.6% (95% CrI: 4.1%, 15.6%), respectively. Results were reasonably robust to different prior values of sensitivity and specificity of the medical record review and self-interview. Conclusions: Failure to account for measurement error of recent substance use resulted in a clinically meaningful underestimate of the prevalence difference for unsuppressed viral load associated with substance use. Time-varying substance use is prevalent and difficult to measure in routine care; we demonstrate a method that maximizes the utility of imperfect data by accounting for measurement error.
QUANTIFYING POTENTIAL ASSOCIATIONS AND BIAS FOR GIVEN DIRECTED ACYCLIC GRAPH
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We know that directed acyclic graph (DAG) is conceptually useful for formulating the underlying causal assumptions for variables. However, one of the drawbacks is that DAG shows the causal relationships among variables in a qualitative manner. In many practical cases, we actually desire to quantify the causal relationships between variables. This drawback can, to some extent, be overcome by using simulation methods. As we have learned from statistical and epidemiological courses, the magnitude of a statistical association between two variables is affected by several factors including the underlying causal relationships, natural of the two variables (categorical or continuous variables), the distributions of all associated variables, and the actual measures of associations (for example odds ratio, risk ratio, hazard ratio and so on) applied in the analyses etc. Inspired by the existing literatures, we have developed a Stata package including two commands (ancestor and child). In the Stata, one types “ssc describe dag”, there will be further information. The two commands are very flexible and can simulate very complicated DAGs with up to 15 ancestor-variables and a child can simultaneously have 20 parents-variables. Currently, the commands assume that all variables are binary and all statistical associations are estimated by odds ratios. However, this is can be expanded to multiple categories as well as continuous variables. For a binary variable, the distribution is interpreted as prevalence. We know that for rare outcomes, the odds ratio is approximately the same as the risk ratio. In order to facilitate interpretation of the estimates, the default of the commands assumes that all variables are rare. However, using the options, one is able to modify the values of the simulation parameters. We have also set up online examples (http://medical-statistics.dk/MSDS/epi/dag/dag.html) . We also consider applying the same algorithms and making it available in SAS and R.
APPLICATION OF THE INSTRUMENTAL INEQUALITIES TO A MENDELIAN RANDOMIZATION STUDY WITH MULTIPLE PROPOSED INSTRUMENTS Elizabeth W Diemer* Elizabeth W Diemer, Jeremy Labrecque, Henning Tiemeier, Sonja A. Swanson, (Erasmus MC)

Mendelian randomization (MR), an application of the instrumental variable model proposing genetic variants as instruments, is increasingly popular. As a result of the weak associations between most genetic loci proposed as instruments and exposures of interest, many recent MR studies propose multiple genetic loci as instruments. Investigators often attempt to support the validity of MR via subject matter knowledge. However, the instrumental variable model implies certain inequalities, offering an empirical method of falsifying (but not verifying) the underlying assumptions. While these inequalities are said to detect only extreme assumption violations in practice, they have not been used in settings with multiple proposed instruments. Here, we explore the utility of the instrumental inequalities in identifying violations of the instrumental conditions required for MR with multiple proposed instruments, using both real and simulated data. By applying the instrumental inequalities across varying combinations of genetic loci proposed as instruments in simulated data, we demonstrate the ability of the inequalities to identify subsets of the proposed instruments for which the MR assumptions definitely do not hold and explore conditions under which these inequalities are more or less likely to detect both structural and sample specific violations of MR assumptions. We further demonstrate detection of some invalid proposed instruments in a study of prenatal exposures on offspring behavioral health outcomes with maternal genetic variants proposed as instruments. Implications for future MR studies, as well as available software for broader implementation of the instrumental inequalities, will be discussed.
EMPIRICAL INSIGHTS FOR IMPROVING SEXUAL ASSAULT PREVENTION: EARLY EVIDENCE FROM A CLUSTER-RANDOMIZED TRIAL OF IMPOWER AND SOURCES OF STRENGTH

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The science of measuring and preventing sexual assault is in its infancy, especially when considering adolescent populations in developing nations. We analyze pre-intervention data collected as part of a two-arm cluster-randomized controlled trial of a classroom-based sexual assault prevention program deployed to class 6 students in informal settlements around Nairobi, Kenya. The study comprises approximately 4,000 girls (ages 10-14), sampled from 95 schools. Baseline data is analyzed to estimate rape frequency among girls, yielding an estimate that 7.2% of girls were raped in the prior year. Two vital questions are addressed for those interested in deploying prevention programs in this setting: (i) given that resources are limited, what characteristics of schools are the most important identifiers for triaging "high need" schools into the program? (ii) given that this is cross-sectional data, how much variation in the probability of rape can be attributed to potentially modifiable variables? To address (i), we identify school- and individual-level risk factors for rape. To address (ii), we leverage a nearest-neighbors matching-based technique to improve identification of these potential causal pathways. We discuss statistical challenges and solutions in each of these domains, and discuss the methodological tools and decisions that go into these analyses. We introduce several best-practice statistical techniques we hope others in this field will find novel and useful.

S/P indicates work done while a student/postdoc
VISUAL FRAMEWORK FOR TEACHING DIFFERENCES BETWEEN COMPARATIVE EFFECTIVENESS ANALYTICS Hayden Smith* Hayden L. Smith, Rosina F. Schiff, Vedica Sharma, Matthew J. Taylor, (UnityPoint Health Des Moines)

INTRODUCTION: Comparative effectiveness research can include treatment non-compliance and report multiple sets of results (e.g., intent to treat [ITT], per protocol [PP], as treated [AT]). It is important for medical learners to understand the differences between these analytic designs. Objective: to present visual options for displaying the differences between comparative analytics. METHODS: A medical education project was developed using resident quality improvement (QI) data from a multi-year Internal Medicine project. The study established the baseline rate of inappropriate continuation of stress ulcer prophylaxis (SUP) for inpatients transferred out of the ICU and included the implementation of an intervention (i.e., resident electronic transfer note) to reduce inappropriate SUP continuation. The intervention was passive, not provided to non-teaching service patients (controls), and had a risk for disproportionate non-compliance between service groups. Residents created schematics to visualize the ITT, PP, and AT analytic designs. Bayesian models were fit to data in order to calculate ITT, PP, and AT. Results were visually reported as posterior distributions to remove dependence on null hypothesis testing. RESULTS: Study sample included 264 and 420 ICU teaching and non-teaching service patients, respectively. Post-intervention data revealed a rate of non-compliance of 33% and 3% in the teaching and non-teaching services, respectively. Posterior distributions for estimates are presented in Figure 1. At the end of the project residents meet with an epidemiologist to review posterior distributions and their relationships to resident created design schematics. Complier average causal effects were also calculated and discussed with the residents. CONCLUSIONS: The presented project used an internal dataset for teaching analytic designs. A strong focus was placed on visualizing design schematics and posterior distributions to illustrate the differences between commonly presented results.

Figure 1: Posterior estimates of risk difference for continuation of stress ulcer prophylaxis in patients transferred out of ICU without access to the implemented transfer note (n=684). Intent-to-treat [ITT] estimate; As treated [AT] estimate; Per protocol [PP] estimate. Designed analytic schematics will be presented at the conference.
QUANTIFYING THE ROLE OF FOODBORNE TRANSMISSION IN HUMAN SALMONELLOSIS USING ROUTINE SURVEILLANCE DATA Jessica Healy, Beau Bruce, R. Michael Hoekstra, (Enteric Diseases Epidemiology Branch, Centers for Disease Control and Prevention)

The enteric pathogen Salmonella can be transmitted by many modes: food, water, person-to-person, the environment, and animal contact. Estimating the relative importance of each transmission mode is challenging, yet is an important step in understanding how to best direct and evaluate public health interventions. We developed a simple, relative measure of foodborne relatedness (FRM) for Salmonella serotypes using routine surveillance data from 1998–2015. For each serotype we calculated the outbreak case proportion (number of cases caused by that serotype reported to the Foodborne Disease Outbreak Surveillance System [FDOSS] divided by all cases reported to FDOSS) and divided it by the sporadic case proportion (number of cases caused by that serotype reported to the Laboratory-based Enteric Disease Surveillance System [LEDS] divided by all cases reported to LEDS). Of the 15 most common serotypes, Saintpaul (3.58), Heidelberg (1.63), and Agona (1.25) had the highest FRMs; Mississippi (0.01), Thompson (0.54), and Oranienburg (0.59) had the lowest. We also estimated the total proportion of U.S. salmonellosis cases that were foodborne by combining our FRM with additional assumptions (i.e., one or more serotypes are 90–100% foodborne, the FRMs of any two serotypes are mathematically related, and any measure of foodborne case occurrence can be used to calculate the FRM) creating various plausible scenarios. Summarizing the results of all scenarios, we estimate the median percentage foodborne of salmonellosis from all serotypes is 74% (interquartile range: 62–81%). Our approach allows us to leverage routinely collected surveillance data to estimate each serotype's likelihood of foodborne transmission and the proportion of U.S. Salmonella cases we expect to have been foodborne. A better understanding of the amount of salmonellosis and proportion of each major serotype that is foodborne will help public health officials target and evaluate approaches to reduce illness.
COMPOSITE VARIABLES IN CONTEXT: BODY MASS INDEX Kellyn F Arnold*, Kellyn F Arnold, Laurie Berrie, Johannes Textor, Mark S Gilthorpe, Peter WG Tennant, (Leeds Institute for Data Analytics, University of Leeds)

Background: Composite variables are variables that are functionally created from, and fully explained by, two or more parent variables; examples include waist-to-hip ratio, the Townsend deprivation index, and body mass index (BMI). Often, these variables are analysed in relation to a subsequent outcome, and their causal effect on that outcome interpreted. Methods: We identify two primary motivations for the construction of composite variables: (1) to summarise multiple related concepts in a convenient and parsimonious way, or (2) to standardise one variable by one or more other variables. We use BMI as a specific case study to illustrate the implications of this distinction, and the potential consequences of failing to appreciate it in context. Directed acyclic graphs (DAGs) are used to depict BMI and its source variables (weight and height) in relation to risk of cardiovascular disease, as well as other potential causally-relevant variables. Results: Where BMI aims to represent a useful summary of or proxy for adiposity, analysing the composite as a variable with a distinct causal effect is arguably sound; however, the potentially complex relationships between its source variables and other causally-relevant variables are masked by the composite measure. Where BMI aims to represent a measure of weight standardised by height, analysing the composite instead of its components may lead to interpretational bias. Conclusion: Summarisation implies an interest in understanding the average effect of a series of related concepts on an outcome, whereas standardisation implies an interest in understanding the effect on an outcome of an individual variable, conditional on another variable deemed to confound the focal relationship. Care should be taken to appreciate and respect this distinction in any analysis, though it has particular importance for researchers wishing to obtain causally-relevant information in order to inform future interventions.

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AN ALTERNATIVE G-FORMULA IMPLEMENTATION FOR CAUSAL ANALYSES IN HIV COHORTS Lan Wen*, Lan Wen, Miguel Hernan, (Harvard T.H. Chan School of Public Health)

Traditional methods used in cohort studies to adjust for confounders such as matching and stratification cannot provide valid estimates of the effect of treatment strategies in the presence of treatment-confounder feedback. Rather, g-methods such as inverse probability (IP) weighting and parametric g-formula need to be used. Specifically, the parametric g-formula has been used to estimate the causal effect of treatment strategies on clinical, virologic and immunologic outcomes in the HIV-CAUSAL Collaboration of cohorts from Europe and the United States. The version of the g-formula that has been implemented required modelling the joint density of time-varying treatments, confounders, and outcomes. In this presentation we will discuss an alternative, less computationally intensive, way to estimate the parametric g-formula via iterative standardization, which requires iteratively marginalizing over the time-varying treatments, confounders and outcomes. A comparison between these two g-formula estimation procedures has not been done before. We simulated a hypothetical cohort of 1000 HIV-positive, ART-naïve, AIDS-free individuals and estimated the 5-year mortality risk under combined antiretroviral therapy using the two g-formula implementations and IP weighting. The simulations show that estimating the g-formula via iterative standardization is just as efficient as estimating the g-formula via joint density modelling, and both of these methods are more efficient than IP weighting (Table 1). Even though the parametric g-formula is more efficient than IP weighting, it requires more model assumptions. Hence, we will also describe model diagnostic procedures for the parametric g-formula. We will compare these methods in an analysis of the HIV-CAUSAL collaboration, and provide guidelines for practitioners interested in implementing these methods in estimating the average treatment effect on time-to-event data.

<table>
<thead>
<tr>
<th>Year</th>
<th>G-formula Joint density</th>
<th>G-formula Iterative</th>
<th>IP weighting</th>
<th>G-formula Joint density</th>
<th>G-formula Iterative</th>
<th>IP weighting</th>
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</tbody>
</table>
precisely is a study planning tool to calculate sample size based on precision rather than power. Power calculations focus on whether or not an estimate will be statistically significant; calculations of precision are based on the same principles as power calculation but turn the focus to the width of the confidence interval. precisely is a fast and flexible R implementation of the work by Rothman and Greenland on this subject, including a Shiny web app for calculating sample size. precisely has functions for studies using risk differences, risk ratios, rate differences, rate ratios, and odds ratios. The heart of these calculations is the desired precision. For ratio measures, this is the ratio of the upper to lower limit of the confidence interval. For difference measures, this is the absolute width of the confidence interval. precisely also provides functionality to calculate the precision of an estimate given a sample size and to calculate sample size based on the probability that the upper limit of the confidence interval is below a level of concern.
There are patterns in the way both people and disease group across space and time. These patterns are important to epidemiologists and health professionals because they may be indicative of elevated disease risk. In some cases, this elevated risk may be driven by external factors such as environmental exposures, infectious diseases or other factors where a timely public health intervention may save lives. We explore the detection of breast cancer clusters in part of Japan across both space and time. The detection of disease clusters has typically been approached as a large scale multiple testing problem, using a spatial and spatio-temporal scan statistic. We have instead re-examined spatial cluster detection as a high-dimensional variable selection problem using (quasi-)Poisson regression penalized by the least absolute shrinkage and selection operator (LASSO). Fast and efficient computation is made possible by exploiting the effects of potential clusters using sparse matrices. Final models are selected based on (quasi-)information criteria, which allows us to smooth over the background rate and identify the selected breast cancer clusters. Data-driven simulation results show that the spatio-temporal cluster is more challenging to identify than the spatial cluster, disease clusters in small population areas are more difficult to identify than in large population centers, as both the radius and relative risk grow in the cluster, it becomes easier to detect. Practical application of the methods will be illustrated using data on breast cancer incidence in Japan.

Background: Sexual violence perpetration data is notably difficult to collect from young men due to reluctance to report stigmatized, potentially criminal behavior. In this study, we assessed whether exposure to more normalizing language in a survey would influence the likelihood of male students completing a sexual violence survey, reporting sensitive sexual behaviors, or the self-reported honesty to the survey questions. Methods: In April 2018, we conducted a randomized, Qualtrics-based survey study among fraternity members (n=100) enumerated from a list of all fraternity members at a large mid-western university. Participants were randomized to receive normalizing language versus typical language in recruitment and introductory study materials. We used log-binomial regression to compare the binary outcomes of survey completion, self-reported actual and attempted sexual victimization and perpetration, and self-reported honesty of survey responses between the two different survey administration groups. Results: We found no significant differences in the likelihood of survey completion and honesty of participants who received the normalizing language and those who did not, with estimates generally near the null. However, there were non-significant differences in reporting sexual violence victimization between the two groups, with participants who had received the normalizing language 20% and 50% more likely to report rape and attempted rape than those who had not (prevalence ratio (PR): 1.2 95% confidence interval (CI):0.5-3.0 and PR: 1.5 95% CI:0.8-2.9, respectively). Conclusion: Our hypothesis that using more normalizing language in recruitment and introductory survey materials would result in both increased completion and honesty was shown to be incorrect. Thus, altering language to normalize sexual behaviors with the particular scripts that we used may not be enough to make people feel comfortable disclosing stigmatized sexual violence perpetration behaviors.

<table>
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<tr>
<th>Outcomes</th>
<th>PR (95% CI)</th>
<th>p-value</th>
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</thead>
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<tr>
<td>Survey completion (yes/no)</td>
<td>0.98 (0.86, 1.11)</td>
<td>0.72</td>
</tr>
<tr>
<td>Sexual assault perpetration in lifetime (yes/no)</td>
<td>1.04 (0.27, 3.93)</td>
<td>0.95</td>
</tr>
<tr>
<td>Sexual assault victimization in lifetime (yes/no)</td>
<td>1.19 (0.47, 3.03)</td>
<td>0.72</td>
</tr>
<tr>
<td>Sexual assault attempt victimization in lifetime (yes/no)</td>
<td>1.51 (0.78, 2.93)</td>
<td>0.22</td>
</tr>
<tr>
<td>Not honest due to discomfort sharing (yes/no)</td>
<td>0.93 (0.84, 1.04)</td>
<td>0.22</td>
</tr>
<tr>
<td>Number truthful (all vs. some to none)</td>
<td>1.01 (0.84, 1.22)</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Table 1. The association between exposure to normalizing language versus not and survey completion, reporting sexual assault perpetration and victimization, and honesty of responses among college men (n=100)
Risk taking behavior can be considered to be a key characteristic for a person. Consequently, risk behavior is studied extensively in a variety of scientific fields, such as epidemiology, psychology, criminology, and economics. Risk behavior can be measured through experimental tasks, such as the Balloon Analogue Risk Task (BART) and the Columbia Card Task (CCT). Previous studies have shown an association between risk behavior in the real-world and in experimental tasks. Typically, the researcher is interested in the amount of risk a participant is prepared to take. However, modeling risk behavior with these tasks is challenging because of the following issues. The first one concerns censored observations as most experimental risk tasks may randomly end prematurely (e.g., by popping the balloon in the BART). A second issue is that certain outcomes seem to be more attractive to participants than others. For example, in the CCT, some young participants create a geometric pattern for turning over cards, such as a complete row or column of cards, or even a diamond shape and stop when this pattern is completed. These patterns lead to inflated values for some of the risk outcomes. A third issue is that there can be differences between a priori unknown groups of participants in the attractiveness of certain risk outcomes. So far, none of the existing studies have provided a statistical model that takes care of the issues above. Here, we propose the Censored Generalized Linear Finite Mixture Model (CGLFMM), that models risk taking while handling censoring, background variables, experimental conditions, attractiveness of certain patterns and risk outcomes. This model is applied to an unusually large data set with $n>3000$ participants that each completed 16 rounds of the CCT. Background variables on socio-economic status and other individual characteristics are available. We discuss the main results of the CGLFMM applied to these data.
IS THE ASSOCIATION BETWEEN GESTATIONAL WEIGHT GAIN AND MACROSOMIA AN ARTEFACT OF TAUТОLOGY? Peter WG Tennant* Peter WG Tennant, Zoe Craig, George Ellison, Tomasina Stacey, Nigel Simpson, Mark S Gilthorpe, Wendy Harrison, (Leeds Institute for Data Analytics, University of Leeds)

BACKGROUND: High gestational weight gain (GWG) is associated with several adverse pregnancy outcomes, including fetal macrosomia (birthweight ≥4kg). Several countries have thus adopted guidelines for 'optimum' GWG, to reduce the occurrence of macrosomia. These assume the association is causal, flows from mother to child, and that GWG accurately captures maternal weight 'change'. In fact, GWG is a composite variable that mathematically contains fetal weight, since maternal end-of-pregnancy weight includes both post-pregnancy weight and fetal birthweight. An artefactual association would therefore be expected between GWG and fetal weight. This simulation study explores the size and nature of this artefact. METHODS: Data were simulated using dagitty R to reflect three potential scenarios; where fetal weight was caused by 1) maternal height alone, 2) height and pre-pregnancy weight, and 3) height, pre-pregnancy weight, and post-pregnancy weight (i.e. 'change'). GWG was calculated from post-pregnancy weight minus pre-pregnancy weight plus birthweight and related to birthweight. Path coefficients were informed by data from the Danish National Birth Cohort. RESULTS: A strong positive association was observed between GWG and birthweight in all three scenarios despite scenario 3 being the only to include a causal effect of maternal weight 'change' on fetal weight. The total association was similar in magnitude between scenario 1 and scenario 3, but slightly smaller in scenario 2 due to the negative parametrisation of pre-pregnancy weight in the construction of GWG. Adjustment for maternal BMI at baseline had limited impact on the observed associations, which were all consistent with previously reported effect sizes. CONCLUSION: Part or all of the association between GWG and birthweight may result from birthweight being mathematically implicit in the construction of GWG. Existing studies of GWG should be treated with extreme caution and the resulting guidelines revisited.

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GENERALIZING INFERENCES ABOUT FAILURE-TIME OUTCOMES FROM RANDOMIZED INDIVIDUALS TO A TARGET POPULATION  Sarah Robertson*, Sarah Robertson, Jon Steingrimsson, Miguel Hernan, Issa Dahabreh, (Brown University)

We describe methods to generalize survival probabilities from a randomized trial to the target population of all trial-eligible individuals or trial-eligible non-randomized individuals. The methods do not require constant hazard ratios and may account for informative censoring in the trial. We discuss identification when baseline covariate data are collected from all trial-eligible individuals, but treatment and outcome data are only required from randomized individuals. We examine estimation methods that rely on modeling assumptions for the hazard of the outcome, the probability of trial participation, and the hazard of censoring, as well as methods that combine these models to increase efficiency and gain robustness to model misspecification. We compare the performance of the methods in a simulation study in terms of bias and efficiency under different target and trial population sizes. Lastly, we apply the methods to the Coronary Artery Surgery Study (CASS), a comprehensive cohort study that compared the effect of surgery plus medical therapy versus medical therapy alone for chronic coronary artery disease.
Agonistic interaction is one of the most important types of mechanistic interaction, which is difficult to be distinguished from synergistic interaction by empirical data. In this study, we propose four approaches that suffice to identify and estimate the agonistic interaction: (1) To make a strong assumption that synergism does not exist; (2) To exploit information from a third factor by assuming that this factor is a necessary component for the background condition of synergistic interaction but is not involved in other mechanisms; (3) To consider a third factor necessary for the background condition of agonistic interaction but not involved in other mechanisms; and (4) Similar to (3) but to allow flexibility that the third factor may have a main effect on the outcome and/or a synergistic effect with the two risk factors of interest. We applied the proposed methods to quantify the agonism of Hepatitis B and C viruses (HBV and HCV) infections on liver cancer using a Taiwanese cohort study (n=23,820; HBV carrier n=4,149 (17.44%), HCV carrier n=1,313 (5.52%)). The result demonstrated that agonistic interaction is more dominant compared with synergistic interaction, which explains the findings that the dual infected patients do not have a significantly higher risk of liver cancer than those with single infection. By exploiting an additional risk factor that satisfies certain assumptions, these approaches potentially fill the gap between mechanistic and causal interactions, contributing the comprehensive understanding of causal mechanisms.
DIFFERENCE PERFORMANCE BETWEEN CONVOLUTIONAL NEURAL NETWORK BASED ON IMAGE ONLY AND THAT INCLUDING DEMOGRAPHIC VARIABLES FOR DETECTIVE TUBERCULOSIS ON CHEST X-RAY Yangwook Kim*, Yangwook Kim, Jin-Ha Yoon. (2 The Institute for Occupational Health, Yonsei University College of Medicine, Seoul, Korea)

Background: We aimed to use deep learning to detect tuberculosis on chest radiographs on annual workers’ health examination data, and test performances between convolutional neural network (CNN) based on images only (I-CNN) and CNN including demographic variables (D-CNN). Methods: 1,000 chest x-ray images each who were positive and negative for tuberculosis were used for training models by I-CNN and D-CNN. Feature extraction was conducted using VGG19, InceptionV3, ResNet50, DenseNet121, and InceptionResNetV2. Age, weight, height, and gender were used for demographic variables. The area under the receiver operating characteristic (ROC) curve (AUC) was calculated for model comparison. Results: AUC values of the D-CNN model greater than that of I-CNN. AUC values for VGG19 increased by 0.0144 (0.957 to 0.9714) in the training set and 0.0138 (0.9075 to 0.9213) in the test set (both p <0.05). D-CNN show greater sensitivity than I-CNN do at the same cut-off point for same specificity of 0.962 (0.815 vs 0.775, respectively). Sensitivity of D-CNN does not be attenuate as much as that of I-CNN even though when specificity is increased by cut-off points. Conclusion: Our results indicate that machine learning can facilitate detecting tuberculosis on chest X-ray, and demographic factors can improve that process.

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THE ASSOCIATION BETWEEN PRE-EXISTING ANXIETY AND PROLONGED RECOVERY AFTER MILD TRAUMATIC BRAIN INJURY IN CHILDREN AND ADOLESCENTS  Alexia Martin*
Alexia Martin, Heather Sesma, Katherine Ingram, Katie Slifko, Victoria Nguyen, Kevin Coleman, Robert Doss, Amy Linabery, (University of Minnesota, School of Public Health; Children's Hospitals and Clinics of Minnesota)

Background: While mild traumatic brain injury (mTBI) symptoms resolve in many pediatric patients within 2-4 weeks after injury, 25-40% have prolonged sequelae lasting months or years. Here, we examine pre-existing anxiety disorder (AD) as a predictor of prolonged recovery from mTBI. Methods: We established a retrospective cohort of patients seen at our 3 specialty concussion clinics to examine potential risk factors for prolonged recovery. Medical record data for children aged 5-17 yrs who presented to a clinic with mTBI and were discharged between 4/2018-11/2018 were included. Outcome measures included time to symptom recovery, provider clearance for full return to physical activity, return to school full time without accommodations, and concussion symptom load, as measured by a validated symptom inventory. Differences across AD exposure groups were estimated via log-rank tests, and linear and Cox regression. Results: Among 248 eligible mTBI patients (mean age 13.1 years), 30% reported pre-existing AD. Concussion symptom load was similar between the AD and no AD groups, after adjustment for age (p=0.12). Patients with AD had longer duration of concussion symptoms than those without (median 210 v 70 days, p=0.0003). After controlling for age category (5-11 v 12-17 yrs), presence of AD was significantly associated with prolonged symptom recovery (adjusted Hazard Ratio=4.48; 95% CI: 2.00-10.0), delayed return to school (2.93; 1.67-5.13), and delayed return to physical activity (1.90; 1.34-2.70). No substantial differences were observed upon stratification by age category. Conclusions: Pre-existing AD is a risk factor for prolonged recovery in pediatric/adolescent mTBI patients. Anxiety is closely related to executive functioning skills, which are particularly vulnerable after mTBI. Providers should advise mTBI patients with AD of the importance of brief rest followed by early return to light physical and cognitive activity, and address anxiety and stress management.
IDENTIFICATION OF ENVIRONMENTAL RISK FACTORS FOR PEDIATRIC-ONSET MULTIPLE SCLEROSIS USING MACHINE LEARNING Cameron Adams* Cameron Adams, Xiaorong Shao, Gregory Aaen, Anita Belman, Leslie Benson, Meghan Candee, T. Charles Casper, Tanuja Chitnis, Mark Gorman, Manu Goyal, Jennifer Graves, Benjamin Greenberg, Yolanda Harris, Ilana Kahn, Lauren Krupp, Timothy Lotze, Soe Mar, Manikum Moodley, Jayne Ness, Mary Rensel, Moses Rodriguez, John Rose, Jennifer Rubin, Teri Schreiner, Jan-Mendelt Tillema, Amy Waldman, Bianca Weinstock-Guttman, Lisa Barcellos, Emmanuelle Waubant, (School of Public Health, UC Berkeley)

Multiple sclerosis (MS) is an autoimmune disease with genetic and environmental risk factors. While initial MS symptoms typically occur during adulthood, approximately 5% of patients develop symptoms before age 18 (pediatric-onset MS, POMS). It is hypothesized that POMS patients have either increased genetic susceptibility, acute exposure to one or more environmental risk factors, or both. There are shared genetic risk factors between PO and adult-onset MS (AOMS) but POMS patients have higher genetic susceptibility than AOMS patients. POMS patients are also more ethnically diverse than AO patients. The role of environmental factors in POMS is not well understood, but maternal, fetal, and early life exposures are implicated. The goal of this study was to identify factors associated with risk of POMS using machine learning algorithms. POMS cases (n=501) and controls (n=720) were from the US Network of Pediatric Multiple Sclerosis Centers. Detailed data were collected on maternal, fetal, early life, and childhood exposures including, Epstein-Barr virus (EBV) and social-economic status (SES). Elastic net regression was used for variable selection. The penalty and mixing parameters were selected by cross validation. Preliminary analyses identified known AO risk factors HLA-DRB1*15:01 (OR: 2.41, 95% CI: 1.79, 3.24), EBV infection (OR: 3.39, 95% CI: 2.53, 4.59), and obesity (BMI>30, OR: 1.57, 95% CI: 1.13, 2.19) as well as previously unknown factors, including parental education level (OR: 0.55, 95% CI: 0.41, 0.75), maternal freckling (OR: 0.65, 95% CI: 0.48, 0.9), tonsillectomy (OR: 1.9, 95% CI: 1.18, 3.05), early life flu infection (OR: 1.57, 95% CI: 1.16, 2.13), and formula use (OR: 1.5, 95% CI: 1.12, 2.01). These results suggest that sun exposure, SES, and early-life health contribute to POMS risk. The next steps are to incorporate genetic risk scores into the model, estimate variable importance using ensemble learning, and assess the predictive accuracy of the model.
Hearing Difficulties, as Reported by Partner, and the Risk for Mild Cognitive Impairment and Dementia

Maria Vassilaki* Maria Vassilaki, Jeremiah A. Aakre, David S. Knopman, Walter K. Kremers, Michelle M. Mielke, Yonas E. Geda, Mary M. Machulda, Razan Al Fakir, Rosebud O. Roberts, Ronald C. Petersen, (Department of Health Sciences Research, Mayo Clinic, Rochester, Minnesota)

Background: Hearing difficulty (HD) is a common social and medical problem with 10% of the population experiencing hearing loss that interferes with communication, the rate dramatically increases to 40% in those >65 years old. Hearing loss has been associated with cognitive decline (including mild cognitive impairment (MCI)/dementia). This study aimed to examine the longitudinal association between HD that interfere with daily activities as reported by an informant (typically, a spouse or someone who knew the participant well) and the risk of incident MCI/dementia. Methods: The study included 5,216 community dwelling non-demented participants (≥50 years old; mean age (SD) 73.3 (9.8) years; 50.6% men; 26.9% APOE Ɛ4 allele carriers) enrolled in the population-based Mayo Clinic Study of Aging with a comprehensive cognitive evaluation at baseline and every 15 months, and partner-based information on participant’s HD that interfere with daily activities. Hazard Ratio (HR) for incident MCI or dementia obtained from Cox proportional hazards models utilizing time-dependent HD status was adjusted for sex and years of education, with age as the time scale. Results: 1,056 participants had HD, 652 had prevalent MCI, 275 participants developed incident dementia (mean (SD) follow-up 4.3 (3.5) years) and 767 developed incident MCI (mean (SD) follow-up 4.0 (3.4) years). Those with HD had a higher risk for incident dementia (HR: 1.40, 95% confidence interval [CI], (1.09-1.79), p=.009) and for incident MCI (in cognitively unimpaired at baseline: HR=1.25, 95%CI (1.07, 1.46), p=.006). The estimate was stronger for incident non-amnestic MCI (HR=1.43, 95%CI (1.03, 1.97), p=.03). Conclusions: Findings suggest that informant-based HD is associated with increased participant’s risk for MCI and dementia. Partner-based HD information is easily obtained and could be helpful in guiding the selection of persons at risk for progression to MCI or dementia for further evaluation.
Diet and nutrition affect diabetes, obesity, coronary heart disease (CHD), and chronic kidney disease (CKD). The United States Department of Agriculture (USDA) defines food deserts as locations with at least 500 people or a third of the population residing more than one mile from a grocery store. This study assesses the relationship between food access and diabetes, obesity, CHD and CKD using the USDA definition and as well as two alternatives: 1) the number of retailers within average commuting distances and 2) the distance between the population centroid of a census tract and its closest retailer. Data from Data sources include the Food Access Research Atlas, Minnesota Department of Transportation, ESRI’s Roads and Highways, North American Industry Classification System for grocery stores, Census commuting distances, and the CDC’s 500 Cities Project by census tract (n=246) were used for the analysis. A conditional autoregressive model controlled for race, median income, public transportation access, vehicle ownership, SNAP enrollment, smoking status, and health insurance access. Analyses using the USDA definition showed that areas classified as food deserts had significantly higher prevalence of diabetes (β=0.53), but not obesity (β =0.25), CKD (β =0.01), or CHD (β =0.02). An increased number of retailers within average commuting distance was also significantly associated with higher prevalence of diabetes (β =-0.05), but and not obesity (β=0.03), CKD (β=0.00), or CHD (β=0.00). Total distance to the nearest retailer was not significantly associated with diabetes (β=-0.07), obesity (β=0.43), CKD (β=-0.03), or CHD (β=-0.01). Our findings suggest other factors, such as age, may be stronger predictors of health outcomes than food deserts. Our results are consistent across all three definitions of food deserts in this population. However, these findings also suggest that spatially defined food access measures do not fully capture the complexity of the food environment.
Valid and reliable assessment of dietary intake is crucial to nutritional epidemiology research. Unfortunately, the current gold standard dietary intake assessment, the 24-hour dietary recall, carries high participant burden, is costly to investigators, and is prone to inaccuracies due to recall and social desirability bias. Assessment of dietary intake via Ecological Momentary Assessment (EMA) may alleviate some of these limitations. Thus, the present study sought to understand the level of concordance between a brief EMA survey measuring children’s dietary intake and a standard 24-hour dietary recall. A diverse, population-based, sample of parent-child dyads (n=150) completed three 24-hour dietary recalls and 8 days of EMA surveys; in total, there were 185 days where dietary intake data from both EMA and 24-hour recalls were available. The EMA measure asked participants to indicate whether (yes/no) they had consumed any of eight total food items (e.g. fruit, vegetable, etc.) at each reported eating occasion. Concordance of the intake of specific food items reported via 24-hour recalls and EMA varied widely and depended on type of food eating occasion, location of meal and food preparation style. For example, participant report of sweets, meat, and fruit intake were concordant for 91%, 79% and 71% of matched meals, respectively, whereas reports of refined grains, vegetables and sugar-sweetened beverages were 54%, 68% and 69%, respectively. Concordance of intake was highest for breakfast and snacks, as compared to other eating occasions. Higher concordance was observed between the two measures if the meal occurred at home and was fully or partially home-cooked. Overall, data suggest that use of EMA to assess dietary intake is appropriate to answer specific research questions; insights gleaned from this study can assist researchers in understanding the pros and cons of each dietary intake assessment method as they move forward with their own research.
EFFECT OF RACIAL/ETHNIC DISTRIBUTION ON OBESITY TRENDS AMONG CHILDREN AGED 2-4 YEARS ENROLLED IN WIC DURING 2000-2016 Liping Pan* Liping Pan, Sohyun Park, Stephen Onufrik, Heidi Blanck, (CDC)

Background: A lower proportion of non-Hispanic white children and higher proportions of Hispanic and Asian/Pacific Islander children were enrolled in WIC in recent years. It is unclear whether changes in obesity prevalence were due to concurrent changes in racial/ethnic composition. Objective: To examine the effect of changes in racial/ethnic distribution among young WIC children on trend in overall obesity prevalence during 2000-2016. Methods: The analytic sample included 25,373,112 children aged 2–4 years from 50 states, DC, and 5 U.S. territories enrolled in WIC during 2000-2016. We excluded 210,927 (0.82%) children with missing or biologically implausible sex, weight, height, or BMI. JoinPoint was used to identify transition years when significant changes in overall obesity trend occurred. Log binomial regression was used to determine the significance of changes in obesity prevalence between two transition years. Kitagawa decomposition was used to examine the effect of changes in racial/ethnic composition on obesity trends. Results: The 2004 and 2010 were identified as the transition years for the overall obesity trend. Overall, the crude obesity prevalence increased significantly from 14.0% in 2000 to 15.5% in 2004 and 15.9% in 2010, and then decreased significantly to 13.9% in 2016. The decomposition analysis partitioned the prevalence difference into two parts, race distribution and race-specific components. Change in racial/ethnic distribution explained 16.6% of the prevalence increase from 2000 to 2004, 66.3% of the increase from 2004 to 2010, and 5.1% of the decrease from 2010 to 2016. The increased proportion of Hispanic children contributed most to the increase in obesity prevalence from 2004 to 2010. Conclusions: While change in racial/ethnic distribution explained 2/3 of the increase in obesity prevalence during 2004–2010, the race-specific component contributed substantially to the prevalence changes during 2000–2004 and 2010–2016.
ASSOCIATION OF EARLY INTRODUCTION TO SOLID FOODS WITH GUT MICROBIOTA ABUNDANCE AND OVERWEIGHT/OBESITY STATUS AT 5 YEARS OF AGE

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Background: Early infant introduction to solid foods has been associated with increased risk of childhood overweight/obesity (OWOB). New evidence suggests that this association may differ by breastfeeding (BF) status at the time of solids introduction. Changes to the gut microbiota may underlie this association. Purpose: To determine if timing of infant introduction to solid foods is associated with gut microbiota and OWOB at age 5, and if this is modified by BF status. Methods: Mother-child pairs from the prospective Gen3G pre-birth cohort were asked to provide stool at their 5-yr visit (n=179 children). Early introduction to solids was defined as solids ≤ 4 months of age (n=47) vs. later (n=132). OWOB was defined as a BMI > 85th percentile. Beta-binomial regression was used to assess microbial differential abundance. For BMI z score (BMI-z) and OWOB, we fit linear and logistic regression models for all children with 5-yr height and weight data (n=186). Results: Mother-child pairs in the early solids group resembled those in the later solids group, except for shorter BF (median 6.0 mo. in early solids vs. 9.0 months for later solids) and gestational age (38.6 wks in early solids vs. 39.4 wks for later). Six bacterial taxa including Bacteroides were differentially abundant by early vs. later solids, after adjustment for BF and gestational age (Figure). Early solids was also associated with a 0.31 higher child BMI-z (95% CI: 0.004, 0.61) and 2.3 times greater odds (95% CI: 1.0, 5.4) of OWOB at 5 years, after adjustment. Furthermore, there was evidence of effect measure modification by BF (p = 0.009). Among infants BF at 4 months, early solids was associated with a 0.60 higher child BMI-z (95% CI: 0.27, 0.92), whereas in formula-fed infants, there was no association [BMI-z=-0.23; 95% CI: -0.85, 0.38]. Conclusions: Early introduction to solids is associated with differences in gut microbiota and higher odds of OWOB at age 5, and this association may be modified by BF.

![Differentially abundant ASVs in children, adjusted](image)

Figure: Differential abundance of bacterial assigned sequence variants in relation to timing of introduction to solids after adjustment for breastfeeding duration and gestational age at birth. Taxa in color are significantly differentially abundant (FDR-corrected p-value < 0.05).
MATERNAL DIET PATTERNS IN EARLY PREGNANCY AND NEONATAL ANTHROPOMETRY IN THE NICHD FETAL GROWTH STUDY—SINGLETONS
Samrawit F. Yisahak* Samrawit F. Yisahak, Sunni Mumford, Jagteshwar Grewal, Mengying Li, Stefanie N. Hinkle, (National Institute of Child Health and Development)

Maternal nutrition is a key determinant of offspring development. Existing studies typically assess nutrition in terms of exposures to single nutrients. However, analysis of comprehensive dietary patterns that capture complex nutrient profiles is more rigorous and better suited for providing recommendations. Using principal components analysis (PCA), we derived maternal diet patterns in early pregnancy, then assessed their association with neonatal anthropometry. We studied 1964 women in a diverse multi-site cohort of U.S. pregnant women (2009-2013). Birthweight was abstracted from medical records and neonatal anthropometry (upper-arm, upper-thigh and birth length, head circumference, abdominal circumference, sum of skinfold) was measured post-delivery using a standardized protocol. Women completed a 145-item self-administered Food Frequency Questionnaire at 8-13 weeks gestation reflective of diet over the past 3 months. To identify major dietary patterns, we conducted PCA of 26 food groups in my pyramid equivalent units. We grouped the derived patterns into quartiles and used the lowest quartile as the referent group in regression models. The models were adjusted for sociodemographic factors, parity, infant sex, pre-pregnancy BMI, pre-pregnancy physical activity, and total energy. We identified a “Western” and a “Vegetable-based” pattern that together explained 48.47% of the variance. Figure 1 shows the top five food groups loaded on each pattern and their respective factor loadings. After adjusting for covariates, we found no significant association between the two diet patterns and neonatal anthropometry. In conclusion, we identified two major diet patterns in early pregnancy, but neither pattern was associated with neonatal anthropometry. Dietary assessment in later pregnancy may be more predictive of neonatal outcomes. Further investigation, at different points of gestation, is needed to better understand these diet patterns.

Figure 1: Factor loadings for the top five food groups loaded on the two major diet patterns identified in the NICHD Fetal Growth Study

- Solid Fat
- Refined Carbohydrates
- Cured Meat
- Meats
- Added Sugars
- Other vegetable
- Orange vegetable
- Dark-green vegetable
- Tomato
- Other starchy vegetable

* indicates work done while a student/postdoc
Background: Limited epidemiologic evidence exists on the association between diet quality and periodontal disease (PD), particularly in older women. Methods: We examined the cross-sectional association of diet quality and PD prevalence among women, aged 53-85, in the Buffalo Osteoporosis and Periodontal Disease (OsteoPerio) Study (1997-2000; n=1235). Diet quality was defined by the Healthy Eating Index-2015 (HEI-2015), based on usual dietary intake assessed with a food frequency questionnaire. PD was assessed via a whole mouth dental probing exam. Prevalent PD was defined using the Centers of Disease Control and Prevention/American Academy of Periodontology (CDC/AAP) disease classification based on measures of periodontal clinical attachment loss and pocket depth. The percent of gingival sites that bled on probing (BOP) was also documented (50% vs. ≥ 50%). Logistic regression was used to estimate odds ratios (ORs) and confidence intervals (CIs) of prevalent PD (moderate and severe vs. none/mild) by quartile (Q) of HEI score. Models were adjusted (adj) for age, education, frequency of flossing, and smoking status. Results: In this cohort, 27% of women had none/mild, 57% had moderate, and 16% had severe PD. HEI scores ranged from 30 to 92 (mean [SD]=68 [4]). No associations were observed between HEI (Q4 vs. Q1) and moderate (adj OR=1.04, 95% CI: 0.71, 1.54, p-trend=0.92), or severe (adj OR=0.80, 95% CI: 0.48, 1.36, p-trend=0.05) PD. Women in HEI Q4 vs. Q1 had a lower odds of BOP, adj OR=0.55 (95% CI: 0.37-0.82, p-trend=0.001). Conclusion: Better adherence to the HEI-2015 was not associated with PD severity, but was inversely associated with gingival bleeding, a measure of acute oral health and inflammation.
DO PREGNANT WOMEN CHANGE THEIR DIET AND PHYSICAL ACTIVITY AFTER GESTATIONAL DIABETES DIAGNOSIS? FINDINGS FROM A LONGITUDINAL MULTI-RACIAL U.S. PROSPECTIVE COHORT

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There is limited longitudinal population-based data on whether women modify their diet and physical activity (PA) after diagnosis of gestational diabetes (GDM). Our aim was to examine if women with GDM do in fact alter their diet and PA post diagnosis and identify characteristics of women with favorable changes. We included 1735 women from the NICHD Fetal Growth Studies-Singletons (2009-2013) who completed an Automated Self-Administered 24-Hour dietary recall and Pregnancy PA Questionnaire at 16-22, 24-29, 30-33, 34-37, and 38-41 (PA only) gestational weeks (GW). GDM was ascertained by medical records (n=85; 4.9%), diagnosed at a mean of 27.7 GW (S.D. 4.7). We used adjusted linear mixed models with random effects to estimate changes in diet/PA post-GDM screening (non-GDM)/diagnosis (GDM) and tested for differences by GDM status. For factors that changed among women with GDM, we tested for differences across covariates. Women with GDM reduced total sugar intake after diagnosis by 27.9 g/d (95% CI -41.5, -14.3), while it increased in women without GDM by 3.7 g/d (0.7, 6.7) after screening (Figure). Specifically, women with GDM reduced added sugars [-12.0 g/d (-22.0, -2.0)] and fruit juice [-0.4 serving/d (-0.6, -0.2)], and increased artificially sweetened beverage intake [0.2 serving/d (0.1, 0.3)]. Reductions in total sugar persisted in all women except Hispanics [-9.0 g/d (-27.2, 9.3); P-interaction=0.08] and non-nulliparous women [-10.7 g/d (-25.5, 4.2); P-interaction=0.001]. After diagnosis women with GDM performed less moderate intensity PA [-30.6 MET-hr/wk (-43.2, -18.0)] than women without GDM [-17.1 (-19.9, -14.3)]. In conclusion, majority of women with GDM undergoing usual care substantially decreased their total sugar intake after diagnosis primarily by reducing added sugars and fruit juice, and increasing artificially sweetened beverages. Greater dietary counseling efforts may be needed among Hispanic and multiparous women, and for PA in all women with GDM.

Figure. Adjusted changes in total sugar intake from before to after screening/diagnosis for gestational diabetes (GDM).

S/P indicates work done while a student/postdoc
TEMPORAL ASSOCIATION OF PROSTATE AND THYROID CANCER WITH WORLD TRADE CENTER RESCUE/RECOVERY WORK: A 14 YEAR COHORT STUDY
David Goldfarb* David Goldfarb, Charles B. Hall, Rachel Zeig-Owens, David J. Prezant, (Montefiore Medical Center/FDNY)

Background The World Trade Center (WTC) attack on 9/11/2001 created a mixture of hazardous materials including known and suspected carcinogens. For many first responders, exposures began on the morning of the attacks and continued in the months that followed. Several studies have identified an increased risk of prostate and thyroid cancer in this cohort when compared to the general population. Objectives To identify whether elevated cancer risk persists in firefighters and EMS workers when follow-up is extended to 14 years, and to detect specific time periods which the risk was considerably elevated. Methods There were 16,221 participants exposed to the WTC disaster. All were cancer-free at the beginning of follow-up. Person-time accrueds began on the later of 9/11/2001 and enrollment into the WTC Health Program, and ended on 12/31/2015. The population was matched to several state cancer registries to confirm incident cases. We used Poisson regression to estimate risk ratios and associated 95% confidence intervals; the change points in the relative rates were estimated using profile likelihood. Results We observed 54 incident thyroid cancer cases. RRs were highest between 2002 and 2004, were attenuated between 2004 and 2012, and were again significantly elevated between 2012 and 2015. Incidence of thyroid cancer has increased from 2002-2015 with rates in 2015 more than double 2002. We also observed 348 incident prostate cancer cases. Rates were mildly elevated between 2002 and 2008, were significantly elevated between 2008 and 2012, and were diminished between 2012 and 2015. Conclusions: Risk of both thyroid and prostate cancer remains elevated in WTC-exposed firefighter and EMS workers. While the unique exposures at the disaster site are a plausible culprit for the observed effect, screening practices (PSA and imaging) in this monitoring program cannot be discounted. Further work needs to be done to adequately address surveillance bias in this cohort.

A. Adjusted incidence rates of Prostate Cancer by year
B. Adjusted incidence rates of Thyroid Cancer by year

S/P indicates work done while a student/postdoc
OBJECTIVE: Studies suggest that night shiftwork disrupts the normal circadian rhythms, but are often based on self-reported shiftwork and evidence is limited among protective services. The current study examined the relationship between objectively assessed shiftwork and circadian activity rhythm in urban police officers.

METHODS: Participants were 289 officers from the baseline examination of the Buffalo Cardio-Metabolic Occupational Police Stress study. Electronic work history records were used to determine the dominant shift as day, afternoon, or night. Activity data were collected by wrist actigraphy for 15 consecutive-days. Because rest/activity is a behavioral change that follows 24-hour cycle, a cosine curve with a 24-hour period was fit to estimate parameters of the activity circadian rhythm: mesor (mean activity level), amplitude (extent of oscillation), and acrophase (time of oscillatory crest). In addition, a 24-h autocorrelation parameter, which measures strength of the rhythm, was estimated as the correlation of activity at time t with activity at time t+24. Analyses of covariance were used to compare mean values of rhythm parameters across shifts.

RESULTS: Following adjustment for confounders, officers working on night shift had significantly lower autocorrelation and amplitude and a delayed acrophase compared to day shifts. Night shift officers also had lower autocorrelation and amplitude compared to those working on afternoon shift. Mesor estimates did not vary significantly across shift. Results were consistent when stratified by gender.

CONCLUSION: Night shiftwork is associated with reduced levels of circadian activity rhythm parameters (autocorrelation and amplitude) and delayed acrophase suggesting that officers working on night shift may have a disturbed circadian activity rhythm. This study further contributes to our understanding of the risk associated with regular night shift work. Future prospective studies of this relationship are warranted.
THE FUNCTIONAL MOVEMENT SCREEN AS A PREDICTOR OF OCCUPATIONAL INJURIES AMONG DENVER FIREFIGHTERS Erin Shore* Erin Shore, MPH, Miranda Dally, MS, Danielle Ostendorf, PhD, Madeline Newman, MPH, Lee Newman, MD MA, (Center for Health, Work & Environment, Colorado School of Public Health, University of Colorado Anschutz Medical Campus)

Background-The Functional Movement Screen (FMS) is a screening tool that is used to assess an individual's ability to perform fundamental movements that are necessary to participate in athletic activities. The FMS has been shown to predict injury among collegiate and professional athletes. The purpose of this study was to assess the ability of FMS to predict occupational injury among firefighters. Methods-The Denver Fire Department (DFD) began administering the FMS to new recruits in early 2015. Workers' compensation claims from the DFD were collected from January 2015 to March 2018. Claim status was defined as any claim occurrence vs. no claim and a claim specific to musculoskeletal injury (overexertion) vs. no claim/other claim. To assess associations between FMS score and claim status, FMS scores were dichotomized into ≤ 14 and > 14 and Chi-square tests were performed. Age adjusted odds ratios were calculated using logistic regression. To determine if there was an optimal FMS cut-off, we tested the sensitivities and specificities of FMS predicting claims at various FMS score cut points, ranging from 10 to 20. Results-Of 581 firefighters (mean age 38 y, SD =9.8) who completed FMS between February 2015 and March 2018, 188 (32.4%) filed a workers' compensation claim in the study time frame. Seventy-two of those (38.3%) were categorized as overexertion claims. Chi-square tests between FMS score and claim status indicated that there was no association (p > 0.05). Logistic regression results confirmed this finding for claim vs. no claim (OR = 1.27, 95% CI: 0.88 – 1.83) and for overexertion claim vs. no claim/other claim (OR = 1.33, 95% CI: 0.81 – 2.21). There was no optimal cut-off for FMS in predicting a workers’ compensation claim. Conclusions-Although the FMS has been predictive of injuries in other populations, among this sample of firefighters, it is not predictive of a future workers’ compensation claim.
NIGHT AND ROTATIONAL WORK EXPOSURE WITHIN THE LAST 12 MONTHS AND RISK OF INCIDENT HYPERTENSION Jacqueline Ferguson* Jacqueline Ferguson, Sadie Costello, Andreas Neophytou, John Balmes, Patrick Bradshaw, Mark Cullen, Ellen Eisen, (Division of Environmental Health Sciences, School of Public Health, University of California Berkeley)

Objectives: Shift work, such as alternating day and nights, causes chronobiologic disruptions which may cause an increase in hypertension risk. However, the relative contributions of the components of shift work – such as shift type (eg, night work) and rotations (ie, switching of shift times; day to night) – on this association are not clear. To address this question, we constructed novel definitions of night work and rotational work and assessed their associations with risk of incident hypertension. Methods: A cohort of 2151 workers at eight aluminum manufacturing facilities previously studied for cardiovascular disease was followed from 2003 through 2013 for incident hypertension, as defined by ICD-9 insurance claims codes. Detailed time-registry data was used to classify each worker’s history of rotational and night work. The associations between recent rotational work and night work in the last 12 months and incident hypertension were estimated using adjusted Cox proportional hazards models. Results: Elevated hazard ratios (HR) were observed for all levels of recent night work (>0–5, >5–50, >50–95, >95–100%) compared with non-night workers, and among all levels of rotational work (10–20, >20–30, and >30%) compared with those working <1% rotational work. In models for considering the combination of night and rotational work, workers with mostly night work and frequent rotations (≥50% night and≥10% rotation) had the highest risk of hypertension compared to non-night workers [HR 4.00, 95% confidence interval (CI) 1.69–9.52]. Among workers who were mostly non-night work with infrequent rotations, the HR for hypertension was 2.18 (95% CI 0.97–4.87) compared with non-night workers. Conclusions: Our results suggest recent night and rotational work may both be associated with higher rates of incident hypertension. Furthermore, this research suggests hypertension risk rises and remains elevated with increasing exposure to night work compared to non-night work.
Background: Crohn’s diseases (CD) and ulcerative colitis (UC) are autoimmune diseases. However, its’ etiology due to environmental risk became more important in occupational epidemiology, particularly for preventive concepts. Hence, we undertook the cohort study to investigate the relationship between toluene exposure and risk of CD and UC. Methods: Exposure assessment data of male workers by biomonitoring examination from January 1, 2000 and December 31, 2004 were merged into morbidity data of National Health Insurance Claim Data until 2005. Risk of admission for CD and UC were calculated by standardized admission rate ratio (SAR). Hippuric acid, the metabolite of toluene, were categorized tertile level. Results: More than 500,000 person-years, there were 46 and 45 cases of CD and UC. Risk of CD is related to exposure to toluene, but risk of UC is not. SARs [95% confidence interval, (95% CI)] of CD were 1.71 (1.16-2.44) and 1.42 (0.81-2.31) in below 10 years and in 10 years or more exposed group. For metabolite exposure assessment, SARs (95% CI) of CD were 1.32 (0.71-2.27) in 1st Tertile exposed group, 1.46 (0.75-2.55) in 2nd Tertile exposed group, 1.96 (1.21-2.99) in 3rd Tertile exposed group compared to that in general workers. Conclusion: Although additional in-depth studies about mechanism will be needed to elucidate causality, our findings highlighted that toluene can be added as one of the environmental risk factors that can cause CD. We also suggest the etiology of CD and UC far different related to toluene exposure.
PESTICIDE EXPOSURE AND RISK OF AGGRESSIVE PROSTATE CANCER AMONG FARMERS.
Larissa Pardo* Larissa Pardo, Laura Beane Freeman, Catherine Lerro, Gabriella Andreotti, Jonathan Hofmann, Christine Parks, Dale Sandler, Jay Lubin, Aaron Blair, Stella Koutros, (National Institutes of Health (NIH)/National Cancer Institute (NCI))

Background: Prostate cancer (PCa) is among the most commonly diagnosed cancers among men in developed countries; however, little is known about modifiable risk factors. Some studies have implicated organochlorine and organophosphate (OP) insecticides as risk factors, particularly the organodithioate class of OPs, and clinically significant PCa subtypes. However, there are few studies that have evaluated other specific active ingredients. Objective: We used data from the Agricultural Health Study, a large prospective cohort of pesticide applicators, to evaluate the association of 39 individual pesticides and aggressive PCa risk. Methods: 20,040 non-cases and 883 cases reported pesticide use at 3-time points between 1993-2010. Cox proportional hazards models, using age as the time scale, were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between ever use of individual pesticides and aggressive PCa. Aggressive PCa was defined as having ≥1 of the following tumor characteristics: distant stage, poorly differentiated grade, Gleason score ≥7, or fatal PCa. All models were adjusted for birth year, state, family history of PCa, race, and smoking status. We also evaluated the impact of prostate-specific antigen (PSA) screening. Results: There was a significant increased risk of aggressive PCa among ever users of the organodithioate insecticide dimethoate (exposed cases n=54, HR=1.37, 95%CI=1.04, 1.80) compared to never users. We also observed elevated associations between aggressive PCa and the herbicides bromoxynil (n= 255, HR=1.17, 95%CI=0.99, 1.37), linuron (n= 141, HR=1.19, 95%CI=0.99, 1.42), and sethoxydim (n= 236, HR=1.12, 95%CI=0.96, 1.30). History of PSA testing was not associated with use of any pesticide. Discussion: Our results support previous findings, suggesting an association between organodithioate insecticides and PCa. Suggestive associations with commonly used herbicides merit further investigation.

S/P indicates work done while a student/postdoc
TOTAL-CAREER TIME DEPLOYED AS A RISK FACTOR FOR DISABILITY DISCHARGE IN ACTIVE DUTY SOLDIERS Theresa N Faller* Theresa N Faller, Tanja C Roy, (United States Army Research Institute of Environmental Medicine)

Background: Disability discharge is a costly and growing problem in the Army. Prior studies have shown a history of deployment reduces risk of overall disability discharge and increases risk of mental health discharge. To our knowledge, few studies have examined total-career time deployed as a risk factor. Methods: A cohort study was conducted among all active duty Soldiers from October 2001 - September 2015 using the Total Army Injury and Health Outcomes Database, a repository of Army medical data. Soldiers with permanent disability discharges were classified by a Physical Evaluation Board. The relationship between disability discharge and deployment history was evaluated with a logistic regression. Among the deployed, Cox proportional hazard models described the effect of total time deployed on time to disability discharge. Results: Of the 1,502,848 Soldiers, 99,476 (6.6%) received a disability discharge and 795,124 (52.9%) had been deployed. Those with a history of deployment had a decreased odds of disability discharge (OR: 0.74 [0.73-0.75]) and an increased odds of a mental health discharge (OR: 1.36 [1.28-1.44]). Among Soldiers with a deployment, those deployed for a total time of 1-2 years (HR: 1.13 [1.10-1.15]) and >2 years (HR: 1.07 [1.04-1.10]) had an increased rate of disability discharge compared to those deployed for 2 years (HR: 0.84 [0.75-0.94]) compared to Soldiers deployed <1 year. Conclusion: Our findings on disability discharge are consistent with previous literature. Among Soldiers with a deployment, more deployment time increased the risk of overall disability discharge. Risk of mental health disability varied by deployment length, possibly due to reduction of susceptible Soldiers over time. Future studies on deployment and disability should consider cumulative time deployed as a risk factor.
CALIFORNIA PUBLIC SAFETY REALIGNMENT AND MORTALITY IN STATE PRISONS AND COUNTY JAILS: AN INTERRUPTED TIME SERIES ANALYSIS Christopher L. Rowe* Christopher L. Rowe, Jennifer Ahern, (University of California, Berkeley; San Francisco Department of Public Health)

In October 2011, Assembly Bill 109 (AB109; California [CA] Public Safety Realignment) initiated major changes to CA’s criminal justice system to relieve overcrowding in state prisons. Among other changes, low-risk offenders were shifted from prisons to county jails. Prison/jail overcrowding is linked to several adverse health outcomes. Although AB109 reduced CA’s prison overcrowding, it also contributed to jail overcrowding in some facilities. No studies have examined the effects of AB109 on mortality among prison or jail inmates. As other states grapple with overcrowded prisons and look to CA’s experience with AB109, it is critical that we understand the policy’s effects on the health of inmates in affected institutions. To evaluate the effect of AB109 on prison and jail mortality, we fit Poisson models to prison/jail mortality and population data 2002-2014. We regressed the monthly number of deaths on the count of months (i.e., linear time trend), an AB109 indicator variable for months since Oct. 2011 (i.e., immediate policy effect), an interaction between month count and the AB109 indicator (i.e., change in slope), and a population offset. CA state monthly mortality and three-knot restricted cubic splines in month count were included if they improved the model fit, assessed using Akaike information criterion. We calculated month-specific rate ratios of the true predicted rate to that predicted in the absence of AB109 and 95% CI's using robust standard errors. We assessed and found no autocorrelation in model residuals using autocorrelation plots. For prisons, estimates suggest a decrease in mortality following AB109, but confidence intervals include the null until 28 months after implementation. For jails, estimates suggest no change in mortality. Results should be interpreted with caution due to limitations of the interrupted time series design (e.g., no comparison group); further investigation incorporating mortality data from other states is needed.
EXPLORING THE RELATIONSHIP BETWEEN FACTORS ASSOCIATED WITH PAIN-RELATED DISABILITY IN PEOPLE WITH PAINFUL TMD: A STRUCTURAL EQUATION MODELING APPROACH

Vanessa Miller*, Vanessa Miller, Ding-Geng Chen, Deborah Barrett, Richard Ohrbach, Gary Slade, (University of North Carolina at Chapel Hill)

Introduction Pain-related disability is a multi-faceted construct that refers to impact on individuals' functioning and that is common among people with chronic temporomandibular disorder (TMD). The purpose of this research was to examine relationships between factors associated with pain-related disability among people with chronic TMD. Methods We analyzed data from a cross-sectional community-based sample of 1088 individuals with chronic TMD. We constructed a model of pain-related disability including an item assessing presenteeism and created measurement models of TMD clinical features (7), psychological distress (4), and experimental pain sensitivity (4). Latent variables were assessed in a full structural equation model based on our conceptual model of pain-related disability. Results Participants (n=1088) were 18-44 years old (mean 29.2, SD + 7.8) with a mean duration of 6.9 (SD +6.4) years of chronic TMD pain. A model of pain-related disability, TMD features, and psychological distress was created and refined based on exploratory model revisions to account for correlation among variables. Estimation of the final model indicated a good fit with the data (RMSEA=0.048, RMSEA 90% CI 0.043,0.053, CFI=0.956, SRMR=0.040). TMD clinical features and psychological distress had a strong relationship with pain-related disability. The final model explained 78% of the variance in pain-related disability. Conclusions Jaw limitation and psychological distress latent variables were shown to have a strong relationship with pain-related disability while experimental pain sensitivity and clinical features such as jaw opening and pain duration were not related to pain-related disability.
THE ASSOCIATIONS AMONG ASTHMA EXACERBATION, OVERWEIGHT, OBESITY, AND FUNCTIONAL LIMITATION IN ADULTS WITH ASTHMA: A REPORT FROM THE NATIONAL HEALTH INTERVIEW SURVEY Zheng Li* Zheng Li, Wei Geng, (Valparaiso University)

Background: Evidence suggests overweight and obesity are associated with worse asthma outcomes. Asthma exacerbation is a risk factor for functional limitation. However, very few studies have investigated the complex associations among asthma exacerbation, overweight, obesity, and functional limitation. Objective: We aimed to examine the effect of asthma exacerbation on functional limitation through the mechanism of overweight and obesity in adults with asthma. Methods: 1,292 subjects from the 2016 National Health Interview Survey were used for analyses. Asthma exacerbation was denoted if individuals answered “yes” to one of the two items measuring occurrence of asthma attack and utilization of emergency room. BMI was used to assess if participants were overweight or obese. Functional limitation was measured by whether participants reported having difficulty walking. Structural equational modeling was performed to quantify the direct and indirect effects of asthma exacerbation on functional limitation through overweight and obesity. Results: Of the study participants, 609 (47.1%) had asthma exacerbation in the past 12 months, 975 (75.5%) were overweight or obese, and 417 (32.3%) had difficulty walking. Multivariate analyses showed participants who had asthma exacerbation and were overweight or obese were more likely to have difficulty walking (all Ps <.05). Mediation analyses suggested asthma exacerbation was directly associated with having difficulty walking (p<.05); however, the effect of asthma exacerbation on functional limitation was indirectly influenced through overweight and obese (p<.05). Approximately 10% of the total variance in the asthma exacerbation-functional limitation association was explained by the indirect effects of overweight and obesity. Conclusion: Asthma exacerbation affects functional limitation through overweight and obesity. Functional limitation can be reduced by interventions targeting asthma-related overweight and obesity.
Experimental data indicate that maternal exposure to factors known to alter inflammatory milieu may be specifically harmful to the conception or survival of male fetuses. Indeed, in a recent clinical trial, preconception administration of low dose aspirin versus placebo restored the skewed sex ratio at birth among women with elevated inflammation, providing direct evidence of this phenomenon in humans. However, it is unknown whether other factors associated with inflammation, such as vitamin D status, are associated with offspring sex ratio at birth. Our objective was thus to evaluate the association of preconception serum 25-hydroxyvitamin D [25(OH)D] levels and male live birth among 1,228 reproductive-age women with a history of 1-2 prior losses who were enrolled in the Effects of Aspirin in Gestation and Reproduction trial between 2007-2011. We estimated RRs and 95% CIs for male live birth according to 25(OH)D sufficiency (≥75 vs. 1.95 ng/mL: RR: 1.41; 95% CI: 0.99, 2.00 versus ≤1.95 ng/mL RR: 1.11; 95% CI: 0.88, 1.41), a marker of systemic low-grade inflammation. Preconception vitamin D status was associated with male live birth, particularly among women with low-grade inflammation. These data suggest that maternal vitamin D sufficiency may mitigate maternal inflammation that would otherwise be detrimental to male fetal survival.
MATERNAL DIABETES BEFORE AND DURING PREGNANCY AND RISK OF PRETERM BIRTH
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Importance: Few studies have reported the effects of pre-pregnancy diabetes and gestational diabetes on preterm birth, and the findings are inconsistent and inconclusive. Objective: To estimate the association of pre-pregnancy diabetes and gestational diabetes with preterm birth. Design: Retrospective cohort study. Setting: Birth data from the National Vital Statistics System (NVSS) 2016-2017. Participants: All mothers in the United States who had a live singleton birth. Exposure: Pre-pregnancy diabetes and gestational diabetes, which were obtained from the hospital medical record. Main outcomes and measures: Preterm birth was defined as gestational age less than 37 weeks. Results: Among the 7,319,280 mothers (mean age: 28.7±5.8 years) who delivered a live birth in 2016-2017, 7.7% had a preterm delivery. After adjustment for maternal age, race/ethnicity, parity, education, smoking during pregnancy, previous history of preterm birth, marital status, infant sex, pre-pregnancy BMI, and use of prenatal care, pre-pregnancy diabetes and gestational diabetes were significantly associated with preterm birth. The adjusted odds ratio of preterm birth was 3.46 (95% CI, 3.39-3.52) in women with pre-pregnancy diabetes and 1.48 (95% CI, 1.47-1.50) in women with gestational diabetes, compared with those without diabetes. Significant associations of pre-pregnancy diabetes and gestational diabetes with preterm birth were observed in all subgroups stratified by age, race/ethnicity, or BMI categories. Conclusions and Relevance: In a nationwide mega cohort in the United States, we observed significant associations of pre-pregnancy diabetes and gestational diabetes with preterm birth.
ASSOCIATIONS BETWEEN PREGNANCY INTENTION AND MATERNAL AND OFFSPRING HEALTH: A 2012-2015 SOUTH CAROLINA PRAMS ANALYSIS Danielle R Stevens*, Danielle R Stevens, Chelsea L Richard, Harley Davis, Kelly Hunt, (Medical University of South Carolina)

Background: Unintended pregnancies encompass approximately 45% of the 6.1 million annual pregnancies in the United States. Despite their prevalence, there is uncertainty around the impact unintended childbearing may have on the health and behavior of the mother and infant. Objective: To examine the association between pregnancy intention and maternal and infant health and behaviors using the South Carolina (SC) Pregnancy Risk Assessment Monitoring (PRAMS) data from 2012-2015. Methods: Unintended pregnancy was defined as responding “I wanted to be pregnant later,” “I didn’t want to be pregnant,” or “I wasn’t sure what I wanted” to the question, “Thinking back to just before you got pregnant with your new baby, how did you feel about becoming pregnant?” A weighted propensity scores model was run to examine the impact of pregnancy intention (unintended versus intended) on postnatal outcomes related to maternal and infant health (postpartum check-up, depression, diabetes, birth control use, Cesarean delivery, neonatal intensive care unit admission, premature birth, low birth weight birth, small-for-gestational-age birth, large-for-gestational-age birth, and breastfeeding initiation) among 3,029 participants in SC PRAMS from 2012-2015. Results: After propensity-scores adjustment for maternal sociodemographics, behaviors, health, and previous births, we found significantly reduced odds of a mother receiving a postpartum check-up (Odds Ratio [OR]: 0.10, 95% Confidence Interval [CI]: 0.04, 0.30), initiating breastfeeding (OR: 0.42, 95% CI: 0.23, 0.78), and delivering via a Cesarean section (OR: 0.40, 95% CI: 0.22, 0.74) among women with unintended versus intended pregnancies. Conclusions: Unintended childbearing results in reductions in key maternal healthy behaviors in the postnatal period. However, unintended pregnancies do not appear to significantly impact perinatal health. Additional research is needed on the long-term infant health outcomes of unintended pregnancies.
CHARACTERIZING TIMING OF DEATH AND SURVIVAL DURING AND AFTER EXTRACORPOREAL MEMBRANE OXYGENATION INTERVENTIONS IN A COHORT OF CRITICALLY ILL CHILDREN Derek K Ng* Derek K Ng, Gideon Loevinsohn, Po-Yang Tsou, Melania Bembea, (Johns Hopkins Bloomberg School of Public Health)

Extracorporeal membrane oxygenation (ECMO) is highly effective in critically ill children, yet the timing of death or survival to discharge, during and after ECMO, has not been well characterized. To address this, we used competing risk survival methods in a cohort of critically ill children who received ECMO between 2008 and 2014. Treating events as competing risks, the cumulative incidence of all events (death or decannulation during ECMO; or in-hospital death or discharge after decannulation) were partitioned as the sum of the two cause-specific cumulative incidences. The primary exposure was duration of ECMO (≥ 5 ECMO-days) overall and stratified by clinical indication, with corresponding subhazard ratios. A total of 155 children received ECMO: 54% were <1 month old. Median ECMO-days was 5 [IQR: 3, 11] and indications were categorized as respiratory (42%), cardiac (33%), cardiopulmonary resuscitation (ECPR) (19%) or sepsis (6%). Overall, the cumulative incidence of death was 36%; 22% died on ECMO, and of those surviving to decannulation (n=121), 18% died in hospital. Nonparametric estimates of death or ECMO decannulation as competing risk events suggested that risk of death was highest during the first 5 days on ECMO (Figure). After decannulation, those with ≥5 ECMO-days had higher incidence of death (24%; Fig.) and higher subhazard (sHR=2.2; 95%CI: 0.9, 5.7). Conditional on survival to decannulation, ≥5 ECMO-days was related to increased risk of death for those with respiratory (sHR=5.2) and cardiac (sHR=2.2) indications but not for ECPR/sepsis (sHR=0.9). The majority of children in this cohort survived to ECMO decannulation, with most deaths occurring soon after ECMO initiation. Overall, and for respiratory and cardiac indications, shorter ECMO courses were related to earlier hospital discharge. Treating the outcomes as competing events before and after ECMO decannulation using nonparametric methods provided a comprehensive description of the joint distributions of outcomes over time.

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ASSOCIATION BETWEEN ADVERSE CHILDHOOD EXPERIENCES (ACES) AND HEADACHES AMONG CHILDREN AGE 3-17 YEARS USING THE NATIONAL SURVEY OF CHILDREN'S HEALTH, 2016. Fahad Mansuri* Fahad Mansuri, Michelle Nash, Chigaf Bakour, Kevin Kip, (University of South Florida)

Background: Undergoing adverse childhood experiences (ACEs) such as physical, emotional, or sexual abuse, parental divorce, parental death, mental illness, or addiction during childhood is associated with many adverse health outcomes in adulthood, including death. A relationship between ACEs and headaches has been found among adults, but few studies have examined the link in children. Methods: The National Survey of Children's Health, 2016 (NSCH) is a nationally representative survey of U.S. children's well-being aimed at recognizing their health needs. Parental-reported data was collected on history of headaches and 9 ACEs (7 traditional ACEs, plus the impact of racial discrimination and family income) for children ages 3-17. We used multivariable logistic regression with survey weighting in SAS 9.4 (Cary, NC) to estimate odds-ratios (ORs) for the relationship between total number of ACEs and headaches adjusted for demographics, anxiety, depression, epilepsy, and brain injury. We further assessed the independent relationship between each ACE and headaches. Results: Our final sample included 43,062 children, with about 50% facing at least one ACE and 7% suffering 4+ ACEs. Overall, the odds of headache history were significantly higher for children with 2, 3 and 4+ ACEs compared to children with no ACE (1 ACE: aOR= 1.22, 95% CI: 0.94-1.58, 2 ACEs: aOR=2.5, 95% CI: 1.7-3.5; 3 ACEs: aOR=1.5, 95% CI: 1.1-2.3; 4+ ACEs: aOR=3.0, 95% CI: 2.2-4.2). Individually, no ACE was independently associated with headache history except for difficulty due to family's income (aOR=2.4, 95% CI: 1.8-3.1) and unfair treatment due to race (aOR=3.4, 95% CI: 1.9-6.2). Conclusions: Experiencing 2+ ACEs (vs none), struggling due to income, and racial discrimination were associated with higher odds of headaches in children. Our findings support results of a longitudinal study on ACEs and headache in young adults and suggests that poor ACE-related outcomes begin earlier than previously studied.

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GRAND-MATERNAL PRE-PREGNANCY BMI, GESTATIONAL WEIGHT GAIN, AND RISK OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND AUTISM SPECTRUM DISORDER IN THE THIRD GENERATION

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Background: Obesity is associated with endocrine alterations, which can induce heritable changes in gene expression without changing DNA structure. Risk of attention deficit hyperactivity disorder (ADHD) and autism spectrum disorders (ASD) is increased in the offspring of obese mothers, yet no study has investigated the association between grand-maternal obesity and grandchild's risks of neurodevelopmental disorders. Objectives: To examine the associations between grandmother pre-pregnancy body mass index (BMI) and gestational weight gain (GWG) and risk of ADHD and ASD in her grandchildren. Methods: Nurses’ Health Study (NHSII) participants (F1) born 1946-1964, and their mothers (F0) (n=35,794) who reported their height and weight before pregnancy with their nurse daughter, and pregnancy weight gain. ASD and ADHD cases were identified according to the nurses’ report of whether they had ever had a child (F2) diagnosed with ASD (2009) or ADHD (2013). Data were analyzed using cluster-weighted generalized estimating equations with a logit link. Results: For ADHD, N=20,595 F0 grandmother-F1 mother pairs had complete data, and for ASD, N=21,358 pairs had complete data. For both outcomes, the prevalence of F0 pre-pregnancy obesity status and GWG was similar (underweight=15%, overweight or obese=7%; 34% of GWGrecommended). Of 46,423 and 48,212 F2 children, 3,694 (7.96%) were diagnosed with ADHD and 985 (2.04%) with ASD. Grand-maternal pre-conceptional underweight and GWG>recommended were associated with an increased risk of ADHD among grandchildren (adjusted odds ratio (aOR) = 1.15 (95% CI, 1.02, 1.30) and 1.25 (95% CI, 1.06, 1.48). No association was observed between F0 pre-pregnancy obesity status or GWG and risk of ASD among the F2 generation.

Conclusions: Maternal prenatal exposure to pre-pregnancy underweight BMI status and excessive GWG is associated with an increased risk of ADHD, but not with ASD.
CHRONIC MEDICAL CONDITIONS AND PERINATAL MENTAL ILLNESS: A POPULATION-BASED COHORT STUDY Hilary Brown*, Hilary Brown, Andrew S. Wilton, Joel Ray, Cindy-Lee Dennis, Astrid Guttmann, Simone Vigod, (University of Toronto)

One in five women experience mental illness in pregnancy or the postpartum period. Universal preventive interventions have not lowered the incidence of perinatal mental illness, possibly because those at highest risk were not targeted. Outside of pregnancy, chronic medical conditions (CMC) have been shown to increase the risk of mental illness. Our objective was to examine the association between CMC and perinatal mental illness. We undertook a population-based cohort study of women with (n=77,385) and without CMC (n=780,619), all of whom had a singleton livebirth in 2005-2015 in Ontario, Canada. Women with a mental illness or addiction diagnosis within 2 years before pregnancy were excluded. Exposure was defined by ≥ 1 emergency department visits or hospitalizations for CMC in the 2 years before pregnancy. Perinatal mental illness was defined by a mental illness or addiction diagnosis documented in a physician visit, emergency department visit, or hospitalization between conception and 365 days postpartum. We used Modified Poisson regression to generate relative risks (aRR) and 95% CI, controlling for age, parity, rural residence, income, and remote history of mental illness. Women with CMC were at increased risk for perinatal mental illness compared to those without CMC (20.4% vs. 15.6%; aRR 1.20, 95% CI 1.18-1.22). Risks were increased for mental illness diagnosed in pregnancy (aRR 1.12, 95% CI 1.10-1.15) and postpartum (aRR 1.25, 95% CI 1.23-1.28). Mood or anxiety disorders (aRR 1.19, 95% CI 1.17-1.21), psychotic disorders (aRR 1.52, 95% CI 1.32-1.75), and substance use disorders (aRR 1.43, 95% CI 1.29-1.60) were more likely in women with than without CMC, but not self-harm (aRR 1.02, 95% CI 0.74-1.41). Women with CMC are at increased risk for perinatal mental illness. They may require targeted preventive efforts initiated before pregnancy to reduce risk as well as screening and other secondary preventive measures in the perinatal period to improve their wellbeing.

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ASSOCIATION OF LUTEAL PHASE DEFICIENCY WITH LIVEBIRTH, PREGNANCY LOSS, AND TIME TO PREGNANCY

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Luteal phase deficiency (LPD) occurs when progesterone from the corpus luteum cannot support early pregnancy. The importance of LPD is debated in part because its clinical manifestations are not well-studied in relation to reproductive outcomes. The length of the luteal phase (LP) of the menstrual cycle may reflect underlying hormonal characteristics of the cycle. We examined associations between LP length, livebirth, pregnancy loss, and fecundability. We analyzed a cohort of women (N=774) enrolled in the Effects of Aspirin on Gestation and Reproduction (EAGeR) Trial who were followed for up to 6 cycles while trying to conceive. LP length in ovulatory cycles was determined with Clearblue fertility monitors (Alere, Waltham, MA) and diaries. We defined LPD as ≤11 days, and long LP as ≥15 days. We considered LP length in the preconception cycle, 2 cycles before conception, and first cycle of the study as exposures. We estimated RR of livebirth and pregnancy loss with log binomial or Poisson regression models and fecundability OR (FOR) with Cox proportional hazard models. Covariates included age, race, BMI, smoking, previous livebirths, and previous pregnancy losses. Mean LP length among all cycles (N=1898) was 13.8±2.2 days and 11% of cycles had LPD. In adjusted analysis, livebirth was not associated with LPD in the preconception cycle (RR LPD vs. normal length 0.88; 95% CI 0.71, 1.09), 2 cycles before conception (RR 1.32; 95% CI 0.80, 2.15), or the first study cycle (RR 0.98; 95% CI 0.76, 1.27). Similarly, pregnancy loss was not associated with LP length. In bivariate analysis, long LP length in the first study cycle was associated with longer time to pregnancy (FOR, long vs. normal length 0.68; 95% CI 0.50, 0.91). The association was attenuated after adjustment (FOR 0.74; 95% CI 0.54, 1.01). LPD in individual cycles before conception was not associated with reproductive outcomes. Sporadic LPD may not be an important determinant of fertility in women.

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THE ASSOCIATIONS BETWEEN MATERNAL, FETAL AND PLACENTAL FACTORS AND MEDICALLY-INDICATED PRETERM AND EARLY TERM DELIVERIES

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Aim: To examine the association between maternal, fetal and placental factors and medically-indicated preterm birth (PTB) and early-term birth (ETB) compared to full-term deliveries. Methods: We studied women from National Institute of Child Health and Human Development Consecutive Pregnancy Study in Utah (2002-2010) with the first liveborn, singleton pregnancy. The outcome was the occurrence of medically-indicated PTB (< 37 weeks of gestation, n=510), medically-indicated ETB (37-38 weeks, n=2,099) or full-term (≥ 39 weeks, n=32,626) deliveries. Maternal factors include pre-existing or gestational diabetes, pre-existing or gestational hypertension, chorioamnionitis, preeclampsia, and other chronic health conditions. Examined fetal factors include oligohydramnios, polyhydramnios, fetal congenital anomalies, and small for gestational age. Placental factors include placental abruption and placenta previa. Adjusted odds ratios (aOR) and their 95% confidence intervals (CI) of PTB and ETB were estimated for maternal, fetal and placental factors using multinomial logistic regression. Full-term deliveries were used as a reference group. Maternal age, race, prepregnancy body mass index, health insurance, marital status and smoking during pregnancy were controlled in the models.

Results: Maternal, fetal and placental factors were associated with increased odds of both PTB and ETB compared to full-term deliveries. Mostly, the magnitude of estimates was higher for PTB compared to ETB, particularly for preeclampsia, fetal congenital abnormalities, placental abruption and placenta previa. However, among maternal chronic health conditions, gestational diabetes was associated with increased odds of ETB (aOR =5.8, 95%CI: 4.9, 6.8) to a larger extent as compared to PTB (aOR =3.3, 95%CI: 2.3-4.7). Conclusion: Risk factors associated with medically-indicated PTB and ETB are heterogeneous. This information may help to identify high-risk groups among those who born preterm or early-term.
DOES SULFADOXINE-PYRIMETHAMINE ANTIMALARIAL TREATMENT FOR PREGNANT MOTHERS INFLUENCE BIRTHWEIGHT VIA NON-MALARIAL MECHANISMS? Michelle Roh*
Michelle Roh, M. Maria Glymour, Stephen Shiboski, Roly Gosling, Anne L'Ianziva, Abel Kakuru, Richard Kajubi, Meghna Desai, Julie Gutman, Feiko O. ter Kuile, Moses R. Kamya, Grant Dorsey, R. Matthew Chico,
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Background: For pregnant women in sub-Saharan Africa, the World Health Organization recommends intermittent preventive treatment (IPTp) with sulfadoxine-pyrimethamine (SP) to improve birth outcomes, an effect assumed to be mediated by preventing malaria in pregnancy. In East Africa, parasite resistance to SP has led researchers to evaluate dihydroartemisinin-piperaquine (DP) as an alternative to SP. Three trials showed DP is markedly more effective at preventing malaria than SP, but not superior at improving birthweight. We hypothesize SP has non-malarial benefits for birthweight, not mediated by malaria prevention. We conducted a mediation analysis to decompose the non-malarial (direct) and antimalarial (indirect) effects of SP versus DP on birthweight (Figure 1). Methods: For 1645 HIV-uninfected women with singleton pregnancies enrolled in one of three East African IPTp trials, treatment was defined as randomized assignment to SP or DP. The mediator was placental malaria at delivery and the outcome was birthweight. We evaluated treatment-mediator interaction and accounted for mediator-outcome confounders (maternal age, education, household wealth, and gravidity). Meta-regression of linear models was used to obtain pooled estimates of the total, direct, and indirect effect. Results: Random assignment to SP (vs. DP) did not significantly increase birthweight (total effect=23 grams (g); 95% CI: -67, 112). The direct, non-malarial effect of SP increased birthweight by 86g [95% CI: 42, 129] relative to DP. In contrast, DP increased birthweight by 64g [95% CI: -24, 152] relative to SP due to its more potent antimalarial properties. Malaria did not modify the direct effect of SP on birthweight (no treatment-mediator interaction). Conclusion: SP has potent, non-malarial effects on birthweight, independent of its antimalarial activity. Future research should evaluate the combination of SP+DP for IPTp to prevent both malarial and non-malarial causes of poor birth outcomes.

Figure 1. Directed acyclic graph depicting the relationship between random assignment, denoted with the subscript Z, to IPTp drug (IPTpZ) and birthweight mediated by malaria infection during pregnancy. C represents the vector of baseline mediator-outcome confounders, including maternal age, education, household wealth, and gravidity. Note: IPTp=intermittent preventive treatment; DP=dihydroartemisinin-piperaquine; SP=sulfadoxine-pyrimethamine.

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HIGHER MATERNAL DIET QUALITY DURING PREGNANCY AND LACTATION IS ASSOCIATED WITH LOWER WEIGHT-FOR-LENGTH, BODY FAT PERCENT AND FAT MASS IN EARLY POSTNATAL LIFE 


Objective: Maternal perinatal nutrition may influence optimal infant growth and reduce lifelong obesity and diabetes. The purpose of this study was to examine associations of maternal diet quality during pregnancy and lactation with infant growth and body composition in early postnatal life. Methods: The Mothers and Infants LinKed for Health (MILK) study is an ongoing prospective cohort of 354 breastfeeding mother-infant dyads who completed the Diet History Questionnaire II in their 3rd trimester of pregnancy and at 1 and 3-months postpartum. Diet quality was assessed using the Healthy Eating Index-2015 (HEI-2015). Infant weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WFL-Z) Z-scores were assessed at birth, 1, 3 and 6 months. Infant body fat percent (BF%), fat mass (FM) and fat-free mass (FFM) were measured at 6-months using dual-energy X-ray absorptiometry. Linear mixed effects and multiple linear regression models were used to examine associations of maternal HEI-2015 total scores with infant growth from birth to 6-months and body composition at 6-months, respectively. Results: A 10-unit higher HEI-2015 score from pregnancy through 3-months postpartum was associated with lower infant WFL-Z from birth to 6-months (β= -0.12, p=0.02). A 10-unit higher HEI-2015 score during pregnancy, 1 and 3-months postpartum was associated with lower infant BF% at 6-months (β= -0.58, p=0.048; β= -1.28, p<0.01; and β= -0.66, p=0.01, respectively). A 10-unit higher HEI-2015 score at 1 and 3-months postpartum was associated with lower infant FM at 6-months (β= -0.13, p=0.001 and β= -0.10, p=0.01, respectively). No associations between maternal perinatal diet quality and infant WAZ, LAZ or FFM were observed. Conclusions: Maternal diet quality during pregnancy and lactation may play a pivotal role in early life programming, growth and fat mass accrual. Additional research is needed to explore the interplay between maternal perinatal diet, infant growth and later disease susceptibility.
Background: Since the U.S. Supreme Court's 1973 Roe v. Wade decision legalizing abortion, states have enacted laws restricting access and availability of abortion services. The main objective of this investigation is to study the relationship between state-level restrictive abortion laws and infant mortality risk. Methods: We used data on 11,972,629 infants and mothers from the U.S. Cohort Linked Birth/Infant Death Data Files 2008-2010. There are five types of restrictive abortion laws-no Medicaid funding, parental involvement laws, mandatory counseling laws, mandatory waiting period laws, and two-visit laws. Multilevel logistic regression was used to determine whether state-level restrictive abortion laws, during year of birth, were risk factors for infant mortality. Laws were tested separately in different multilevel models. The total number of restrictive laws (no laws, 1 or 2 laws, and 3 to 5 laws) were then included in a model. Results: Between 2008 and 2010, there were 71,528 infant deaths resulting in an infant mortality rate of 6.0 deaths/1000 births. The internal consistency of restrictive laws was good (Cronbach's alpha=0.82). In comparison to infants living in states with no restrictive laws, those infants living in states with 1 or 2 restrictive laws (AOR=1.08, 95% CI=0.99,1.18), and those living in states with 3 to 5 restrictive laws, were more likely to experience mortality (AOR=1.10, 95% CI=1.01,1.20). When restrictive laws were investigated separately, only parental involvement laws were significantly associated with infant mortality risk (AOR=1.10, 95% CI=1.01,1.20). Similar findings were obtained when all five restrictive laws were included in the same model. Conclusion: Restricting access to abortion services may increase the risk for infant mortality. With new laws to limit abortion across the US appearing, an opportunity to determine whether these restrictive laws are causally associated with maternal and infant health outcomes may have arrived.
Previous research found that infants who were exposed to high levels of arsenic in utero had an increased risk of infectious disease in the first year of life. It is unclear if this association persists throughout childhood. This prospective study examined the association between repeated arsenic exposures and respiratory, diarrheal, and febrile morbidity in children age 4-5 years. We used data from a cohort of pregnant women recruited in Bangladesh, where chronic arsenic exposure is common from contaminated drinking water, and followed their children until age 5 (n=986). Repeated samples of household drinking water were averaged into pregnancy, toddlerhood, and childhood exposure windows. Mothers were actively surveyed every 2 weeks from age 4-5 years and asked about their children’s symptoms. After exploring collinearity of the repeated exposure and over-dispersion, Poisson regression models were used to estimate the association between arsenic exposure and respiratory, diarrheal, and febrile illness, adjusting for maternal age, education, gravidity, family income, duration of breastfeeding, biomass fuel burning, and tobacco smoke exposure. Birth weight and gestational age were considered mediators and not included in this analysis. Median drinking water arsenic was <10ug/L in all exposure windows. We observed 107 respiratory, 1 diarrheal, and 84 febrile illnesses. The incident rate ratios (IRR) for each unit increase in natural log drinking water arsenic during pregnancy was IRR=0.90 (95% CI: 0.78, 1.03) and IRR=0.93 (95% CI: 0.80, 1.07) for respiratory and febrile illness, respectively. Similar null associations were observed for arsenic exposures measured during pregnancy and toddlerhood. Models for diarrhea incidence did not converge. Drinking water arsenic exposure was not associated with infectious disease risk in children age 4-5 years in Bangladesh. Future research should confirm these findings using biomarkers to minimize exposure misclassification.
EARLY CHILDHOOD ANTIBIOTICS USE AND THE RISK OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: A POPULATION-BASED COHORT STUDY

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Background: Early childhood antibiotic exposure induces changes in infants' gut microbiota composition reportedly associated with the development of Attention-Deficit/Hyperactivity Disorder (ADHD). In this study, we examined the association between antibiotic use in the first year of life and the risk of ADHD. Methods: This was a population-based cohort study utilizing the Manitoba Population Research Data Repository. The cohort included 187,605 children born in Manitoba, Canada between April 1, 1998 and March 31, 2017. Exposure was defined as having filled one or more antibiotic prescriptions during the first year of life. The outcome was ADHD diagnosis identified in hospital abstracts, physician visits or drug dispensations. Risk of developing ADHD was estimated using Cox proportional hazards regression models in a high dimensional propensity scores-matched cohort and a sibling cohort. Results: A total of 69,738 children were included in the matched-cohort. During follow-up, 6087 (8.7%) children received an ADHD diagnosis. ADHD risk was not found to be associated with antibiotic exposure in early life (HR 1.02, 95% CI 0.97-1.08). In secondary analyses, an association was observed in those receiving three or more antibiotic courses or for a duration longer than three weeks (HR 1.57, 95% CI 1.23-2.00 and HR 1.38, 95% CI 1.17-1.64, respectively). In the sibling cohort of 67,671 children, antibiotic exposure was not associated with the risk of ADHD (HR 0.96, 95% CI 0.89 - 1.03). No association was observed in any of the secondary analyses. Conclusions: Antibiotic use in the first year of life does not appear to pose an ADHD risk on a population level.
COMPARATIVE SAFETY OF CHRONIC MACROLIDE MONOTHERAPY AND INHALED CORTICOSTEROIDS IN MEDICARE PATIENTS WITH BRONCHIECTASIS

Emily Henkle*, Emily Henkle, Benjamin Chan, Jeffrey R. Curtis, Timothy R. Aksamit, Charles Daley, David E. Griffith, Kevin L. Winthrop, (OHSU-PSU School of Public Health)

Introduction: Bronchiectasis is an increasingly common and complex airway disease. We evaluated secondary safety outcomes in a comparative effectiveness study of chronic inhaled corticosteroids (ICS) and macrolide monotherapy (macrolide) in U.S. Medicare patients with bronchiectasis. Methods: We conducted a retrospective cohort study using Medicare Parts A, B, and D (but not C) 2006-2014 datasets. Among those with a pulmonologist-associated bronchiectasis claim (ICD-9-CM 494.0 or 494.1), without cystic fibrosis, we identified chronic new-users of either ICS or macrolides. Exposure was defined as time from the first >28-day prescription to 30 days post-prescription end. For each drug exposure group, we calculated crude incidence rates of the secondary safety outcomes: arrhythmia, myocardial infarction (MI), sensorineural hearing loss, hip fracture, and opportunistic infections. We calculated a propensity score (PS) for ICS use that included demographic, clinical, and utilization characteristics and compared risks of each outcome using Cox regression models adjusted by PS decile, oral steroid use, and nontuberculous mycobacteria (NTM) history. Results: Of 285,043 Medicare patients with bronchiectasis, we identified 83,589 (29%) ICS and 6,500 (2%) macrolide new-users. Although patient baseline characteristics differed, key covariates were balanced across exposure groups within decile, except for NTM history. MI, hip fracture, and opportunistic infection were not significantly different between exposure groups. ICS use was associated with an increased risk of arrhythmia (adjusted HR 1.15, 95% CI 1.06-1.25), and a decreased risk of sensorineural hearing loss (aHR 0.73, 95% CI 0.64-0.82) compared to macrolide use. Conclusions: Chronic macrolide use was not associated with an increased risk of MI or arrhythmia compared to ICS use. The increased risk of hearing loss in macrolide users compared to ICS users in older bronchiectasis patients should be balanced against known benefits of macrolides.

Figure: Forest plot of unadjusted and adjusted hazard ratios of secondary safety outcomes, comparing new users of inhaled corticosteroids and macrolide monotherapy for bronchiectasis

*Adjusted hazard ratio (HR) included propensity score decile, oral corticosteroid dose category, and NTM history.
SELECTIVE SEROTONIN REUPTAKE INHIBITORS AND TYPE 2 DIABETES IN ADOLESCENTS AND YOUTHS

Jenny Sun, Jenny Sun, Brian Bateman, Sonia Hernández-Díaz, Sebastien Haneuse, Florence Bourgeois, Krista Huybrechts, (Harvard T.H. Chan School of Public Health)

Background: There is recent evidence suggesting that antidepressant use increases the risk of type 2 diabetes in adolescents and youths. However, selective serotonin reuptake inhibitors (SSRIs), the most widely used antidepressants in this age group, have minimal metabolic side effects questioning the biological plausibility of this finding. Objective: To examine the potential association between SSRIs and the development of T2DM in adolescents and youths. Methods: Using nationwide claims data from the Medicaid Analytic eXtract (2000-2014), we identified a cohort of patients (age 10-24 years) with a medical diagnosis for an SSRI treatment indication. New users of SSRIs were compared to new users of bupropion, an antidepressant without metabolic side effects. Additionally, to inform within-class treatment choices, we compared individual drugs within the SSRI class, using fluoxetine as the reference. Cox proportional hazards regression was used to estimate the association between SSRIs and type 2 diabetes, using propensity score stratification to control for potential confounding. Results: Patients who initiated SSRIs (n=365,798) were more likely to be female and had fewer co-occurring psychiatric conditions and prescriptions compared to bupropion initiators (n=39,933). During a mean follow up of 2.8 years, the incidence rate of type 2 diabetes was 2.8 and 2.9 cases per 1,000 person-years, respectively, among SSRI and bupropion initiators (crude HR=0.96, 95% CI: 0.85-1.08). The finding remained null after adjustment (adjusted HR=1.00; 95% CI: 0.88-1.13). Compared to bupropion, there was no association between initiating fluoxetine and type 2 diabetes (adjusted HR=1.02, 95% CI: 0.88-1.19). In the within-class comparison vs. fluoxetine, none of the hazard ratios were significantly increased. Conclusion: In a large nationwide cohort of publicly-insured adolescents and youths, we found no evidence of an association between initiation of SSRIs and the onset of type 2 diabetes.

Figure 1. Hazard ratios for the onset of type 2 diabetes among adolescents and youths who initiated SSRIs

<table>
<thead>
<tr>
<th>Exposure Group</th>
<th>No. of patients</th>
<th>No. of events</th>
<th>Person-years (PY)</th>
<th>Crude rate per 1,000 PY</th>
<th>Adjusted HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between-class comparison</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any SSRI</td>
<td>365,798</td>
<td>2,366</td>
<td>844,240</td>
<td>2.8</td>
<td>1.00 (0.88-1.13)</td>
</tr>
<tr>
<td>Citalopram</td>
<td>53,627</td>
<td>350</td>
<td>110,412</td>
<td>3.2</td>
<td>1.15 (0.97-1.37)</td>
</tr>
<tr>
<td>Escitalopram</td>
<td>45,936</td>
<td>329</td>
<td>105,605</td>
<td>3.1</td>
<td>1.01 (0.85-1.20)</td>
</tr>
<tr>
<td>Fluoxetine</td>
<td>90,735</td>
<td>591</td>
<td>209,012</td>
<td>2.8</td>
<td>1.02 (0.88-1.19)</td>
</tr>
<tr>
<td>Fluvoxamine</td>
<td>1,604</td>
<td>13</td>
<td>5,023</td>
<td>2.6</td>
<td>0.82 (0.44-1.53)</td>
</tr>
<tr>
<td>Paroxetine</td>
<td>37,200</td>
<td>226</td>
<td>94,393</td>
<td>2.4</td>
<td>0.91 (0.75-1.12)</td>
</tr>
<tr>
<td>Sertraline</td>
<td>106,732</td>
<td>683</td>
<td>256,973</td>
<td>2.7</td>
<td>0.92 (0.80-1.06)</td>
</tr>
<tr>
<td>Bupropion</td>
<td>39,933</td>
<td>300</td>
<td>103,254</td>
<td>2.9</td>
<td>reference</td>
</tr>
<tr>
<td><strong>Within-class comparison</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citalopram</td>
<td>53,627</td>
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</tbody>
</table>

S/P indicates work done while a student/postdoc
Background In Denmark, the HPV vaccine program has been threatened by reports of severe adverse events following immunization (AEFI's). Current scientific literature has however found the HPV vaccine to be safe and no alternative explanation for the symptoms experienced has been established. Mononucleosis/Epstein Barr Virus (EBV) infection is well known to be associated with long lasting fatigue/Chronic Fatigue Syndrome, which include symptoms similar to the reported AEFI's after HPV vaccination. Thus, the aim of the present study is to investigate whether the suspected severe AEFI's after HPV vaccination could in part be caused by EBV infection. Methods The study will be designed as a nationwide register based matched case-control study. Cases will be defined as girls who have had the HPV vaccine in the period from 2011 to 2017 and have been referred to a specialized hospital setting for girls with suspected HPV vaccine AEFI's before 31.12 2017. For each case, five controls will be selected among all HPV vaccinated girls and matched on number of HPV vaccinations, age and year of first HPV vaccination. HPV vaccinated girls will be identified in the Danish Vaccination Register Exposure: Information on EBV will be obtained from the Danish Microbiology Database. A positive test for EBV infection will be assessed for several different time periods. 1) Any EBV infection from 2010 until referral to an HPV center. 2) Any EBV infection from 2010 until date of first HPV vaccination. 3) Any recent/acute EBV infection around time of HPV vaccination (1 year before the first HPV vaccination to 1 year after the last HPV vaccination). Statistical analyses Conditional logistic regression will be used to calculate OR’s (95% CI) for a positive test for EBV and referral to an HPV center for each of the defined exposure time periods adjusting for potential confounders.
THE ASSOCIATION BETWEEN TELMISARTAN AND RISK OF CANCER AMONG NEW ANGIOTENSIN II RECEPTOR BLOCKERS: RETROSPECTIVE COHORT STUDY Sungji Moon*
Sungji Moon, Sue K. Park, (Department of preventive medicine, Seoul National College of Medicine)

Backgrounds: The effect of Angiotensin II receptor blockers (ARBs) on the risk of cancer is inconsistent. But the effect of ARBs may be different by its subtype. Among the subtypes, telmisartan is more associated with peroxisome proliferator-activated receptor gamma than other ARBs, which can inhibit the cancer risk. Therefore, we investigated the association of use of Telmisartan and risk of cancer comparing with other ARBs.

Methods: The retrospective cohort study was done by using Korean National Health Insurance Services database which includes total of 514,866 subjects among 40-79 years old who were randomly selected for 10% among those who took the national health screening between 2002-2003 and were followed up through 2013. The new hypertension patients were selected, and restricted to the new ARB users. The cohort entry was defined by the date of start of ARBs, and the subjects were followed up until diagnosis of any cancer, any cause of death, and final study date. Propensity score matching was conducted between telmisartan users and other ARB users in a 1:1 ratio with the variables including potential confounders. The exposure of drug and diagnosis of cancer were defined by claims code based on international standard code respectively. The Cox regression model was analyzed to calculate hazard ratios (HRs) with 95% CIs of telmisartan on risk of cancer comparing other ARBs.

Results: Final matched subjects included 5206 Telmisartan and 5206 other ARB users. The telmisartan users indicated lower incidence rates of any cancer overall, compared with other ARBs (8.07 vs 9.35 per 1,000 person-years). In Cox regression analysis, telmisartan shows lower hazard, compared with other ARBs with statistical insignificance (HR: 0.90, 95% CI: 0.76-1.06).

Conclusion: The use of telmisartan was not statistically associated with the risk of cancer, with lower hazard compared with other ARBs.
INTAKES OF FIBER AND PHYTOESTROGENS AND RISK OF EARLY NATURAL MENOPAUSE
Alexandra Purdue-Smithe* Alexandra C Purdue-Smithe, Brian W. Whitcomb, Susan E. Hankinson, JoAnn E. Manson, Bernard A. Rosner, Elizabeth R. Bertone-Johnson, (Eunice Kennedy Shriver National Institute of Child Health and Human Development)

Early natural menopause, the cessation of ovarian function before age 45, affects roughly 10% of women in Western populations and is associated with increased risk of adverse health outcomes. Findings of prior studies suggest that dietary fiber and phytoestrogens may be related to levels of circulating reproductive hormones and ovarian aging biomarkers, such as follicle stimulating hormone and anti-Mullerian hormone. Although these data imply a potential role of fiber and phytoestrogens on ovarian function and reproductive lifespan, no prior studies have specifically evaluated how intakes of fiber and phytoestrogens may be associated with risk of early menopause. We therefore evaluated this question in the prospective Nurses’ Health Study II among women who were premenopausal at the start of follow-up in 1991. Food-frequency questionnaires administered every 4 years were used to assess usual dietary intake over 20 years, during which 2,041 women experienced early menopause. In Cox proportional hazards models adjusted for age, smoking, body mass index, and other factors, the hazard ratio for cumulative average total fiber intake in quintile 5 versus quintile 1 was 0.88 (95% confidence interval (CI)= 0.77-1.01; P-trend = 0.27). In models considering specific fiber sources, high (quintile 5) versus low (quintile 1) intake of cereal fiber was associated with 17% (95%CI= 0.72-0.95; P-trend = 0.04) lower risk of early menopause, whereas other fiber sources were not associated with risk. Intakes of total phytoestrogens, genistein, and daidzein were also not associated with early menopause, though intake levels in the population were low overall. Our findings suggest that cereal fiber may represent a modifiable risk factor associated with modestly lower risk of early menopause among premenopausal women, although the findings should be replicated in future studies.
MULTIPLE GESTATIONS MEDIATE THE EFFECT OF IN VITRO FERTILIZATION ON ISCHEMIC PLACENTAL DISEASE

Anna M. Modest, Anna M. Modest, Louisa H. Smith, Thomas L. Toth, Brett C. Young, Michele R. Hacker, (Department of Obstetrics and Gynecology, Beth Israel Deaconess Medical Center; Department of Obstetrics, Gynecology, and Reproductive Biology, Harvard Medical School)

Background: Ischemic placental disease (IPD) affects 16-23% of pregnancies in the United States. In vitro fertilization (IVF) is a risk factor for IPD, and the magnitude of the increase in risk is for women using donor oocytes (donor IVF) vs. their own oocytes (autologous IVF). In addition, multiple gestations, which are more common in IVF than non-IVF pregnancies, also are a risk factor for IPD. Objective: To determine the role of multiple gestations in the association between IVF and IPD. Methods: We identified deliveries at a tertiary hospital from January 1, 2000 to August 1, 2018 and IVF cycles from an affiliated IVF center using electronic medical records and state vital statistics data. IPD was defined as preeclampsia, placental abruption, small for gestational age (SGA), or an intrauterine fetal demise due to placental insufficiency. We used mediation analysis to decompose the total effect of IVF vs. non-IVF pregnancies on IPD into a direct effect and an indirect effect through multiple gestations. We repeated the analyses separately for donor and autologous IVF. All models were adjusted for maternal age, race, parity, insurance, and year of delivery. Results: Among the 86,514 deliveries, 281 resulted from donor IVF and 4,173 resulted from autologous IVF. IVF pregnancies had 2.1 times the risk of IPD compared to non-IVF pregnancies (95% CI 2.0-2.2) and 78% of this increased risk was mediated by multiple gestations. Autologous IVF pregnancies also had 2.1 times the risk of IPD compared to non-IVF pregnancies (95% CI 1.9-2.2) and the percentage mediated was 81%. Donor IVF pregnancies had 2.6 times the risk of IPD (95% CI 2.2-3.0) but the percentage mediated was 40%. Conclusion: The majority of the association between autologous IVF and IPD is mediated through multiple gestations; however, this is not the case in donor IVF pregnancies. This difference may highlight different mechanisms for the increased risk of IPD in donor and autologous pregnancies.

Multiple gestations mediate the effect of in vitro fertilization on ischemic placental disease

Analyses adjusted for maternal age, race, insurance type, parity, and delivery year

S/P indicates work done while a student/postdoc
ASSOCIATIONS OF DEPRESSION, DEPRESSIVE SYMPTOMS, AND PSYCHOTROPIC MEDICATION USE WITH FECUNDABILITY AMONG MEN Craig McKinnon* Craig McKinnon, Elizabeth E. Hatch, Kenneth J. Rothman, Michael L. Eisenberg, Yael I. Nillni, Lauren A. Wise, (Boston University School of Public Health)

Some studies have associated depression and psychotropic medication (PM) use with fertility in females but there are few studies in males. We examined the associations of depression and PM use with fecundability among men in a North American preconception cohort study (2013-2018). Men aged ≥21 years completed a baseline questionnaire with questions on history of physician-diagnosed depression, PM use, and the Major Depression Index (MDI). Pregnancy status was updated via bimonthly female follow-up questionnaires until pregnancy or up to 12 months. Analyses were restricted to 1,743 couples attempting conception for ≤6 cycles at entry. We used proportional probabilities models to estimate fecundability ratios (FR) and 95% CIs, adjusting for the following: age and education (both partners), race/ethnicity, physical activity, alcohol, BMI, smoking, and parity. 10.6% of men reported a history of diagnosed depression; 7.9% were current and 6.8% were past PM users. At baseline, 90.3%, 5.0%, 2.4% and 2.4% were classified as having low (MDI<20), mild (MDI=20-24), moderate (MDI=25-29) and severe (MDI≥30) depressive symptoms, respectively. The FR (95% CI) for history of diagnosed depression (yes vs. no) was 0.91 (0.75-1.10). The FR for PM use (current vs. never) was 0.91 (0.69-1.19). FRs for MDI categories of mild, moderate, and severe depressive symptoms were 0.93 (0.67-1.27), 0.89 (0.55-1.43), and 0.85 (0.55-1.31) relative to low symptoms. Fecundability was 38% lower among current PM users with MDI ≥25 compared with non-users of PM with MDI<25, FR of 0.62 (0.27-1.41). FRs for the intermediate joint exposure categories were 0.98 (current PM users with MDI<25) and 0.99 (non-users of PM with MDI≥25). History of diagnosed depression, severe depressive symptoms, and current PM use in men were weakly associated with reduced fecundability. An inverse association was seen for current PM users with moderate or severe depressive symptoms, but the effect estimate was imprecise.
MODERN CONTRACEPTIVES USE AND ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN BURUNDI: ANALYSIS OF DEMOGRAPHIC AND HEALTH SURVEY DATA, 2016 – 2017
Edouard Nkunzimana* Edouard Nkunzimana, Muawiyyah Babale Sufiyan, Abiodun Egwenu, (Department of Community Medicine, Ahmadu Bello University, Zaria)

Background: Burundi is the ninth country globally with highest growth rate (3.2%) and fertility rate of 5.5 children per woman in 2017. This probably suggests low uptake of modern contraceptive methods (MCM) in the country. The aim of this analysis was to investigate factors associated with MCM use among women of reproductive age in Burundi. Methods: Cross sectional secondary data for non – pregnant women aged 15 – 49 years was extracted from the Burundi Demographic and Health Survey 2016 – 2017. We analyzed the data for frequencies, proportions and odds ratio. Logistic regression was conducted to assess independent factors influencing MCM use among the women. Results: Of the 9945 women, 2372 (23.85%) were using MCM. Ngozi province had the highest prevalence [284 (41.10%)]. The most used method was injectables [1146 (48.31%)]. As age increased, the odds of using MCM significantly reduced; from 30 – 34 years [adjusted Odds Ratio (aOR) = 0.58, 95% CI (0.42 – 0.81)], till ages 45 – 49 years [aOR = 0.18, 95% (0.12 – 0.26)] compared with those of 15 – 19 years. Women who were married (aOR = 3.13, 95% CI [2.67 – 3.68]) used MCM more compared with those not married. Muslims (aOR = 1.53, 95% [1.22 – 1.91]) and Jehovah witnesses (aOR = 3.20, 95% CI [1.56 – 6.54]) were also more likely to be MCM users compared with Catholics. Conclusion: The prevalence of MCM remains low among women of reproductive age in Burundi, with injectables being the commonest method used. Age, marital status and religion were found to be strong predictors of MCM use. Deploying family planning information tools to enhance the access of women 30 years and above to family planning services and engaging religious leaders as advocates is recommended. Key words: Contraceptive use, women, Reproductive age, Burundi
URINARY OXIDATIVE STRESS LEVELS AND REPRODUCTIVE OUTCOMES AMONG WOMEN UNDERGOING FERTILITY TREATMENTS Emma M. Rosen* Emma M. Rosen, Lidia Mínguez-Alarcón, John D. Meeker, Ginger L. Milne, Russ Hauser, Kelly K. Ferguson, (1. Epidemiology Branch, National Institute of Environmental Health Sciences, National Institutes of Health, Research Triangle Park, NC, USA)

Background: Oxidative stress may contribute to adverse fertility outcomes in women and represents a potentially modifiable pathway. Methods: This analysis includes 481 women contributing 1001 cycles [n=575 intrauterine insemination (IUI) and n=426 in vitro fertilization (IVF) who enrolled in the Environment and Reproductive Health (EARTH), an ongoing prospective cohort study that enrolled women undergoing fertility treatments from 2004 onward. Urine samples were collected at each treatment cycle and analyzed for 2 oxidative stress [8-isoprostane-PGF2a (8-isoo-PGF2a) and 8-isoprostane-PGF2a metabolite (F2-isoP-M)] and 1 inflammation [prostaglandin-F2a (PGF2a)] marker. Endpoints of interest included fertilization proportion for IVF (oocytes fertilized/mature oocytes retrieved), and proportion of cycles leading to implantation, clinical pregnancy, and live birth for IVF and IUI. Adjusted generalized linear mixed models were used to analyze associations between tertiles of oxidative stress and each outcome. Results: Overall, levels of F2-isoP-M in the 2nd tertile were associated with the most successful outcomes among women undergoing IVF as well as IUI, while the 3rd tertile was associated with the lowest success. Among IVF cycles, the adjusted mean percent of cycles leading to live birth was 38% (95% CI: 29%, 48%) for females in the upper tertile of F2-isoP-M as compared to 60% (95% CI: 50%, 68%) for those in the middle tertile. Similarly, among IUI cycles, the adjusted mean percent of cycles leading to live birth was 12% (95% CI: 7%, 19%) for females in the upper tertile of F2-isoP-M as compared to 24% (95% CI: 16%, 34%) for those in the middle tertile. No significant associations were found for other measured outcomes with 8-iso-PGF2a or PGF2a. Conclusions: In this population of women undergoing fertility treatments, there appears to be an inverse U-shaped relationship between urinary oxidative stress levels and reproductive success.
DEPOT MEDROXYPROGESTERONE ACETATE CONTRACEPTIVE USE AND BLOOD LEAD CONCENTRATIONS Kristen Upson* Kristen Upson, Quaker E. Harmon, Ganesa Wegienka, Lauren A. Wise, Erik J. Tokar, Donna D. Baird, (Department of Epidemiology and Biostatistics, College of Human Medicine, Michigan State University)

Depot medroxyprogesterone acetate (DMPA) is a highly effective injectable contraceptive commonly used in the United States. The suppression of gonadotropins by DMPA produces a hypoestrogenic state that has been associated with a decrease in bone mineral density. Bone is the primary storage site for the toxic metal lead; increased bone resorption results in the release of bone lead to blood. To our knowledge, only one small study of 174 adolescent clinic patients has examined the association between current DMPA use and blood lead concentrations. We examined this relationship using enrollment data from the Study of Environment, Lifestyle & Fibroids (SELF), a cohort of 1693 African American women ages 23-35 years. Blood lead concentrations were measured in whole blood samples from 1548 participants (91% of the cohort) and data on DMPA use was collected by computer-adaptive telephone interview and questionnaire. We estimated the percent difference in blood lead concentrations and 95% CI between current DMPA users and non-users using linear regression, adjusting for age, education, smoking, alcohol consumption, and recent birth/current lactation. At enrollment, 7% of participants (n=102) reported current DMPA use and the median blood lead concentration was 0.66 µg/dl (interquartile range: 0.49-0.92). Current users of DMPA at enrollment had blood lead concentrations that were 18% higher than non-users (95% CI: 8, 29). We observed a similar association when we restricted the comparison group of non-users to those not using hormonal contraception (16% higher, 95% CI: 5, 27) and when we restricted the study population to never smokers (20% higher, 95% CI: 8, 33). Our results indicate that current DMPA use is associated with increased blood lead concentrations. Given the common use of DMPA among reproductive-age women and the potential health effects of blood lead concentrations, our observation warrants further investigation.
Background: Short sleep duration is associated with adverse pregnancy outcomes in women and poor semen quality in men. Yet little is known about women's preconception sleep and fecundity. Short sleep duration also has established links with stress and inflammation. We hypothesized that women with shorter sleep duration would have longer time to pregnancy (TTP), a measure of couple fecundity. Methods: We examined self-reported sleep duration in the three months prior to pregnancy and TTP among the first 1000 participants in the New York University Children's Health and Environment Study birth cohort. Associations of health and demographic variables with sleep duration were assessed in bivariate analysis. Associations between sleep duration and TTP were assessed via Cox proportional hazards models. Results: Sleep duration was normally distributed among 460 participants with both valid sleep and TTP data, with a mean (SD) of 8.20 (1.36) hours. Women who were Hispanic, were single/divorced, or had ≤ high-school education had longer average sleep than others. Women who were older, consumed alcohol, or had body mass index (BMI) ≥ 35 kg/m2 had shorter sleep. A prediction model including variables statistically significantly associated with sleep duration accounted for 15% of the variance in the data. Sleep duration was not associated with TTP (FOR 1.01; 95% CI 0.94, 1.08). Results were unaffected when we adjusted for covariates, restricted to women with TTP ≤ 12 months, or excluded those who became pregnant while using birth control (assigned TTP=1 month). Conclusions: Demographic factors, BMI, and alcohol consumption do predict sleep duration; however, we did not find an association between preconception sleep duration and TTP. Our study was limited by lack of information on important potential confounders (e.g., physical activity and stress) and reliance on self-reported data. Future studies would benefit from prospective TTP data collection and objective sleep measurement.
ASSOCIATION OF FECUNDABILITY RISK FACTORS WITH MOTHER'S AGE AT PARTICIPANT'S BIRTH IN A NORTH AMERICAN STUDY OF PREGNANCY PLANNERS Olga Basso* Olga Basso, Elizabeth E Hatch, Sydney K Willis, Ellen M Mikkelsen, Kenneth J Rothman, Lauren A Wise, (McGill University)

Background. In Western nations, average childbearing age continues to increase. The extent to which parental age influences offspring health is understudied. While some studies indicate lower fertility among daughters of older mothers, no study has examined fecundability prospectively. Results of prospective time-to-pregnancy (TTP) studies may be biased if attempt time at study entry (and thus fecundability) is differential by exposure. We evaluated the evidence for such “planning bias” by mother’s age at the participant’s birth (maternal age) in a cohort of pregnancy planners. Methods. We examined baseline characteristics, including reproductive history and attempt time at entry, by maternal age in Pregnancy Study Online (PRESTO), an ongoing prospective preconception cohort study. Results. Of 4531 eligible women enrolled from 3/2016 through 12/2018, 4504 had complete data on maternal age. 7%, 26%, 35%, 24%, and 8% were born to mothers aged 20-24, 25-29, 30-34, 35+, and S/P respectively. The proportion of women who tried to conceive before pregnancy planning, sought medical help, or had a longer TTP for pregnancy planning (planners) is shown in the figure.
Hirsutism, the presence of excess coarse terminal hairs in a male pattern distribution, may be a marker of pathologic androgen excess. Androgen excess and menstrual irregularity are clinical features of polycystic ovary syndrome (PCOS), a common cause of ovulation disorders and ovulatory infertility. To our knowledge, no prior studies have evaluated whether hirsutism is associated with fecundability. We used the modified Ferriman-Gallwey (mFG) scoring system to quantify hirsutism, defined by a score of ≥8. The mFG requires women to rate their body hair quantity in 9 different locations, from which we calculated a composite mFG score. We evaluated the association between the mFG and fecundability in Pregnancy Study Online (PRESTO), a prospective North American preconception cohort. Eligible women (n=3,348) were aged 21-45, living in the United States or Canada, not using fertility treatments, and attempting pregnancy for ≤6 months at study entry. Women completed a self-administered baseline questionnaire on socio-demographics, lifestyle, anthropometrics, reproductive and medical history, and the 9-item mFG. Women completed bimonthly questionnaires to update pregnancy status over time. We used proportional probabilities regression models to estimate fecundability ratios (FR) and 95% CIs adjusted for age, body mass index, lifestyle factors, and medical history. The median mFG score was 3 (IQR: 1-6), with 18% of participants reporting mFG scores ≥8. Overall, relative to mFG scores <8, the FR for scores ≥8 was 0.96 (CI: 0.85-1.08). When stratified by cycle regularity, relative to mFG scores <8, FRs for scores ≥8 were 1.03 (CI: 0.87-1.21) among regular cyclers and 0.73 (CI: 0.51-1.04) among irregular cyclers. Results were similar when restricting to non-Hispanic whites and slightly attenuated among women without a PCOS diagnosis. In a prospective study of pregnancy planners, self-reported mFG scores ≥8 were associated with reduced fecundability among irregular cyclers.
THE ROLE OF LINOLEIC ACID IN ASTHMA AND INFLAMMATORY MARKERS: A MENDELIAN RANDOMIZATION STUDY

Jie V Zhao* Jie V Zhao, C Mary Schooling, (The University of Hong Kong)

Background: Asthma is a common respiratory disease, possibly caused by auto-immunity. Linoleic acid (LA), the main n-6 polyunsaturated fatty acid from widely used vegetable oils, is thought to suppress immune responses which might have benefits for asthma. However, this question has not been examined in randomized controlled trials. To obtain unconfounded estimates, we assessed how genetically predicted LA affected asthma using two-sample Mendelian randomization. We also examined its role in white blood cell traits (eosinophil, neutrophil and low monocyte counts) recently identified as potential causal factors in asthma.

Methods: We used 167 genome-wide significant genetic variants to predict LA, and applied them to a large genetic case-control study of asthma (10,365 cases, 16,110 controls), to the UK Biobank (n=408,961 of European ancestry) for asthma (26,332 cases), and also applied to the UK Biobank for white blood cell traits. We also repeated the analysis using 47 functionally relevant genetic variants and 3 genetic variants with top significance.

Results: Genetically predicted LA was associated with lower risk of asthma (odds ratio (OR) 0.97 per % increase of LA in total fatty acids, 95% confidence interval (CI) 0.96 to 0.98), lower eosinophil count (-0.010 standard deviation (SD), -0.012 to -0.008) and higher monocyte count (0.006 SD, 0.003 to 0.009). These estimates were robust to different selections of genetic variants, sensitivity analyses and source of genetic associations with asthma.

Conclusions: LA might protect against asthma and possibly via white blood cell traits, with relevance to identification of effective new interventions for asthma.

S/P indicates work done while a student/postdoc
EDUCATIONAL GRADIENTS IN STROKE-RELATED MEMORY DECLINE Chloe W. Eng* Chloe W. Eng, Anusha M. Vable, Elizabeth R. Mayeda, M. Maria Glymour, (UCSF)

Introduction: Education predicts lower dementia risk in general populations and after stroke. However, it is unknown to what extent education may buffer against stroke-related cognitive decline. Methods: Health and Retirement Study participants who were stroke-free at enrollment and experienced incident stroke (n=1,830; separated as survivors or decedents) during up to 18 years of follow-up self-reported education level (less than high school [HS]; HS/GED; college degree or greater) at enrollment. Short-term decline in a composite memory score (normalized to full baseline sample) at time of stroke and annual rate of memory decline pre- and post-stroke were compared by education level using demographic-adjusted linear mixed models. Results: Overall, survivors with less than HS averaged annual pre-stroke decline of -0.12 points (95% CI: -0.13, -0.12); decline was slower for those with more education (HS/GED β=-0.09, 95% CI: -0.09, -0.08; College β=-0.05, 95% CI: -0.08, -0.06). There were no educational differences in pre-stroke decline for decedents (p=0.64). Survivors with less than HS experienced an average decrement in memory at the time of stroke of -0.44 points (95% CI: -0.52, -0.36); survivors who completed HS/GED (β=-0.39; 95% CI: -0.44, -0.34) or college (β=-0.29 points; 95% CI: -0.39, -0.21) experienced smaller decrements. After stroke, survivors with less than HS averaged annual decline of -0.09 (95% CI: -0.11, -0.08). Survivors with HS/GED had slightly faster post-stroke memory decline (β=-0.10; 95% -0.11, -0.10) points per year as did college graduates (β=-0.11; 95% CI: -0.13, -0.10). Conclusion: Survivors with more education experienced slower memory decline in years prior to stroke diagnosis, but no protective effect was observed in decedents. More education in survivors also predicted smaller declines at the time of stroke, but post-stroke declines were slightly accelerated with higher education in the years following.
CHILDHOOD SOCIOECONOMIC STATUS AND EXECUTIVE FUNCTIONING IN YOUNG ADULTHOOD: EVALUATING THE ROLE OF POSTSECONDARY EDUCATION  Erin Delker* Erin Delker, Estela Blanco, Patricia East, Raquel Burrows, Paulina Correa, Betsy Lozoff, Sheila Gahagan, (Joint Doctoral Program Epidemiology, SDSU / UCSD)

Background: Previous studies show low socioeconomic position (SEP) in childhood is associated with lower cognitive functioning across the life course. Our study examined the extent to which attainment of postsecondary education mediates the effect of low childhood SEP on adulthood executive functioning. Methods: Participants were 721 young adults from Santiago, Chile studied from 6m to 21y. Childhood SEP was measured as a sum of maternal and paternal years of education. Executive functioning was assessed at 21y by the Trail Making Test Part B (Trails B). We used mediation analyses to estimate the total effect (TE) of childhood SEP on Trails B score and decomposed the effect into the controlled direct effect (CDE) and the natural indirect effect (NIE) through one mediator, postsecondary education. Postsecondary education was defined as any schooling after high school. We conducted a sensitivity analysis using the Graffar index as an alternate measure of SEP. Results: Participants were 55% male and low- to middle-income. The average years of education obtained by participants’ mothers and fathers were 9.6 ± 3 and 9.7 ± 3, respectively. At age 21y, 16.5% of participants had pursued postsecondary education and the average Trails B score was 83.9 ± 37 seconds, where higher scores indicate worse performance. Every SD increase in childhood SEP was associated with a 4-second reduction in time needed to complete the Trails B test (β = -4.1, 95%CI -6.4, -1.9) and 1.7 increased odds of pursuing postsecondary education (OR = 1.7, 95%CI 1.3, 2.1). In mediation analyses, the CDE was -3.1 (95%CI -5.4, -0.8) and the NIE was -0.99 (95%CI -1.8, -0.4). Approximately 24% of the TE was mediated by postsecondary education. Sensitivity analyses yielded nearly identical results. Conclusion. Participants with lower SEP were less likely to pursue postsecondary education and performed worse on a test of executive functioning at 21y. Improved access to postsecondary education could reduce these disparities.

Figure 1. Pathways under investigation. Hypothesis: attainment of postsecondary education mediates the effect of childhood socioeconomic position (SEP) on executive functioning at 21 years.
The United States faces an affordable housing crisis, with severe consequences for public health and health care; prior studies have linked unstable housing to worse patterns of health care utilization, including less connection with primary care and more emergency department (ED) visits. This study assessed how selection for a Housing Choice Voucher (HCV), the government’s main housing assistance program, impacted health care utilization among a Medicaid-enrolled population. The housing agency in Portland, Oregon periodically opens their HCV waitlist to 3,000 applicants. Every six months some applicants are then randomly selected to apply for a voucher until the waitlist is exhausted, usually after three years. We used the 2014-2016 waitlist for this study, and employed a stepped wedge design. We linked each applicant’s housing data to their Medicaid claims data, then calculated our health care outcomes – per member per year primary care, outpatient mental health, ED, and inpatient visits – for each 6 month step. Our models regressed the outcome on treatment status, time step, and a time-by-treatment interaction term. The majority of applicants were under 35 years old, female, and English speakers. We found no association between selection for a voucher and ED, inpatient, or outpatient mental health visits. We did, however, find an association between selection for a voucher and increased number of primary care visits (0.65, p=0.0197 in the first step), as well as a significant interaction term (-0.0191, p=0.008) suggesting heterogeneity of the treatment effect over time. Selection for a voucher did not necessarily mean success locating and renting housing; only a quarter of applicants obtained housing. Our preliminary analysis is intent-to-treat, but next steps include incorporating an instrumental variable to estimate the impact of obtaining housing on health care outcomes, and modifying the analytic model to account for a delayed treatment effect.
BI-DIRECTIONAL RELATIONSHIPS BETWEEN EBOLA VIRUS DISEASE-RELATED STIGMA AND CLINICAL FINDINGS AMONG SURVIVORS DURING THE POST-OUTBREAK PERIOD IN LIBERIA: AN OBSERVATIONAL COHORT STUDY

J. Daniel Kelly* J. Daniel Kelly, Moses Badio, Clara Drew, M. Maria Glymour, Jacqueline M. Torres, Catherine Oldenburg, Bartholomew Wilson, Joseph B. Cooper, Meekie Glayweon, Dehkontee Dennis, Michael C. Sneller, Chiung-Yu Huang, George W. Rutherford, Cavan Reilly, Sheri D. Weiser, Mosoka P. Fallah, (Department of Epidemiology and Biostatistics, University of California, San Francisco)

Introduction: Qualitative studies have described a relationship between clinical sequelae and stigma related to Ebola virus disease (EVD), but quantitative studies are lacking. We evaluated the overall association between EVD-related clinical sequelae and stigma and tested competing hypotheses that 1) clinical findings among EVD survivors contributed to subsequent stigma and 2) stigma caused psychosomatic symptoms. Methods: EVD survivors in Liberia were enrolled in an observational cohort study starting in June 2015, with four follow-up visits repeated at six-month intervals. Trained Liberian physicians elicited self-reported symptoms and exam findings. At baseline and visit 4 (18 months later), a 7-item index of EVD-related stigma was administered. Possible confounders included age, gender, educational level, referral to medical care, and HIV serostatus. We used baseline and visit 4 stigma measures to predict concurrently measured outcomes, using robust generalized estimating equations. To evaluate for reverse causation, we lagged baseline stigma to predict visit 2 clinical findings. Conversely, we lagged visit 3 clinical findings predict visit 4 stigma. Results: 859 EVD survivors were enrolled median 358 days after being discharged from an Ebola treatment unit. In adjusted analyses pooling baseline and visit 4 data, EVD-related stigma was associated with constitutional, musculoskeletal and gastrointestinal symptoms and abdominal exam findings. In lagged, adjusted analyses, memory loss (Odds Ratio [OR]: 4.6; 95% Confidence Interval [CI]: 1.73, 12.36) and abdominal pain at visit 3 predicted stigma at visit 4 (OR: 2.3; 95% CI: 0.98, 5.27). Baseline stigma did not predict visit 2 clinical sequelae. Conclusion: This study supports the presence of cross-sectional associations between EVD-related stigma and clinical sequelae. Select clinical symptoms may have contributed to stigma, although there was no evidence that stigma contributed to post-EVD clinical sequelae.
RELATIONAL SOCIAL CLASS, SELF-RATED HEALTH, AND MORTALITY IN THE UNITED STATES

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INTRODUCTION: Applying a relational theory of social class based on control over productive resources and others’ labor, we analyzed the relationship between class, self-rated health (SRH), and mortality in the US.

METHODS: We used data on respondents ages 25-64 in the 1972-2016 General Social Survey (n=29974). In our simple measure, we assigned respondents to the worker, manager, small-business owner (SBO), or capitalist class based on business ownership and workplace authority. In our complex measure, we divided workers (unskilled/skilled), managers (low/high), and capitalists (small/large). Next, we estimated temporal trends in class structure. Finally, using gender-stratified Poisson and Cox models, we estimated the age- and year-adjusted relationships between class and SRH and class and mortality. In secondary analyses, we tested for class*race interaction.

RESULTS: Class structure changed little over time, with workers comprising ~55% of the population each decade, and people of color, particularly women, consistently overrepresented among workers. Concerning SRH, for the simple measure, managers, SBO, and capitalists reported better health than workers (Fig 1). For the complex measure, patterns were similar, although skilled workers reported better health than unskilled workers and somewhat better health than low managers and SBO. Concerning mortality, for the simple measure, inequities were small among women; among men, only capitalists had a lower mortality hazard than workers (Fig 1). For the complex measure, although inequities were smaller among women, across genders, unskilled workers and SBO had a higher mortality hazard than other classes. Furthermore, the hazard for skilled workers resembled the hazard for managers and capitalists. We found no evidence of class*race interaction.

DISCUSSION: We found substantial SRH inequities and small mortality inequities across classes. To our knowledge, this is the first US study of relational class and mortality.
EVICTION IN EARLY CHILDHOOD AND CHILDHOOD OBESITY: EVIDENCE FROM A LONGITUDINAL COHORT STUDY Kathryn M. Leifheit* Kathryn M. Leifheit, Gabriel Schwartz, Craig E. Pollack, Maureen M. Black, Kathryn Edin, Keri N. Althoff, Jacky M. Jennings, (Johns Hopkins Bloomberg School of Public Health)

Background: Due to the ongoing U.S. housing crisis, an estimated 15% of children born from 1998-2000 in large cities experienced an eviction by age 15. We aimed to evaluate the association between early childhood (ages <5) eviction and increased prevalence of obesity in later childhood and adolescence (ages 5, 9, and 15).

Methods: We analyzed data from the Fragile Families and Child Wellbeing Study, a longitudinal cohort of children born in 20 large U.S. cities from 1998-2000. Children who lived in rental housing with known eviction histories, and whose BMI was measured at 5, 9, or 15 years were included. We applied inverse probability of censoring weights to account for loss to follow-up and compared baseline characteristics of evicted children with non-evicted children. We applied inverse probability of treatment weights (IPTW) to improve the exchangeability of evicted children with non-evicted children and then compared the prevalence of obesity by eviction history at ages 5, 9, and 15.

Results: Among 4898 enrolled children, 1962 5-year-olds, 3003 9-year-olds, and 957 15-year-olds met our inclusion criteria. After IPTW, differences in baseline characteristics including socioeconomic status, maternal health, and birth outcomes demonstrated balanced distributions between evicted and non-evicted children. Obesity prevalence did not differ significantly between evicted vs. non-evicted children at any age (5 years: 18.0% [15.5, 19.0] vs. 17.3%[15.5, 19.0]; 9 years: 27.4% [20.2, 34.4] vs. 25.0% [23.4, 26.6]; 15 years: 27.7% [14.1, 41.3] vs. 26.3% [23.4, 29.2]).

Conclusions: Among children in this cohort, eviction in early childhood was not associated with statistically significant increases in obesity prevalence in later childhood and adolescence. Baseline differences between evicted and non-evicted children reinforce earlier findings that eviction affects vulnerable populations and children with high baseline risk of negative health outcomes.
Background Research on adolescent employment and substance use has largely relied on cross-sectional data in non-representative samples, yielding mixed results. We assessed the longitudinal association between adolescent employment and cannabis initiation in a nationally-representative sample of adolescents, with attention to social environment and demographic characteristics. Methods We included adolescents (12-18) from the National Longitudinal Survey of Youth 1997 cohort who had never used cannabis at baseline (N=7,459). Cox proportional-hazards models estimated the relationship between adolescent employment and hazard of subsequent cannabis initiation, controlling for individual, family, school and neighborhood confounders, and stratifying by race and income. Results Employment was most prevalent among whites and adolescents from higher income households. Employment was associated with a 29% increased hazard of cannabis initiation (95% CI=1.19. 1.40). In stratified models, employment was associated with increased hazard of cannabis initiation among whites in the lowest and highest two income quintiles, and Hispanic adolescents and non-Hispanic adolescents of mixed or other race in the highest income quintiles. Employment was not associated with initiation among black adolescents. Conclusions Adolescent employment is associated with increased hazard of cannabis initiation among white and higher-income, but not black adolescents. These findings reveal a relationship that may be related to social privilege. Given structural inequities in hiring, adolescents of color or from lower-income families who obtain employment may be less likely to initiate cannabis than those for whom the bar for entry is lower. Future research may investigate how workforce selection and the social environment impacts these observed differences. Findings underscore the importance of stratification by demographic factors in questions of the social environment and adolescent health behaviors.
HOPE: AN MHEALTH RECOVERY AID FOR PATIENTS IN RECOVERY FOR OPIOID USE DISORDER
Chelsea Canan*, Chelsea Canan, Marika Grabowski, Michelle Hilgart, Sabrina Swoger, Nassima Ait-Daoud Tiouririne, Rebecca Dillingham, (University of Virginia)

Background. Mobile technology can support chronic disease self-management. In this study, we adapted PositiveLinks (PL), a successful self-monitoring and retention-in-care app for patients living with HIV, to meet the needs of patients in recovery for opioid use disorder (OUD). Methods. Between June-November 2018 we conducted formative interviews with patients in recovery and providers at the University of Virginia Medication Assisted Treatment (MAT) clinic. During semi-structured interviews (N=10), we evaluated patient needs and discussed how an app could aid the recovery process. Interviews were recorded, transcribed, and reviewed to identify common themes. We developed low fidelity app mockups to show patients in a second round of interviews (N=5) to inform clarity and appropriateness of features. Data from these interviews guided the development of a high fidelity, interactive prototype, which was further tested with patients and iteratively revised after each round of testing. The development team utilized the final prototype to build the app. Results. We created “HOPE: Heal. Overcome. Persist. Endure”, an app to support patients in recovery. HOPE features include mood and stress check-ins, tracking of medication adherence, substance use, and opioid free-days, goal-setting, logs for triggers and encouraging experiences, provider messaging, an anonymous private social network, appointment reminders, MAT guidelines, and informational resources. Initial usability interviews suggest patient and provider acceptance of HOPE. In a 6-month pilot test, we will assess usability, acceptability, and the impact of HOPE on stigma, social support, and patient-provider relationships. Conclusion. User-centered formative research led to the successful creation of HOPE, a mobile app for patients in recovery for OUD. Initial usability interviews with MAT patients and providers suggest a potential benefit to HOPE. The pilot study will further evaluate the impact of HOPE on key outcomes.
Background: Chronic pain is a major cause of disability in the US, and opioid prescriptions rose amid limited availability and awareness of other pain therapies. Though many non-pharmacological therapies (NPT) are effective for chronic pain, little is known about NPT use patterns among people prescribed opioid analgesics. We examined NPT use within a national sample of US military veterans on long-term opioid therapy for chronic pain. Methods: The Effects of Prescription Opioid Changes in Veterans (EPOCH) study established a national cohort of 271,892 Veterans Affairs patients prescribed long-term opioid therapy for chronic pain. A representative sample received a survey including questions about past-year use of non-pharmacological therapies to treat or cope with chronic pain. We use descriptive statistics, generalized linear regression and latent class analysis to describe patients’ self-reported NPT use and associations of demographic and clinical characteristics with NPT use. Results: 8,891 (65%) of 13,660 invitees participated. Female sex and younger age were associated with use of every non-pharmacological therapy for chronic pain. Higher pain-related functional interference, higher prescribed opioid dose, and psychiatric diagnoses (depression, anxiety, PTSD) were associated with psychological skills-related NPT (meditation, relaxation, psychotherapy). Lower pain-related functional interference and lower physical comorbidity were associated with movement skills-related NPT (aerobic exercise, stretching/strengthening). Lower physical comorbidity was associated with physical manipulation NPT (acupuncture, chiropractic, massage). Conclusions: Findings can inform implementation and clinical research on non-pharmacological therapies for chronic pain, and raise questions about health system-related factors. Further analyses will examine how participants’ NPT use relates to pain-related functional interference, opioid dosing, and quality of life outcomes over time.

Table. Characteristics of U.S. military veterans on long-term opioid analgesics reporting past-year use of non-pharmacological therapies for pain.

<table>
<thead>
<tr>
<th>Therapy type</th>
<th>Users (%)</th>
<th>Female (%)</th>
<th>Age Mean (SD)</th>
<th>Number of pain sites Mean (SD)</th>
<th>Functional interference mean (SD)</th>
<th>Opioid use MEOD mean (SD)</th>
<th>Long-acting opioids (%)</th>
<th>Physical comorbidity mean (SD)</th>
<th>Depressive disorder (%)</th>
<th>Anxiety disorder (%)</th>
<th>PTSD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All respondents</td>
<td>100 (451)</td>
<td>7.16 (2.06)</td>
<td>64.0 (10.6)</td>
<td>6.80 (2.12)</td>
<td>6.51 (2.12)</td>
<td>51.2 (62.6)</td>
<td>58.1 (52.6)</td>
<td>1.47 (1.71)</td>
<td>30.1 (2.673)</td>
<td>15.5 (1.358)</td>
<td>22.5 (7.607)</td>
</tr>
<tr>
<td>Psychological skills-based</td>
<td>47.0 (480)</td>
<td>7.11 (2.40)</td>
<td>61.4 (10.7)</td>
<td>7.14 (2.05)</td>
<td>6.82 (1.57)</td>
<td>54.3 (34.6)</td>
<td>32.0 (34.3)</td>
<td>1.37 (1.65)</td>
<td>42.7 (1.794)</td>
<td>22.6 (9.930)</td>
<td>33.4 (3.393)</td>
</tr>
<tr>
<td>Meditation / mindfulness</td>
<td>19.7 (1749)</td>
<td>14.5 (25.4)</td>
<td>59.8 (11.2)</td>
<td>7.15 (2.07)</td>
<td>6.83 (1.98)</td>
<td>56.0 (62.4)</td>
<td>33.8 (59.2)</td>
<td>1.27 (1.66)</td>
<td>44.8 (78.4)</td>
<td>22.5 (394)</td>
<td>43.6 (932)</td>
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<tr>
<td>Relaxation techniques</td>
<td>35.5 (332)</td>
<td>12.1 (378)</td>
<td>61.1 (11.0)</td>
<td>7.10 (2.05)</td>
<td>6.71 (1.98)</td>
<td>54.4 (55.0)</td>
<td>31.7 (889)</td>
<td>1.37 (1.68)</td>
<td>38.1 (1.388)</td>
<td>20.5 (641)</td>
<td>29.9 (924)</td>
</tr>
<tr>
<td>Psychotherapy</td>
<td>27.3 (2428)</td>
<td>12.1 (293)</td>
<td>60.4 (10.6)</td>
<td>7.43 (1.97)</td>
<td>7.18 (1.82)</td>
<td>54.6 (64.2)</td>
<td>33.0 (800)</td>
<td>1.35 (1.63)</td>
<td>57.1 (1.386)</td>
<td>28.4 (701)</td>
<td>44.4 (1,128)</td>
</tr>
<tr>
<td>Movement skills-based</td>
<td>64.0 (508)</td>
<td>8.1 (518)</td>
<td>62.6 (10.8)</td>
<td>6.86 (2.11)</td>
<td>6.40 (2.10)</td>
<td>51.0 (63.3)</td>
<td>29.0 (643)</td>
<td>1.38 (1.68)</td>
<td>31.0 (1,763)</td>
<td>16.2 (920)</td>
<td>23.6 (1,340)</td>
</tr>
<tr>
<td>Aerobic exercise</td>
<td>39.8 (3,342)</td>
<td>10.2 (382)</td>
<td>61.2 (11.1)</td>
<td>6.86 (2.11)</td>
<td>6.24 (2.12)</td>
<td>50.8 (62.5)</td>
<td>28.4 (1,007)</td>
<td>1.30 (1.64)</td>
<td>30.7 (1,067)</td>
<td>15.5 (550)</td>
<td>23.8 (843)</td>
</tr>
<tr>
<td>Stretching/strengthening</td>
<td>57.5 (5101)</td>
<td>9.0 (461)</td>
<td>62.4 (10.9)</td>
<td>6.86 (2.11)</td>
<td>6.40 (2.10)</td>
<td>50.8 (63.0)</td>
<td>28.8 (1,469)</td>
<td>1.36 (1.67)</td>
<td>31.2 (1,591)</td>
<td>15.9 (811)</td>
<td>23.6 (1,206)</td>
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<tr>
<td>Yoga</td>
<td>6.9 (568)</td>
<td>10.8 (118)</td>
<td>59.1 (12.1)</td>
<td>7.14 (2.11)</td>
<td>6.54 (2.07)</td>
<td>53.7 (65.1)</td>
<td>29.8 (1,790)</td>
<td>1.19 (1.54)</td>
<td>39.2 (217)</td>
<td>22.2 (126)</td>
<td>31.2 (177)</td>
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<tr>
<td>Tai chi</td>
<td>4.52 (402)</td>
<td>11.4 (46)</td>
<td>63.1 (10.5)</td>
<td>7.26 (2.08)</td>
<td>6.56 (2.05)</td>
<td>56.5 (64.4)</td>
<td>33.1 (133)</td>
<td>1.50 (1.77)</td>
<td>38.1 (1,533)</td>
<td>19.4 (78)</td>
<td>30.4 (1,222)</td>
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<tr>
<td>Physical manipulation</td>
<td>31.9 (2,838)</td>
<td>10.3 (388)</td>
<td>61.5 (11.7)</td>
<td>7.01 (2.12)</td>
<td>6.61 (2.05)</td>
<td>51.6 (62.5)</td>
<td>28.8 (837)</td>
<td>1.30 (1.64)</td>
<td>33.1 (930)</td>
<td>17.7 (503)</td>
<td>25.5 (773)</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>10.8 (952)</td>
<td>9.8 (94)</td>
<td>61.9 (11.6)</td>
<td>7.17 (2.11)</td>
<td>6.97 (1.92)</td>
<td>57.1 (64.4)</td>
<td>34.5 (340)</td>
<td>1.48 (1.73)</td>
<td>35.2 (1,052)</td>
<td>19.6 (188)</td>
<td>27.9 (267)</td>
</tr>
<tr>
<td>Chiropractic</td>
<td>14.0 (1,234)</td>
<td>8.25 (115)</td>
<td>63.1 (12.4)</td>
<td>7.08 (2.10)</td>
<td>6.59 (2.05)</td>
<td>47.6 (56.8)</td>
<td>27.3 (339)</td>
<td>1.21 (1.55)</td>
<td>32.1 (199)</td>
<td>17.4 (216)</td>
<td>27.5 (342)</td>
</tr>
<tr>
<td>Massage</td>
<td>19.5 (1,137)</td>
<td>11.6 (201)</td>
<td>60.9 (11.8)</td>
<td>7.10 (2.11)</td>
<td>6.57 (2.10)</td>
<td>51.0 (62.7)</td>
<td>27.8 (483)</td>
<td>1.24 (1.62)</td>
<td>32.1 (558)</td>
<td>18.0 (631)</td>
<td>25.7 (447)</td>
</tr>
</tbody>
</table>

1. Number out of 10 possible bodily sites in which respondent was “bothered at all by pain” over preceding 6 months: head, teeth/mouth/jaw, neck, back, shoulder, hip, knee/ankle/lower leg, stomach/abdomen, penis/genitals.

2. Brief Pain Inventory-Interference (BPI-I). Study population range 0–10; higher = worse.

3. MEOD: Morphine Equivalent Daily Dose, in milligrams. Study population range 0 – 1038.15.

4. Charlson comorbidity index. Study population range 0-15, higher = worse.

CONTRASTING CIGARETTE SMOKING AND NICOTINE DEPENDENCE TRAJECTORIES AMONG INCIDENT ADOLESCENT SMOKERS: A LONGITUDINAL STUDY IN MONTREAL, CANADA
Miceline Mésidor* Miceline Mésidor, Marie-Pierre Sylvestre, Nanor Minoyan, Jennifer O’Loughlin, (CRCHUM / Université de Montréal)

Few studies investigate the timing or pattern of the appearance of nicotine dependence (ND) symptoms in distinct smoking trajectories. In previous work, we identified five cigarette smoking trajectories among incident adolescent smokers, including low-level decreasers, stable-low consumers, slow escalators, moderate escalators and rapid escalators who peak. Building on this study, we: 1) estimated the number and shape of trajectories of four ND indicators (craving, withdrawal, the modified Fagerström Tolerance Questionnaire (mFTQ) and ICD-10 tobacco dependence) among incident adolescent smokers; and 2) described the distribution of participants in each smoking trajectory according to their membership in each ND trajectory. Data were drawn from the Nicotine Dependence in Teens (NDIT) study, an ongoing longitudinal study of 1294 grade 7 students recruited in 1999-2000. Self-report questionnaires were administered at school every 3 months eliciting sociodemographic and behavioral data. A total of 307 incident smokers were included in group-based trajectory modeling analyses. Five trajectories were identified for ND/craving and four trajectories for each of the other three ND indicators. Each ND indicator had one no/low trajectory (66% to 86% of participants) and 1-2 early increasing and/or high trajectory (3% to 15% of participants). Cigarette smokers classified as low-level decreasers and stable-low cigarette smokers were most likely to be in the no/low trajectory of all ND indicators. Rapid escalators who peak had high probabilities of being in the early-high ND trajectories, regardless of ND indicator. However, some discordance was observed. Surprisingly, our results suggest that heavy smokers with low ND are more likely to have parents who smoke; conversely adolescents with low level of smoking and high ND are less likely to have parents who smoke. Further investigation of genetics may contribute to a better understanding of ND.
ASSOCIATIONS BETWEEN HOUSING INSTABILITY AND OPIOID USE CHARACTERISTICS AMONG A SAMPLE OF NEW YORK CITY EMERGENCY DEPARTMENT PATIENTS, 2016–2017

Neloufar Rahai* Neloufar Rahai, Lorna Thorpe, Magdalena Cerda, Yongzhao Shao, Kelly Doran, (New York University School of Medicine)

Aim: Few studies have examined the relationship between housing instability, opioid use, and overdose. Emergency departments (ED) serve a high proportion of patients with increased social needs, including housing instability, and are a critical setting for opioid overdose prevention and care. This analysis characterizes the burden of housing instability and opioid use among ED patients. Methods: This study is a cross-sectional random sample of ED patients presenting to Bellevue Hospital recruited into the ED-CARES study (n=2,312) between 2016–2017. Housing instability was defined as: past-year inability to pay rent or mortgage, eviction, and/or living in 3 or more different places in the past year, perceived 2-month housing instability, and spending most nights in past year in potentially unstable housing. Logistic regression was used to estimate associations between housing instability measures and 1) lifetime history of opioid overdose and 2) past year use of heroin or prescription opioids, adjusting for demographics and socioeconomic status. Results: Excluding currently homeless participants, the analytic sample was 1,993. Characteristics of participants include: at least one form of housing instability (47%), past-year housing instability (27%), perceived 2-month housing instability (29%), and spent most nights in potentially unstable housing (14%). In adjusted models, past-year housing instability, perceived 2-month housing instability and spending most nights in unstable housing were associated with 1.97 (95% CI 1.18–3.30), 2.03 (1.19–2.45) and 2.09 (1.13–3.86) times higher odds of a lifetime history of opioid overdose, and 2.93 (1.96–4.38), 3.49 (2.30–5.30) and 2.46 (1.55–3.90) times higher odds of any opioid use in the past year, respectively. Conclusion: Among ED patients, housing instability was associated with higher odds of a history of opioid overdose and past year opioid use. Identifying and addressing housing instability in healthcare settings may reduce the burden of opioid-related harm.
Background: In the context of changing marijuana and other drug policy and regulation, concerns arise regarding drug use, disorder, and treatment need. While Uruguay recently legalized marijuana, little is known about broader drug treatment utilization trends in the region before the policy enactment. We assessed drug treatment need and use over time in Uruguay, Chile, and Argentina, prior to the policy change. Methods: We used secondary data from repeated cross-sectional household surveys conducted separately in Uruguay (2006-2014, N=18,737), Chile (2002-2016, N=233,389), and Argentina (2006-2010, N=44,679) were harmonized. Participants ages 15-64 reported their use of drugs (i.e., marijuana, cocaine, or cocaine paste), drug treatment need (i.e., 3+ DSM-IV drug dependence symptoms), and any past-year treatment use. We estimated weighted prevalences of treatment need and use by country and tested changes over time in odds of treatment need and use, accounting for survey year and regional clustering. Results: Across years, 8.7% in Chile, 8.2% in Uruguay, and 5.2% in Argentina used marijuana, cocaine, or cocaine paste, and a quarter of people who used drugs met 3+ dependence symptoms (25.8% Chile; 27.6% Uruguay; 35.1% Argentina). Odds of treatment need decreased over time in Argentina and increased in Chile and Uruguay. Among those who needed treatment, 5.9% in Chile; 14.4% in Uruguay, and 6.7% in Argentina received any treatment. Odds of any treatment use among those who needed treatment declined over time in Uruguay and Argentina and remained stable in Chile. Conclusion: Drug treatment use was low in all three countries, which could be due to low perceived need, stigma, or scarce service availability. Decreases in treatment use despite increasing need in Uruguay contrast patterns in neighboring countries. In the context of Uruguay’s changing drug policy, planners should monitor changes in treatment indicators to adequately allocate resources.
SELF-REPORTED USE VERSUS INDIRECT USE INDICATORS OF ILLICIT DRUGS IN TAIWAN: FINDINGS FROM THE 2018 NATIONAL SURVEY OF SUBSTANCE USE Shang-Chi Wu* Shang-Chi Wu, Wen-Ing Tsay, Lian-Yu Chen, Chung-Yi Li, Cheng-Fang Yen, Hao-Jan Yang, Chia-Feng Yen, Chuan-Yu Chen, Jiun-Hau Huang, Shu-Sen Chang, Yu-Kang Tu, Jui Hsu, Wei J. Chen, (Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan)

Background: Since under-reporting is a common concern in surveys of illicit drug use, the utility of indirect indicators, such as being requested to undergo drug-related urinalysis, and knowing or perceiving others’ use of illicit drugs, warrants further investigation. This study aims to compare the prevalence of self-reported use of illicit drugs versus that of indirect indicators of such use. Methods: Data were from the 2018 National Survey of Substance Use in Taiwan, targeting 12 to 64 year-old non-institutionalized civilians. A total of 18,626 respondents completed anonymously a computer-assisted self-interview, with a response rate of 64.4%. The questionnaire on illicit drug use covered 24 specific kinds of illicit drugs and newly emerged, mixed drug packs mimicking daily products. For indirect indicators, participants were asked if they had been required to undergo urinalysis for illicit drug testing, had family members or friends who ever used illicit drugs, or ever perceived of someone’s use of illicit drugs. Statistical analysis was performed using PROC SURVEYFREQ in software SAS 9.4 to deal with the complex survey design. Results: Among the 18,626 participants, 259 reported to ever use any illicit drug (a weighted prevalence of 1.44%). The most commonly used illicit drug was amphetamines (0.42%), followed by ketamine (0.39%), ecstasy (0.34%), marijuana (0.31%) and mixed drug packs (0.18%). Regarding indirect indicators of illicit drug use, 2.59% of participants had been requested to undergo urinalysis by the police, 3.02% had family members or friends who ever used illicit drugs, and 14.96% ever perceived of others’ use of illicit drugs at some places. Conclusion: Prevalence of self-reported illicit drug use remains relatively low in Taiwan, whereas the results from indirect indicators of illicit drug use imply that the scale of illicit drug use might be greater than that. These results may help to better understand the extent of illicit drug use in Taiwan.
COUNTY-LEVEL GEOGRAPHIC DISPARITIES IN AVAILABILITY OF MEDICATION-ASSISTED TREATMENT ACCESS FOR OPIOID USE DISORDER Victoria Jent* Victoria Jent, Scott Hadland, Magdalena Cerdá, Brandon Marshall, (New York University School of Medicine)

Background: Medication-assisted therapies (MAT) are effective treatments for opioid use disorder and prevent overdose death. Access to MAT throughout the United States (US) is inadequately understood. We examined the geographic distribution of facilities that provide access to MAT and providers certified to prescribe MAT across the US. Methods: The National Survey of Substance Abuse Treatment Services (N-SSATS 2018) and addresses of providers certified to prescribe buprenorphine from SAMSHA were used to identify and geocode facilities and individual providers that provide MAT. Global Moran’s I identified clusters of counties with lower/higher than the median ratio of treatment facilities and providers to opioid overdose deaths. A negative binomial Poisson regression model estimated the relationship of county-level demographic characteristics to the number of MAT facilities and providers. Results: In 2018, 29% of counties lacked access to any type of MAT, 44% of U.S. counties did not have a provider certified to prescribe buprenorphine, and 82% of counties did not have a SAMSHA-certified methadone treatment center. Clusters of counties with a low ratio of MAT availability to overdose fatalities (“hot spots”) were concentrated in the Southeast, Texas, and the Midwest. Clusters of counties with a high ratio (“cold spots”) were concentrated in the West and Northeast. Counties with more MAT facilities and providers had higher proportions of publicly insured residents (IRR:1.02, 95% CI:1.02, 1.03), were more likely to be located in non-metro rather than metro counties (IRR:1.15; 95% CI:1.05, 1.26), and had lower proportions of families in poverty (IRR:0.98, CI:0.97-0.94), and uninsured individuals (IRR:0.89, CI:0.87, 0.99). Conclusions: Almost half of US counties lack access to MAT, with sizable gaps in the South and the Midwest. Improving access to MAT facilities and providers to treat opioid use disorder is an urgent public health concern.

S/P indicates work done while a student/postdoc
RECIDIVISM AMONG FIRST-TIME OFFENDERS OF KETAMINE USE IN TAIWAN: A NATIONAL COHORT STUDY FROM 2009 TO 2017
Wen-Hsuan Pan*, Wen-Hsuan Pan, Chi-Ya Chen, Shang-Chi Wu, Chien-Chang Wu, Susyan Jou, Tzu-Pin Lu, Yu-Chi Tung, Hsien-Ho Lin, Wei J. Chen, (Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University)

Background: Since 2000, ketamine has become a new recreational drug of choice among young people, particularly in Asia. Despite people’s perception that ketamine was less addictive than traditional narcotics, its recidivism remains unknown. This study aims to estimate the recidivism among first-time offenders of ketamine use in national cohorts from 2009 to 2017 in Taiwan. Methods: Persons convicted of possessing or using ketamine of less than 20 grams were stipulated by a law amendment in 2009 to attend a narcotics hazard seminar. Hence these offenders were enrolled in a database called “Administrative Penalty system for Schedule III/IV Illegal Drugs.” Ketamine users with previous drug offense records were excluded after linking with other databases. From 2009 to 2017, a total of 45394 first-time offenders of ketamine use were identified. In the survival analysis for recidivism, an event was defined in two ways: 1) repeated drug offense of using schedule III/ IV illicit drugs, mostly ketamine; and 2) repeated drug offense of schedule I/ II illicit drugs or possessing schedule III/ IV illicit drugs of over 20 grams. Different survival rates were compared using the Logrank test. Results: The median time to recidivism was 3.99 years for the recidivism of repeated ketamine use and 4.57 years for the recidivism of using higher schedule narcotics. In the analysis for repeated ketamine use, the recidivism rate in males was slightly higher than in females (p-value=0.0017), and the recidivism rate in people aged 18-24 was also slightly higher than that in people aged over 25 (p-value=0.0043). For the recidivism of using higher schedule narcotics, there were no significant differences in comparing sexes or age groups. Conclusions: Approximately half of first-time ketamine offenders committed recidivism within four years. Males and young adults had slightly higher recidivism rates in repeated offense of ketamine use than their counterparts.

S/P indicates work done while a student/postdoc
SMOKING BEHAVIORS AND EXPENDITURES AMONG MIDDLE-AGE AND ELDERLY CHINESE: IMPLICATIONS FOR POLICY L.H. Lumey* L.H. Lumey, Mengxi Zhou, Chihua Li, (Columbia University)

Background Smoking is the leading public health issue in China. It is unknown how heavy the financial burden of cigarette smoking is in China at the family level. A better understanding of people's smoking characteristics and spending patterns may generate important information for health policy and intervention. We used the China Health and Retirement Longitudinal Study (CHARLS) for 2011 and 2015 to examine this question. Methods CHARLS is an ongoing nationally representative health survey among Chinese men and women aged 45 years and older. Among 14556 participants from the 2011 baseline survey, we examined their smoking behaviors, including age of starting and quitting smoking, number of cigarettes smoked per day, and price per pack of cigarettes purchased. We calculated smoking expenditures and compared these to total family expenditures and to household food expenditures. We estimated the number of current smokers and their smoking expenses nationwide. Results In 2011, 51.3% of men (n=3193) and 3.5% of women (n=360) were current-smokers. The average age men started smoking was 22 and women was 30. Men smoked 18.9 cigarettes/day and women 12.9 cigarettes/day. Men on average used 11.8% of their family expenditures for smoking and women 7.4%. The proportion of men who spent more money on smoking than the family spent on food was 12.0% overall and 35.0% among men from families below the poverty line. There were 104 million active smokers aged over 45 years in China who consumed about 700 billion cigarettes. They spent about 195 billion RMB on smoking. Over 11 million men spent more on smoking than their family spent on food. The patterns were similar using 2015 CHARLS data. Conclusions Large economic benefits could be obtained from smoking cessation, especially by men from poor families. While interventions are needed to encourage smoking cessation among men, policymakers should not overlook the need to prevent smoking initiation among women.
RISK AND BENEFIT PERCEPTIONS PREDICT ALTERNATIVE TOBACCO PRODUCT AND CIGARETTE SWITCHING AMONG ADOLESCENTS AND YOUNG ADULTS

Hoda S. Abdel Magid*  
Hoda S. Abdel Magid, Patrick T. Bradshaw, Pam Ling, MPH, MD, Bonnie Halpern-Felsher, (Division of Epidemiology, School of Public Health, University of California, Berkeley)

The majority of adolescents and young adults (AYAs) initiate tobacco smoking with Alternative Tobacco Products (ATPs) including e-cigarettes, smokeless tobacco, tobacco pipes, cigars, and hookah. ATP use is a strong predictor of cigarette initiation, switching to other ATPs, and becoming an established smoker. Changes in AYAs’ ATP use including switching across products may occur in part because of changes in their risk and benefit perceptions of these products. This study examines the relationship of cigarette or ATP switching with perceptions of short-term health-risks, long-term health risks, short-term benefits, perceived addictiveness, and perceived harmfulness in a longitudinal California cohort of AYAs, aged 16 to 19 years at baseline (n=482). Baseline cigarette or ATP users were classified as having switched products at follow up one year later if they reported (1) switching products either ever or past 30-day use and (2) switching completely from one cigarette or ATP to another, simultaneously reporting no dual or poly product use (≥2 tobacco products). Generalized estimating equation logistic regression models were used to estimate odds ratios and 95% confidence intervals between baseline perceptions and odds of switching cigarette or ATP use one year later. Among 119 AYAs who reported either ever or past 30-day cigarette or ATP use at baseline, 66% (n=79) reported switching to another product over the year, with the majority reporting switching to cigarette or e-cigarette use exclusively. The probability of switching cigarette or ATP use over time was higher among adolescents who had lower perceived short-term (OR=1.10, 95% CI: 1.04, 1.26) or long-term health risks (OR=1.19, 95% CI: 1.15, 1.37), and higher short-term benefits (OR=1.04, 95% CI: 1.02, 1.12). These findings provide novel evidence for the influence of risk and benefit perceptions on adolescents’ tobacco product switching.
EXPOSURE TO NEIGHBORHOOD CRIME INCREASES THE PREVALENCE OF ADVERSE RESPIRATORY HEALTH FROM PSYCHOSOCIAL STRESS IN ADULTS

Kristen Arthur* Kristen Arthur, Synnøve F Knutsen, Rhonda Spencer-Hwang, David Shavlik, Susanne Montgomery, (Loma Linda University)

Background- Exposure to poor air quality and social stressors are more common in low-income, minority, urban neighborhoods. Evidence suggests a synergistic effect between social stressors on adverse health outcomes, which is of particular concern for vulnerable, urban populations as they often reside in more hazardous environments. We hypothesized that high exposure to neighborhood crime would modify the association between an individually-measured stressor (lack of perceived community safety (LPS)) and respiratory health. Methods- We conducted interview-administered surveys (n=964) in English/Spanish from households sampled in an area known for routine poor air quality. The outcome was self-reported doctor-diagnosed respiratory illness (asthma, bronchial condition, emphysema, COPD, or prescribed-inhaler usage). In adjusted log-binomial regression models, we assessed effect modification of LPS by exposure to crime by modeling multiplicative interaction terms. Results- LPS was a strong independent risk factor for the prevalence of adverse respiratory health (PR= 1.40; 95%CI 1.09, 1.80) and its effect was magnified in the presence of neighborhood crime. The prevalence of respiratory illness increased 154% (95% CI 33%, 386%) among those with LPS when personal crime was high (90th percentile) compared to those who perceived their community as safe and lived in an area of very low personal crime (10th percentile) (p=0.049 for multiplicative interaction term). Conclusions- These results suggest that adults exposed to more crime may be more susceptible to psychosocial stress adversely affecting respiratory health in an adult, vulnerable population. Our finding further supports efforts to include the social context, as well as the environmental risk, into public health research and policy. We support others who also suggest the the advancement of interdisciplinary science and cross-sector policy collaboration to address multiple-determinants as an effort to reduce health disparities.
Adolescent dating violence is a pervasive issue in the US that leads to many adverse physical and mental health consequences for young people and is often associated with violent and unhealthy relationships later in life. The NYC Healthy Relationship Training Academy is a primary intervention that provides educational and skills-building training for young people across the City through interactive workshops on dating violence and healthy relationships. We examined the effectiveness of the intervention through surveys implemented at baseline and immediately following the intervention. We also examined differential effects of the intervention by age and gender of participants. Paired survey responses from 12,338 intervention participants were analyzed and results demonstrated a statistically significant improvement in average score on the 13-question survey: 7.7 at baseline to 8.9 post-intervention ($t=61.6$, $p<0.001$). Additionally, we found that older age was associated with better performance on both the pre- and post-intervention surveys, but the youngest age group showed the largest improvement in average score. Girls performed statistically significantly better than boys on both the pre- and post-intervention survey, but there was no significant gender difference in the improvement of average score following intervention participation. These findings suggest that participant in the workshop-based intervention leads to significant short-term improvements in knowledge and attitudes concerning health relationships for all ages and gender; and that younger age groups could be a particularly important population to target with this intervention. Future analyses will aim to assess longer-term impacts of the intervention when implemented in a series of workshops over time.
VALIDATION OF WOMEN’S SELF-REPORTED INFERTILITY DIAGNOSIS IN THE AFTER TREATMENT FOLLOW-UP STUDY Alesia M. Jung* Alesia M. Jung, Stacey A. Missmer, Daniel W. Cramer, Elizabeth S. Ginsburg, Kathryn L. Terry, Allison F. Vitonis, Leslie V. Farland, (Department of Epidemiology and Biostatistics, Mel and Enid Zuckerman College of Public Health, University of Arizona)

Background: Infertility may influence future chronic disease risk, and accurate assessment of this variable is critical to this research area. Previously, the validity of self-reported infertility measurements has been limited in follow-up (<5 years) and focused on medical records. The purpose of this study was to validate, among women who utilized assisted reproductive technology (ART), self-reported infertility diagnosis 14-23 years after ART initiation. Methods: Women who received ART treatments from three Boston infertility clinics and participated in a prior study (1995-2004) were recontacted in 2018 to participate in the AfteR Treatment Follow-up Study (ART Follow-up Study). Participants reported their primary infertility diagnosis (polycystic ovary syndrome (PCOS), endometriosis, uterine factor infertility, tubal factor infertility, diminished ovarian reserve/advanced maternal age (DOR), male factor infertility, other/unknown). We compared these current self-reported responses to both self-reported and medical record data collected from participants during the prior study 14-23 years ago, calculating Cohen’s kappa, sensitivity, specificity, and 95% confidence intervals. Results: Of 2,688 women from the original study, 808 completed the ART Follow-up Study. Compared to medical records, self-reported male-factor (K=0.66 (0.61,0.72)) and tubal factor infertility (K=0.62 (0.54,0.74)) had high agreement, while uterine factor (K=0.01 (-0.07,0.09)) and DOR had low agreement (K=0.07 (-0.01,0.14)). Compared to self-report at ART initiation, similar patterns of agreement by diagnosis type emerged (with modest improvement for PCOS and endometriosis). Overall, agreement was greater with prior self-report (sensitivity: 16-64%) than with medical records (sensitivity: 6-67%). Conclusions: The validity of self-reported infertility diagnosis varied by diagnosis type. Researchers should consider this heterogeneity when utilizing self-reported measures of infertility.
VAGINAL MICROBIOME DIVERSITY AND VULVODYNIA

Bernard L Harlow, Lisa Bedford, Samantha E Parker, Elyse Davis, Betsy Salzman, Betsy Foxman, (Boston University School of Public Health)

Vulvodynia is chronic idiopathic vulvar pain that has been estimated to affect 8% of American women by the age of 40. Although the cause of vulvodynia is largely unknown, we have previously shown that women, prior to their onset of vulvodynia, are more likely to have suffered from repeated vulvovaginal infections, allergenic exposures such as hives or hypersensitivity to insect bites, childhood sexual, physical, and emotional abuse, as well as psychiatric morbidity. All of these potential risk factors can alter immune function and perhaps increase the risk of vulvodynia through similar immunological pathways. A relatively unexplored mediator of the immune inflammatory response mechanism is the vaginal microbiome where species-specific innate immune signatures are elicited by bacterial pathogens. We used vulvovaginal swab specimens from 234 women with clinically-confirmed vulvodynia and 234 population controls to conduct DNA-based taxonomic screening for common genera, and diversity of community state types in cases and controls. Overall, we found that women with vulvodynia did not differ from controls by degree of diversity of organisms within the vaginal microbiome. However, when cases and controls were compared within women with lower median diversity vaginal microbiomes, we observed strong associations of immune related risk factors that were antecedent to the onset of vulvodynia and a comparable time period for controls, that was not observed among cases and controls within upper median diversity microbiomes. This included history of allergies (OR=3.3, 95%CI 1.4-7.5), >5 recurrent yeast infections (OR=8.1, 95%CI 2.9-22.7), history of anxiety (OR=2.9, 95%CI 1.6-5.3), history of depression (OR=2.8, 95%CI 1.4-5.6), and highest tertile of rumination (OR=2.6, 95%CI 1.3-5.3). We speculate that women with less diverse and more single organism dominated vaginal microbiomes may be more susceptible to the immunological assaults that lead to the onset of vulvodynia.
THE ASSOCIATION BETWEEN BACK PAIN AND MORTALITY MAY DIFFER BY SEX: A SYSTEMATIC REVIEW AND META-ANALYSIS OF COHORT STUDIES

Eric J. Roseen*, Eric J. Roseen, Iniya Rajendran, Peter Stein, Lisa Fredman, Howard A. Fink, Michael LaValley, Robert Saper, (Boston University)

Importance: Back pain is the most common cause of disability worldwide. While disability generally is associated with early mortality, the association between back pain and mortality is unclear. Objective: To estimate the association between back pain and mortality and whether this varies by sex, age, and back pain severity. Methods: Multiple electronic databases through November 2018. Analysis included English-language cohort studies that evaluated the association of back pain with mortality in adults over at least five years of follow-up. Three reviewers independently screened the studies, abstracted data, and appraised risk of bias. A random effects model was used to estimate the combined odds ratio (OR) and 95% confidence interval (CI), using the most adjusted model from each study. Potential effect modification was evaluated by performing analyses stratified by sex, age, and back pain severity. We hypothesized that risk of mortality would be highest among older adults, women, and those with more severe back pain, compared to their counterparts. Results: Fourteen studies met eligibility criteria (n=87,937 participants): six included men only, four included women only, and four included both men and women. Follow up ranged from 5 to 23 years. Compared to adults with no back pain, back pain was associated with an increased risk of all-cause mortality (OR: 1.09, 95% CI: 1.00-1.19). Sex-stratified analyses showed elevated mortality risk in women (OR: 1.24, 95% CI: 1.07-1.76), but not men (OR: 0.94, 95% CI: 0.73-1.22). Similarly, whereas less severe back pain was not associated with mortality, more severe back pain was (n=4 studies, OR: 1.26, 1.14-1.40). Risk of mortality associated with back pain did not increase with age (slope per year of mean study age=0.005, p=0.34). Conclusions: Among women, but not men, back pain was associated with a modest increase in risk of all-cause mortality. Additionally, elevated mortality was observed in adults with more severe back pain symptoms.

Meta-analysis of Back Pain and All-Cause Mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrand 1988 M</td>
<td>1.29 (1.01–1.42)</td>
</tr>
<tr>
<td>Penttinen 1994 M1</td>
<td>1.20 (0.90–1.50)</td>
</tr>
<tr>
<td>Penttinen 1994 M2</td>
<td>0.83 (0.75–1.10)</td>
</tr>
<tr>
<td>Heliovaara 1995 M</td>
<td>1.00 (0.90–1.30)</td>
</tr>
<tr>
<td>Heliovaara 1995 F</td>
<td>1.00 (0.90–1.30)</td>
</tr>
<tr>
<td>Karehoit 1998 MF</td>
<td>1.04 (0.90–1.40)</td>
</tr>
<tr>
<td>Jacobs 2005 M</td>
<td>0.41 (0.25–0.68)</td>
</tr>
<tr>
<td>Torrance 2010 MF</td>
<td>1.08 (0.87–1.34)</td>
</tr>
<tr>
<td>Jordan 2010 MF</td>
<td>1.17 (1.12–1.22)</td>
</tr>
<tr>
<td>Zhu 2010 F*</td>
<td>1.85 (1.00–3.43)</td>
</tr>
<tr>
<td>Docking 2014 M*</td>
<td>1.00 (0.50–1.90)</td>
</tr>
<tr>
<td>Docking 2014 F*</td>
<td>1.40 (1.10–1.90)</td>
</tr>
<tr>
<td>Fernandez 2017 MF</td>
<td>1.03 (0.96–1.11)</td>
</tr>
<tr>
<td>Roseen 2017 F*</td>
<td>1.24 (1.11–1.39)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.09 (1.00–1.19)</strong></td>
</tr>
</tbody>
</table>

M Male; F Female; M1 Men ages 30-49; M2 Men ages 50-86; * Frequent/disabling back pain phenotype
FEMALE AGE AT FIRST SEXUAL INTERCOURSE BY BIRTH COHORT AND RURAL-URBAN RESIDENCE

Jaclyn Janis* Jaclyn Janis, Katherine Ahrens, Erika Ziller, (University of Southern Maine)

Background: Previous studies have examined timing of sexual initiation in the United States by birth cohort, time periods, and race/ethnicity, but little is known about rural-urban differences in age at first sex and changes over time. Methods: We used female respondent data (n=29,133) from the National Survey of Family Growth (2006-2010 and 2011-2017) to examine age at first sex. We used the Kaplan-Meier estimator and Cox proportional hazard analyses to assess differences in timing of first vaginal sex with a male partner by rural-urban residence, overall and stratified by 5-year birth cohorts (1968-1997). Cox models were also adjusted for respondent characteristics at childhood and time of interview. We used SAS and SUDAAN survey procedures to account for complex survey design and population weights. Results: Overall, rural women experienced first sex earlier compared to urban women (HR=1.20, 95%CI 1.12, 1.29); for example, 29% of rural women had had first sex by age 16 compared with 24% of urban women. By age 18, 62% of rural women had had sex compared to 54% of urban women. After adjustment, estimates were attenuated, but rural women were still more likely to have experienced first sex at any age compared to urban women (HR =1.07, 95%CI 1.01, 1.13). In unadjusted models, rural women in cohorts 1968-1972, 1973-1977, 1983-1987, and 1988-1992 were more likely to have experienced sex at any age compared to urban women (HR ranged from 1.14 to 1.32); but for only one cohort (1988-1992) was this association found in the adjusted analysis (HR=1.23, 95%CI 1.09, 1.39). No rural-urban difference was found for the birth cohort 1993-1997. Conclusion: Rural women are generally more likely to have had sex at any age compared to urban women, though the rural-urban difference has varied over time. Our results suggest that rural-urban status may need to be taken into account when analyzing sexual behavior trends and the need for education and preventive services.
Organochlorine pesticides (OCs) are organic pollutants commonly detected in humans. Due to concerns of their persistence and adverse impacts on health, the U.S. banned their use in the late 1970s. Using baseline data from a prospective cohort study of Black women aged 23-34 years from Detroit, MI (2010-2012), we examined predictors of commonly detected OC analytes such as Chlordane, dichlorodiphenyltrichloroethane (p,p'-DDT), and dichlorodiphenyldichloroethylene (p,p'-DDE). Non-fasting blood samples were collected from 742 participants at enrollment. Demographic, behavioral, dietary, occupational, and medical history data were collected via self-administered questionnaires, telephone interviews, and in-person clinic visits. We fit linear regression models to calculate percent differences and 95% CIs for each baseline predictor with lipid-adjusted plasma OC concentrations. In models adjusted for all other predictors, the most consistent indicators of elevated plasma OC concentrations were current cigarette smoking (7-18% higher vs. never smokers), poultry intake (9-18% higher for a 5-ounce increase), and tap or bottled water intake (8-15% higher comparing ≥5 glasses/day vs. ≤2 glasses/day). BMI, birth order, and parity were all inversely associated with plasma OC concentrations. A 5-year increase in age was generally not associated with plasma OC concentrations, with the exception of transnonachlor (95% CI=12-42). Relative to not having been breastfed, having been breastfed as an infant for ≥3 months was associated with 15% higher transnonachlor (95% CI=5-27) and 15% higher p,p'-DDE (95% CI=6-25). Farm residence, or visitation, before the age of 18 was associated with 21-32% higher plasma concentrations of transnonachlor, p,p'-DDE and p,p'-DDT. Current smoking, greater poultry and water intake, age, breastfeeding, and farm exposure were associated with higher plasma OC concentrations.
CHARACTERISTICS OF WOMEN WITH HYPERTENSIVE DISORDERS OF PREGNANCY AND FUTURE CARDIOVASCULAR DISEASES  Ugochinyere Vivian Ukah* Ugochinyere Vivian Ukah, Natalie Dayan, Nathalie Auger, Robert W Platt, (Department of Epidemiology, Biostatistics and Occupational Health, McGill University)

Background: Hypertensive disorders of pregnancies (HDP) complicate 5-10% of pregnancies and are associated with severe maternal and perinatal outcomes. HDPs increase the risk of developing future cardiovascular diseases (CVD). Certain factors may contribute to the increased risks of CVD in women with HDP. Therefore, we sought to describe the characteristics of women with a history of HDP according to their future CVD status. Methodology: MED-ECHO dataset consisting of all women who delivered in hospitals in the Quebec province of Canada between 1989 and 2016 was used. The analyses were restricted to women who had a history of HDP in any pregnancy and no pre-existing CVD. HDPs were defined as chronic hypertension, gestational hypertension, pre-eclampsia/eclampsia, and superimposed pre-eclampsia, using International Classification of Diseases (ICD) codes. Outcomes were CVD outcomes also identified using ICD codes which included heart diseases e.g. heart failure, cerebrovascular diseases e.g. stroke pulmonary heart diseases, procedures involving the heart and blood vessels, and coronary care unit admission. The demographics and characteristics of women with and without CVD were presented. Results: Of 2,197,124 pregnancies admitted for hospital delivery, HDP occurred in n=60,850 (5.2%), with the majority (69.7%) occurring in first births. Among women with HDP, the rate of CVD was 9.8% (Table 1). Women who developed CVD were more likely to be older, have had substance abuse during pregnancy, pre-existing diabetes, and socio-economic disadvantage compared with women without CVD. Women with CVD were also more likely to have a history of gestational diabetes and adverse perinatal outcomes such as preterm delivery and stillbirth. Conclusion: Future studies should investigate whether these identified factors e.g. substance abuse, diabetes, socio-economic disadvantage, preterm delivery and stillbirth, can be used to predict the risk of future CVD in women with a history of HDP.
IS SOCIAL ISOLATION AS BAD FOR HEALTH AS SMOKING 15 CIGARETTES PER DAY? 
FINDINGS FROM TWO LARGE PROSPECTIVE UK COHORTS. Robert Smith* Robert Smith, Isobel Barnes, Gillian Reeves, Jane Green, Valerie Beral, Sarah Floud, (Cancer Epidemiology Unit, Nuffield Department of Population Health, University of Oxford)

Background: Social isolation has been associated with increased mortality, and a much-cited previous review stated that the risk is comparable to smoking 15 cigarettes per day. However, the available evidence is inconsistent. We examined social isolation in relation to all-cause mortality in two UK prospective cohorts, and assessed whether the excess risk associated with social isolation was comparable to that for smoking 15 cigarettes per day. Methods: After excluding people with vascular disease, cancer or low self-rated health, to minimise reverse causation bias, 326,169 Million Women Study (MWS) participants (mean age=68 years) and 296,913 UK Biobank (UKB) participants (mean age=56 years), were followed for death. Social isolation was measured using an index of self-reported frequency of contact with family or friends, social group contact, and living alone. Adjusted RRs for all-cause mortality were calculated using Cox regression, comparing most isolated participants to the least isolated. Analyses adjusted for smoking and 12 possible confounding factors.

Results: Within each cohort, about 12% of participants were classified as most isolated and 44% as least isolated. Over 5.9 years of follow-up, 9667 MWS participants died; the most isolated had about a 30% excess risk of all-cause mortality compared to the least isolated (RR=1.28, 1.19-1.38). Over 6.8 years follow-up, 4694 UKB participants died; the most isolated had about a 40% excess risk of mortality compared to the least isolated (RR=1.38, 1.27-1.51). Of the constituent measures contributing to isolation, living alone was most consistently associated with an excess mortality. Previous analyses in MWS found smoking 15 cigarettes per day was associated with about a 180% excess risk of mortality compared to never smokers (RR=2.77, 2.72-2.82).

Conclusion: While social isolation was associated with about a 30-40% excess risk of all-cause mortality, the excess risk associated with smoking 15 cigarettes per day was 4-6 fold greater.
STATE-LEVEL SOCIAL CAPITAL IN RELATION TO COUNTY-LEVEL SUICIDE IN THE UNITED STATES: A MULTILEVEL ANALYSIS

Saloni Dev* Daniel Kim, Saloni Dev, Daniel Kim,
(Department of Health Sciences, Bouvé College of Health Sciences, Northeastern University, Boston, MA)

Background: Between 1999 and 2017, age-adjusted suicide rates escalated by 33% in the United States. While our knowledge about the proximal determinants of suicide is growing and is being employed to prevent suicide, suicide rates are still rising. This worsening trend calls for increased efforts to identify upstream determinants of suicide to inform future strategies for reducing its overall burden. Social capital, a key social determinant of health, is plausibly protective against suicide. Yet to date, empirical evidence on this association is lacking.

Objective: To estimate the lagged effects of state-level social capital on county-level suicide rates in the United States. Methods: Using multilevel linear regression models, we explored an updated version of Putnam’s state social capital index by Kim et al. (derived from 14 social capital indicators measured in the 1990s) as a predictor of pooled age-adjusted suicide rates from 2010-2017 across 2,112 counties of the United States as reported by the CDC. All models controlled for multiple demographic and socioeconomic confounders. We further examined gender- and race-specific county suicide rates. Finally, we tested for mediation of these associations by state-level prevalence of alcohol use and substance use disorders using the Baron and Kenny approach and the Sobel test. Results: A 1-standard deviation increase in state-level social capital predicted a 0.72 per 100,000 lower county-level suicide rate (p=0.07). This association was stronger among Blacks (2.38 fewer suicides per 100,000; p<0.001) than Whites (1.86 fewer suicides per 100,000; p=0.002) and among men (1.63 fewer suicides per 100,000; p=0.01) than women (0.64 fewer suicides per 100,000; p=0.03). We found no evidence of mediation by alcohol or substance use disorders. Conclusions: Our findings suggest that raising levels of state social capital may help reverse the recent alarming suicide trends in the United States, particularly among Blacks and men.
Suicide is a leading cause of death for Americans, claiming 45,000 lives in 2016; rates have increased by >30% in half of U.S. states since 1999. The generosity of social welfare policies can impact life quality of individuals targeted by such policies, but few studies have attempted to quantify mental health impacts. Our aim was to estimate effects of state minimum wage laws on suicide rates in the U.S. We used difference-in-differences and difference-in-difference-in-differences approaches by state and month, for all 50 states and Washington, D.C. from 1990-2015. We evaluated two exposures: (1) the difference between state and federal minimum wage in 2015 dollars defined by the date the state law became effective, and (2) the same metric lagged by one year. We obtained suicide counts by month and state from the National Vital Statistics System, and state population totals by month from the University of Kentucky Center for Poverty Research. All models included state and year fixed effects and state-specific covariates. In difference-in-difference-in-differences models, we used educational attainment level to differentiate within-state treatment (≤high school diploma) and control (≥college degree) groups. Across different model specifications, the effect of a one-year lagged minimum wage increase ranged from a 1.1% decrease (95% CI: 0.0, 2.2) to a 7.6% decrease (95% CI: 0.8, 13.9) in the suicide rate for every dollar increase in the minimum wage. Similar patterns were seen for models with an unlagged minimum wage, with the effect ranging from a 1.9% (95% CI: 0.4, 3.3) to a 7.4% (95% CI: -0.1, 14.3) decrease in the suicide rate across different model specifications. To our knowledge this is the first study of the effect of U.S. state minimum wage policies on suicide rates. Based on our findings, if all states in 2016 had increased their minimum wages by one dollar, between 495 and 3,420 fewer suicides may have been occurred that year.

Background: Despite an increasing pre-exposure prophylaxis (PrEP) use among populations at highest risk of HIV acquisition, comprehensive and easy access to PrEP is limited among racial/ethnic minorities and low-income populations. The present study analyzed the geographic distribution of PrEP providers and the relationship between their location, neighborhood socio-demographics and HIV prevalence using spatial analytic methods. Methods: PrEP provider density, socio-demographics (including race/ethnicity, income, and same-sex couple household), HIV/AIDS prevalence data were collected by ZIP code tabulation area (ZCTA) in New York City (NYC). Non/spatial and spatially adjusted Spearman correlation tests, as well as non-spatial (i.e. ordinary least squares) and spatial (i.e. spatial error and lag) regression models were specified to identify the associations between PrEP provider density and neighborhood characteristics. Results: Spatial autocorrelation in residuals of the non-spatial regression model was found (Moran’s I = 0.17, p-value<0.01), confirming need for spatial models. ZCTA-level HIV prevalence was positively associated with PrEP provider density (p<0.01) from spatial error and lag models. Neighborhood socio-demographic measures of race/ethnicity, income, or same-sex couple household, were not associated with PrEP provider density in NYC, after adjusting for spatial autocorrelation. Discussion: In NYC, there was no geographic disparities of PrEP access in terms of neighborhood socio-demographic characteristics, and PrEP providers were located in neighborhoods with high prevalence of HIV. These findings not only support ongoing policy interventions (e.g. public health detailing) vis-à-vis PrEP provider locations in NYC, but also be valuable for designing future PrEP implementation strategies, such as public health campaigns and assistance for low-cost insurance.

S/P indicates work done while a student/postdoc
DECREASED EMERGENCY DEPARTMENT USAGE RATE FOLLOWING POLICE KILLINGS OF UNARMED BLACK NEW YORKERS IN 2013-2014 Sze Yan Liu*, Sze Yan Liu, Sungwoo Lim, (NYC DOHMH)

Police killings of unarmed black Americans are acts of structural racism with possible spillover effects to the larger black community. This is the first study to examine the impact of knowledge of such killings on medical utilization with analysis focused on New York State for 2013-2014. Cases of police killings of unarmed blacks in New York States were identified in the Mapping Police Violence database. We varied the exposure period as the 2 - 5 weeks after a police killing. We used New York’s Statewide Planning and Research Cooperative System event-level emergency department claims data to calculate daily overall and mental health-related ED rates with the Census 2010 race-specific NYS population estimates as the denominator. Mental health-related ED visits were defined as a visit with a principal or secondary mental health disorder diagnosis code (ICD-9-CMV codes 290–319). We used robust regression discontinuity models to estimate the average effect at the cutoff (i.e. time immediately after the police killing) using a local linear regression estimator that restricted the sample to an algorithm-determined optimal bandwidth. To account for residual temporal variation, we adjusted for year, season, and day of week and estimated robust standard errors clustered for date of ED visit. There were six police killing incidents that met our eligibility criteria in 2013-2014, including the well-publicized cases of Eric Garner and Akai Gurley. Police killings reduced ED rate among the black population by 17.6 – 19.6 per 100,000. No significant reduction in ED visits was observed among whites. We also found a small, non-statistically significant decrease in mental-health related ED visits among blacks but not whites after police killings. The results suggest police killings of unarmed individuals are acts of collective trauma that may adversely impact the healthcare utilization behavior of the targeted population and these health impacts warrant further research.

S/P indicates work done while a student/postdoc
EVALUATION OF CAUSAL EFFECTS OF TIME-VARYING PRESCRIPTION OPIOID USE ON MORTALITY AMONG INSURED ADULTS IN THE UNITED STATES Hilary A Aroke* Hilary A Aroke, Tianyu Sun, MS, Jeffrey Bratberg, PharmD, Joseph Hogan, PhD, Josiah Rich, MD MPH, Stephen Kogut, PhD MBA RPh,, Ashley Buchanan, DrPH MS1, (University of Rhode Island)

Background: Several studies have shown that long-term prescription opioid use (POU) increases the risk of death. However, POU is a time-varying exposure subject to time-varying confounding and informative loss to follow-up. Objective: To estimate the causal effects of time-varying prescription opioids use on mortality. Methods: Using de-identified national claims data (Optum Clininformatics® Data Mart) from 2010 to 2015 we identified adults with any POU who were opioid naïve with no claims for OUD, cancer, or palliative care at baseline. Initial POU for all patients during the first 6 months was categorized either as daily, if patient had > 90 days’ supply of prescription opioids or as non-daily otherwise. POU and covariate information (e.g., comorbidity index, claims for cancer, hospice care, OUD, etc.) were updated at 6 month intervals until death, loss of enrollment, dropout or study completion, whichever came first. Using a case-cohort design, a marginal structural Cox model was fit with inverse probability-weighted estimation accounting for time-varying confounding and possibly informative dropout to quantify the effects of time-varying POU on mortality. Results: The case-cohort sample had 575,654 subjects: 57% were female; 28% had Medicare; median age was 52 years; median follow-up was 1.6 years with a total of 5,382,032 person-years at-risk and 18,073 (3.14%) deaths. Overall crude death rate was 336/100,000/y. Compared with patients without additional POU during follow-up, the hazards of all-cause mortality among patients with daily and non-daily use were significantly higher (hazard ratio [HR] = 3.02; 95% confidence interval [CI]: 2.85, 3.21 and 1.70; 95% CI: 1.66, 1.72, respectively). Conclusion: After accounting for measured time-varying confounders and determinants of dropout, time-varying POU among those opioid naïve at baseline is associated with mortality. The hazard of mortality increases with intensity of POU over time.

S/P indicates work done while a student/postdoc
A small body of research suggests that exploitation, or the process of purchasing labor for less than the full value of the products of that labor, may be an important social determinant of mental illness. We conducted a lagged longitudinal analysis of the relationship between exploitation and mental illness with data from the 1983 – 2015 waves of the Panel Study of Income Dynamics. Exploitation was operationalized as the percentage of their wage or salary that full-time workers were hypothetically not paid for productive hours, based on a 40-hour work week and the number of hours they actually worked. Mental illness was measured with the Kessler 6 scale. We used a cut point of $5 \leq \text{K6} < 13$, which has been shown to capture mental distress necessitating mental health treatment and causing impairments in functioning. We fit lagged multi-level logistic models with a random intercept for individuals, who were clustered over time. (We will also fit fixed-effects and inverse-probability-weighted marginal structural models, to triangulate our inferences and attempt to rule out selection effects and time-varying confounding.) Initial findings indicate that an increase in exploitation in the prior wave is associated with 29% increase in the odds of mental illness (OR: 1.29, 95% CI: 1.09-1.52) after adjusting for sex, race, occupation, and childhood history of depression or other psychiatric problems. Our findings provide further evidence that exploitation is a social determinant of mental illness, and suggest key levers for policy and structural interventions, including living wages and stricter and more expansive overtime regulations, workweek reforms, and worker-cooperatives.
CANCER PAIN IN RELATION TO NURSING HOME RACIAL/ETHNIC COMPOSITION AND METROPOLITAN AREA SEGREGATION William M. Jesdale* William M. Jesdale, Sarah N. Forrester, (University of Massachusetts Medical School, Population and Quantitative Health Sciences)

Background: Racial/ethnic disparities in pain among US nursing home (NH) residents persist. Objectives: To estimate pain reporting among residents with cancer in relation to metropolitan area segregation and NH racial/ethnic composition. Research Design: Cross-sectional Subjects: 384,048 newly admitted Black (B), Hispanic (H), or White (W) residents with cancer in 12,096 US NHs (2011-2013) Measures: Using the Minimum Data Set 3.0, pain in past 5 days was determined by self-report or use of pain management. Theil's entropy index, a measure of metropolitan area segregation, was categorized [high (up to 0.20), very high (0.20-0.30), or extreme (0.30-0.53)]. Results: Pain prevalence decreased across segregation level [Black: high: 77%, very high: 75%, extreme: 72%; Hispanic: high: 79%, very high: 77%, extreme: 70%; White: high: 80%, very high: 77%, extreme: 74%]. In extremely segregated areas, all residents were less likely to have recorded pain (adjusted prevalence ratios: B: 4.7% less likely, 95% Confidence interval (CI): 3.2%-6.2%; H: 7.0% less likely, 95% CI: 4.2%-9.6%; W: 7.4% less likely, 95% CI: 6.6%-8.3%) than in the least segregated areas. At all segregation levels, pain was recorded more frequently for residents (B or W) in predominantly White (>80%) NHs than in mostly Black (>50%) NHs or residents (H or W) in predominantly White NHs than mostly Hispanic (>50%) NHs. Conclusions: Whether differential pain recording across homes in greater areas of racial/ethnic segregation occurs through the inequitable distribution of resources between NHs, different resident-provider empathy, varying levels of trust in more segregated settings, or other factors requires further study.

S/P indicates work done while a student/postdoc
The assumption of positivity in causal inference requires that all individuals have a non-zero probability of receiving all available treatments. In most instances, positivity is merely assumed as there is no way to affirm it. According to causal inference theory, if we are unable or unwilling to assume positivity, then effect estimates cannot be interpreted causally. In the specific case of natural-cause mortality among US astronauts and Soviet and Russian cosmonauts, the assumption of positivity is demonstrably violated. US astronauts could not have joined the Soviet or Russian Cosmonaut Corps, or vice versa. Thus, theoretically, no causal "treatment effect" of being a cosmonaut can be estimated. Though the members of each cohort could not have joined a different agency, the astronaut and cosmonaut cohorts are remarkably similar. This stems from thirty years of similarly stringent medical and occupational selection criteria, followed by 20 years of explicitly shared criteria during the agencies’ cooperation on the International Space Station. This intentional selection bias makes achieving covariate balance through propensity analysis simple and effective. Through careful examination of the selection processes of the two cohorts, baseline characteristics before and after IP weighting, and effect estimates from standardized mortality ratios, Poisson regression, and marginal structural Poisson models, we build the argument that situations of strong selection bias can create pseudo-positivity, making the de facto violation of positivity ignorable in practice.
INTERACTION OF MARIJUANA AND ALCOHOL ON FATAL CRASH RISK IN MALE AND FEMALE DRIVERS
Stanford Chihuri* Stanford Chihuri, Guohua Li, (stc2126@cumc.columbia.edu)

Recent research indicates that concurrent use marijuana and alcohol confers a positive interaction effect on the risk of fatal crash involvement on the additive scale. We assessed individual and joint effects of marijuana and alcohol on fatal crash risk among male and female drivers using a case-control design. Data on 2157 cases (1744 male and 413 female drivers) and 15600 controls (9167 male and 6307 female drivers) were obtained from the 2006-2008 and 2012 to 2014 Fatality Analysis Reporting System and the 2007 and 2013-2014 National Roadside Surveys, respectively. Cases were drivers who died at the crash scene and were tested for alcohol and drugs based on blood specimens. Controls were drivers who participated in the 2007 and 2013-2014 National Roadside Surveys. Cases and controls were matched on time of day, day of week and month of year. Cases were more likely than controls to test positive for marijuana (15.8% vs. 6.5%, p<0.001), alcohol (60.8% vs. 7.1%, p<0.001) and both substances (10.9% vs. 0.4%, p<0.001). Among male and female drivers, adjusted odds ratios of fatal crash involvement were 2.54 [95% confidence interval (CI): 1.95-3.30] and 2.41 [95% CI: 1.42-4.07] for those testing positive for marijuana and negative for alcohol, 23.01 (95% CI: 19.72-26.84) and 14.24 (95% CI: 10.90-18.62) for those testing negative for marijuana and positive for alcohol, and 42.43 (95% CI: 31.43-57.28) and 24.32 (95% CI: 13.59-43.51) for those testing positive for both substances, relative to drivers testing negative for both substances, respectively. There was a significant positive interaction between marijuana and alcohol on the additive scale (RERI=17.9 95%CI: 5.60-30.19) among male drivers but not among female drivers. These results suggest that concurrent use of marijuana and alcohol is associated with substantially increased risk of fatal crash involvement in both male and female drivers and the excess risk appears to be greater in male than in female drivers.
EVALUATION OF THE AUTOREGRESSIVE CROSS-LAGGED EFFECTS AMONG ADOLESCENTS' SMARTPHONE ADDICTION AND ONLINE/OFFLINE DELINQUENCY Courtney Blondino* Jong Hyung Lee, (Department of Family Medicine and Population Health, Division of Epidemiology, Virginia Commonwealth University)

The purpose of this study was to estimate and test the causal relationship among adolescents' smartphone addiction (SPAD), online delinquency (OND), and offline delinquency (OFFD). For this purpose, we used the autoregressive cross-lagged (ARCL) model using the longitudinal data of T3 (2012)-T6 (2015) (grades 9-12) collected by Korean Children and Youth Panel Survey (KCYPs) since 2010. So we conducted a multi-group analysis to find out whether there were gender differences in the relationships between the three variables. The main findings are as follows: First, the relationships between SPAD, OND, and OFFD and their measurement variables had the measurement invariance within the time frame from T3 to T6. Second, after we estimated the autoregressive coefficients of SPAD, OND, and OFFD over four years, SPAD, OND, and OFFD from the previous year had significant positive effects on SPAD, OND, and OFFD in the following year, respectively. Third, we confirmed the longitudinal relationships between SPAD, OND, and OFFD as a recursive (or unidirectional) relationship. That is, the OFFD from the previous year had a significant positive effect on the OND the following year, and the OND from the previous year had a significant positive effect on the SPAD the following year. However, the SPAD from the previous year did not affect the OND and OFFD the following year, and the OND and OFFD from the previous year did not affect the OFFD and SPAD the following year. Fourth, the longitudinal relationship between these latent variables showed a statistically similar pattern between male and female groups but showed a slight difference in their influence. Based on the study results, we strongly suggest the need for developing public health approaches and interventions to reduce risk on SPAD, OND, and OFFD for adolescents.
**MOTIVATIONS FOR HEALTH EXAMINATIONS AND ALL-CAUSE MORTALITY: THE KOREAN CANCER PREVENTION STUDY II**

Jooeun Jeon* Keum Ji Jung, Jooeun Jeon, (Department of Epidemiology and Health Promotion, Institute for Health Promotion, Graduate School of Public Health, Yonsei University)

**Background:** The number of health examinations is increasing but, the relationship of reasons for health examination and mortality is unknown. We examined the associations between the motivations for health examinations and all-cause mortality. Methods: In the Korean Cancer Prevention Study II, 34,883 participants who were more than 20 years old and who had received health examinations responded to questions about their motivations for the examinations. During the 8.7 year follow-up (302,093 person years), 408 deaths were documented. Results: The age-adjusted death rate per 100,000 person-years was 184.8. Adjusting for covariates, participants who received a health examination due to adverse symptoms or at the suggestion of a health professional were 2.4-times (95% CI: 1.6-3.7) and 2.0-times (95% CI: 1.2-3.4) higher at risk for mortality than those screened routinely. However, after stratifying by socio-economic status, participants who received a health examination due to at the suggestion of a health professional had the highest significant association with mortality in high-income (HR=8.1, 95% CI: 1.5-45.0) and high-education level (HR=2.9, 95% CI: 1.5-5.6). Conclusions: This study provides that the subjective part of various motivations or the influencing factors on the intention of taking screening could provide simple indicators of mortality risk that is independent of other commonly assessed risk factors in Korean. Keywords: Mortality, Health examination, Self-perception, Motivations *This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2016R1A6A3A11933465). ‡Keum Ji Jung, PhD, MPH (Corresponding Author): kjjung@yuhs.ac

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**Graph:**

- **Low income**
  - Screening by self-decision (i.e. anxiety)
  - Screening due to adverse symptoms
  - Screening suggested by health professional
  - Screening by suggestion of family members and friends
  - Screening at work
  - Others
  - Regular screening

- **Middle income**

- **High income**

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S/P indicates work done while a student/postdoc
ATTITUDES AND PRACTICES ABOUT SKIN CANCER PREVENTION AMONG PATIENTS WITH DERMATOLOGICAL ISSUES Thi Huyen Trang Nguyen* Thi Huyen Trang Nguyen, Thi Huyen Trang Nguyen, (National Cancer Center-Graduate School of Cancer Science and Policy)

Background: Raising awareness and practices on skin cancer prevention are critical in the context of adversely increasing effects on global climate change. This study aims to investigate the knowledge, attitudes, and practice regarding skin cancer prevention and determine its associated factors among dermatological patients in Vietnam.

Methods: A cross-sectional study included 590 dermatological patients aged between 18 to 82 years old, who were received examination or treatment from the National Hospital of Dermatology in Hanoi (Vietnam) from September to December 2018. The attitude on skin cancer was assessed by using the Likert scales to evaluate the practice of skin cancer prevention. Multivariate logistic regression and Tobit regression was used to identify factors associated with awareness about skin cancer. Results: Out of 590 respondents, the majority of the respondents were correct to answer questions about the knowledge of skin cancer. Among the participants, 62.6% knew that skin cancer is benign whereas 35.4% supposed that it can be deadly. Regarding awareness, participants who thought that they had risks of skin cancer accounted for 39.8%, and 13.8% believed their occupation increasing the skin cancer risk. For practices in prevention, most of respondents used hat (94.9%), sunscreen coat (89.5%), went in the shade (86.3%), used an umbrella when exposing to the sun (78.9%). Women were less likely to aware of skin cancer risk but more likely to have prevention behaviors than men. Respondents who received the information from the internet, mobile phone and local speakers tended to have better attitudes and practices of skin cancer. Conclusion: This research highlights the importance of education to raise attitude and apply more into practices in skin cancer prevention in Vietnam. Keyword: skin cancer, knowledge, attitude, practices, associated factors.
A SYSTEMATIC REVIEW OF THE USE OF PROPENSITY SCORES IN CARDIOVASCULAR LITERATURE
Brice Batomen* Brice Batomen, Michelle Samuel, Julie Rouette, Joanne Kim, Robert W Platt,
James Brophy, Jay S Kaufman, (McGill University)

Background: Previous assessments found that propensity score (PS) methods are reported inadequately in cardiovascular literature. An updated comprehensive review of PS reporting and causal interpretations in cardiovascular literature is needed. Objectives: To conduct a systematic review of the use, reporting, and interpretation of PS methods in cardiovascular publications. Methods: Cardiovascular articles using PS methods published between 2010-2017 in high-impact medical (5) and cardiovascular (3) journals were identified. Keywords included propensity, inverse probability weighting (IPW), marginal structural models, targeted maximum likelihood estimation, and doubly robust. Data extraction elements were based on PS literature, with a focus on causal interpretations and target population. Data collection form was reviewed by investigators and pilot tested. Each article was assessed independently by 2 reviewers. Results: A total of 296 articles were included. The most commonly used PS method was matching (53%), followed by multiple methods (19%), direct adjustment (13%), IPW (12%), and stratification (3%). In 48% of the articles, interpretations of the effect estimates did not correspond to the PS method described. Whereas a priori identification of confounders is preferred, 17% of publications used statistical testing to identify variables for the PS model. Balance was not assessed in 16% of articles. Of those who assessed balance, only 55% reported standardized differences. Among articles that used PS matching, 21% did not describe their matching strategy and 8% did not present the post-match balance of covariates. Furthermore, 17% of studies matched <50% of the available treated (or untreated, based on targeted parameter) subjects. Conclusions: Details of PS methods were generally well reported in cardiovascular articles published in high-impact journals, however, the interpretation of the effect estimates was inaccurate in almost half of reviewed articles.
ADVERSE PERCEIVED NEIGHBORHOOD SOCIAL ENVIRONMENT IS ASSOCIATED WITH INCREASED SEVERITY OF DEPRESSIVE SYMPTOMS: DATA FROM THE JACKSON HEART STUDY

Steven Langerman*, Steven Langerman, Tiffany M. Powell Wiley, Marcus Andrews, Joniqua Ceasar, Mario Sims, Jae Eun Lee, Kosuke Tamura, (National Heart, Lung, and Blood Institute)

Background: Depression is a major public health issue in the U.S. and is associated with increased risk of cardiovascular disease and mortality, particularly among African-American (AA) adults. Neighborhood factors are known contributors to depression, but little is understood about the relationship between neighborhood social environment (NSE) and depression in AA populations. The objective of this study was to examine associations between NSE and depressive symptoms in AA adults. Methods: We used baseline data from the Jackson Heart Study, a single-site, prospective, community-based study of AA adults in Jackson, MS. Perceived NSE variables included scores for neighborhood problems, neighborhood violence, and neighborhood social cohesion. Depressive symptoms were measured by the Center for Epidemiologic Studies Depression (CES-D) score as a continuous variable. Multi-level modeling for incorporating the hierarchical nature of the data into analyses was used to estimate associations between NSE and CES-D score, adjusting for demographics (e.g., age), health-related factors (e.g., smoking), and built environment variables (e.g., population density). Results: Our study population (N=3110) was 64.5% female with a mean age of 54 (SD=13) years and a mean CES-D score of 10.9 (SD=8.1). In the fully-adjusted model, we found a positive association between neighborhood problems and CES-D score (B=3.30; 95% CI=1.40, 5.21) and between neighborhood violence and CES-D score (B=4.42; 95% CI=1.65, 7.18). There was no significant association between neighborhood social cohesion and CES-D score. Conclusion: Higher levels of perceived neighborhood problems and violence were positively associated with depressive symptoms among AA adults. Policy interventions which seek to mitigate adverse neighborhood perceptions could reduce depression in this population. Further research will investigate potential modifiers in the associations between NSE and depressive symptoms.
THE USE OF MARIJUANA OR HASHISH AND ITS ASSOCIATION WITH THE RECEIPT OF FLU VACCINATION AMONG ADULTS RESIDING IN THE US: RESULTS FROM THE BRFSS 2016 STUDY S. Cristina Oancea* S. Cristina Oancea, Gary Wu, (University of North Dakota, School of Medicine and Health Sciences, Department of Population Health)

The National Survey on Drug Use and Health reported that in 2015 marijuana was the most used illicit drug in the US, with more than 22.2 million users in the past month. The use of marijuana or hashish (MH) has been shown to have negative health effects such as: impaired memory, hallucinations, chronic bronchitis, and cancer. The annual flu vaccination (AFV) is an effective way to reduce the effect and complications created by the seasonal flu. This is very important especially for health compromised individuals. The current study investigates the association between the use of MH and the receipt of AFV using the BRFSS 2016 US survey. Weighted and adjusted multivariable logistic regression models were employed to investigate this association among 39,057 non-pregnant adults, ages 18 to 79 years old, residing in 12 US states. The weighted prevalence of current MH use was 15.74% and of the AFV was 36.16%. The prevalence of AFV was significantly lower among MH versus non-MH users, 24.46% versus 38.35%, respectively (p-value < 0.0001). After adjusting for age, gender, race, marital status, education, income, health insurance, employment and current cigarette smoking status, the weighted and adjusted odds of receiving the AFV among current MH users were 20% significantly lower (odds ratio 0.80; 95% confidence interval: 0.65 to 0.97) than among non-MH users. The results of the current study emphasize the importance of public health interventions among MH users in order to increase the rates of AFV in this population at risk of major health problems.
ASSOCIATION BETWEEN DIET AND PLASMA CONCENTRATIONS OF PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES: AN APPLICATION OF WEIGHTED QUANTILE SUM REGRESSION


European Food Safety Authority (EFSA) recently issued provisional tolerable weekly intakes (TWIs) for two widespread perfluoroalkyl and polyfluoroalkyl substances (PFASs); PFOA and PFOS. Diet is one of the main sources of exposure to PFASs, but limited information is available on the association between diet and circulating blood levels of PFASs. We evaluated cross-sectional associations between diet and plasma PFAS concentrations among prediabetic adults enrolled in the Diabetic Prevention Program 1996-1999. We used weighted quantile sum (WQS) regression to estimate the total effect of the dietary mixture on plasma concentrations of each PFAS, adjusted for age, sex, race, marital status, education, income, smoking, waist circumference and total caloric intake. We developed two weighted dietary indices for each PFAS, one constrained to be positively and one constrained to be negatively associated with PFAS concentrations. Participants (N=941; 65% female, 58% Caucasian, 68% married) had similar plasma PFAS concentrations compared to the general US population measured in 1999-2000. A “positively constrained” WQS index was associated with MeFOSAA [β=0.18, (95% CI: 0.09, 0.27)], and within the mixture, intakes of sweets/dessert had the highest weight (14%), followed by meat (12%), fish/shellfish (11%), and grains (10%), and coffee/tea (9%). A “positively constrained WQS index was also associated with PFNA [β=0.19, (95% CI: 0.13, 0.32)], and the predominate dietary contributions came from other fish/shellfish, poultry, sweets/dessert, and dairy. The “negatively constrained” WQS indices were predominately composed of vegetable food groups and associations with PFAS concentrations were not statistically significant. We concluded WQS regression can be a useful method to identify food items and diet mixture associated with elevated PFAS exposure; however, it should be used in conjunction with other dietary pattern analyses to provide comprehensive assessments for health outcome studies.

Introduction: Obesity is a serious epidemic in the United States. One area of particular concern in regards to obesity’s morbidity impact is women's reproductive health. Prior studies have shown that obesity impacts fertility due to alterations in reproductive hormones and menstrual cycle function. Most existing studies, however, focus on assessing the link between maternal pre-pregnancy BMI and pregnancy outcomes among women undergoing infertility treatment; there is little research looking at the association between pre-pregnancy BMI and infertility within population-based cohorts. Methods: A stratified (by education and birth weight) systematic sample of 5,770 mothers taking part in the Utah Pregnancy Risk Assessment Monitoring System, 2012–2015, were included. Relationships between maternal pre-pregnancy BMI and infertility (reported time trying or use of fertility-enhancing drugs) were evaluated via Poisson regression models, adjusting for maternal age, income, education, and race/ethnicity. Results: Women who were under-, over-, and obese were more likely (adjusted prevalence ratio [aPR]: 1.3 [95% CI: 0.5, 3.1]; aPR: 1.3 [95% CI: 0.8, 1.9]; and 2.4 [95% CI: 1.6, 3.5], respectively) to report trying >25 months vs <12 months to achieve pregnancy compared to normal weight women. While there were no clear associations between under- or over-weight women in relation to use of fertility-enhancing drugs (aPR: 0.8, [95% CI: 0.3, 2.3] and aPR: 0.9 [95% CI: 0.6, 1.4]), obese compared to normal weight women were more likely to report (aPR: 1.7 [95% CI: 1.2, 2.5]). Conclusion: In this population-based study among new mothers, with targeted sampling for high risk populations, we found that while under- or over-weight women, compared to normal-weight women, did not report higher infertility, obese women did. Preconception lifestyle, nutrition, and weight loss counseling targeted at obese, but not necessarily overweight women, may reduce risk of infertility.
ESTIMATING MEASURES OF INTERACTION IN THE ADDITIVE SCALE TO ASSESS SUICIDE RISK AMONG SEXUAL MINORITY AND DISABLED YOUTH Cesar Higgins Tejera* Cesar Higgins Tejera, Willi Horner-Johnson, (Oregon Health and Science University)

Introduction: Youth with disabilities or with a diverse sexual orientation have been found to be at increased odds of suicidal ideation and suicide attempts. To date, most epidemiologic analyses regarding suicide risk among youth with disabilities and diverse sexual orientation have focused on the individualized effect of each identity, ignoring the possibility of a synergistic effect between the two. Recently, epidemiologists have proposed the use of statistical interaction in the additive scale to quantify intersectional disparities. Therefore, the objective of this study is to estimate diverse measures of interaction in the additive scale to assess whether youth with intersectional identities (disabled and sexual minority) are at a multiplicative risk of suicide. Methods and Results: We analyzed cross-sectional data from the 2015 and 2017 Oregon Healthy Teens Survey. A total of 25,476 11th graders participated in the survey. We used Poisson regression analysis with robust variance to estimate Prevalence Ratios (PRs). We derived three measures of interaction in the additive scale 1) the excess risk due to interaction (RERI); 2) the proportion attributable to interaction (AP); and 3) the synergy index (SI) and their respective CIs using the delta method proposed by Hosmer and Lemeshow. Our initial model shows that the PR of suicide among youth with intersectional identities is 2.65 (CI: 1.70 - 4.14) times the PR of youth with diverse sexual orientation only and 2.23 (CI: 1.70 - 2.91) times the PR of youth with a disability only. Additionally, the RERI= 2.94 (95%CI: -0.13 – 6.01); the AP=0.26 (95% CI: 0.37 – 0.49); and the SI=1.41 (95% CI: 0.99 – 1.98), suggesting that the risk of suicide among youth with intersectional identities is more than additive. Conclusion: Our findings suggest the combination of disability and minority sexual orientation may be associated with compounded negative experiences that could exacerbate the risk of suicide.
ACQUIRED HEARING LOSS AND DEPRESSION AMONG ADULTS RESIDING IN BRAZIL: A NATIONAL LEVEL STUDY  S. Cristina Oancea* S. Cristina Oancea, Courtney A. Brackin, Luciana B. Nucci, (University of North Dakota, School of Medicine and Health Sciences, Department of Population Health)

Purpose There is limited literature regarding the association between acquired hearing loss (AHL) and current depression (D) in South American countries. The purpose of this study was to investigate the relationship between AHL and D among adult Brazilians. This study consisted of a large, representative sample of young (YA; 18-39 years old), middle-aged (MAA; 40-59 years old), and older adults (OA; 60+ years old) residing in Brazil.

Methods The 2013 Brazilian National Health Survey data was utilized for this cross-sectional study. Pregnant women, individuals born with hearing loss, and those using hearing aids were excluded from the study. The exposure was self-reported AHL, and the outcome was D measured by the Personal Health Questionnaire depression scale (PHQ-8). To investigate the relationship between AHL and D, multivariable weighted and adjusted logistic regression models were conducted while adjusting for sociodemographic and health related factors.

Results In the final study sample (N=59,092; YA=27,751, MAA=20,312) of adult Brazilians, the prevalence of D was 7.99% and of AHL was 1.94%. Those with AHL had 103% significant increase in the odds of depression (adjusted odds ratio (AOR)=2.03, 95%CI: 1.55-2.67) compared to those without AHL. Among YA there was no significant association between AHL and D (AOR=2.15, 95%CI: 0.73-6.28). On the other hand, there was a significant association among MAA (AOR=2.39, 95%CI: 1.50-3.80) and OA (AOR=1.82, 95%CI: 1.25-2.66). Conclusions Brazilian adults 40+ years old with AHL experience significantly higher odds of having D. Those with AHL are a unique group of individuals and therefore, interventions should be tailored to them. These individuals may benefit from auditory rehabilitation such as the use of hearing aids. Further investigation is necessary to better understand this association and to incorporate relevant psychiatric assessments.

S/P indicates work done while a student/postdoc
ASTHMA AND DEPRESSION AMONG INDIVIDUALS RESIDING IN BRAZIL: A NATIONAL LEVEL STUDY
S. Cristina Oancea* S. Cristina Oancea, Sumit Ghosh, Luciana B. Nucci, (University of North Dakota, School of Medicine and Health Sciences, Department of Population Health)

Purpose
Although links between asthma and depression have been discussed extensively in the scholarly literature, little empirical data exist about this association in South American Countries such as Brazil. This study examines the prevalence of asthma (A) and its association with depression (D) in a very large, nationally representative sample of adult Brazilian. Methods Data from the 2013 Brazilian National Health Survey was used. The Personal Health Questionnaire depression scale (PHQ-8) was applied to measure D as the outcome of interest, and the exposure was clinically diagnosed A. Multivariable weighted logistic regression models were used to investigate the association between A and D, while adjusting for socio-demographic characteristics and obesity status, among individuals diagnosed with A before or after the age of 18, or never diagnosed. The association between physical disability due to A and D was further investigated among adult Brazilians clinically diagnosed with A. Results The final study sample size was 57,299 (2,373 A diagnoses). After adjusting for the covariates of interest, the clinical diagnosis of A before (AOR 1.81, 95%CI 1.34-2.45) and after (AOR 2.53, 95%CI 1.86-3.43) the age of 18 was significantly associated with an increase in D compared to individuals without A diagnosis. Among individuals with A diagnosis, there was a significant increase in D if suffering of intense or very strong physical limitation when compared to those suffering of slight or moderate physical limitation (AOR 3.93, 95%CI 1.90-8.10). Conclusions The results from this study suggest that there is a strong association between clinical A diagnosis, physical limitation due to A and D among adult individuals residing in Brazil. Further studies should be carried out to investigate the underlying mechanism that drives this association. New programs should be developed that include strategies for mitigating stress for the individuals clinically diagnosed with asthma.
NATIVE AMERICAN MORTALITY: AN OKLAHOMA ECOLOGICAL STUDY COMPARING OF MORTALITY TIME TRENDS AND MEDICAID PRESCRIPTION OPIOID SPENDING

Mark Brandenburg*, Mark Brandenburg, (Bristow Medical Center)

Introduction: American Indian/Alaska Native have been suffering high rates of opioid overdose morbidity and mortality in the US. Oklahoma (with 9% Native Americans) is a leading state in per capita consumption of prescription opioids, substance abuse-related death, and middle-age, all-cause mortality. In Oklahoma, opioid prescribing, Medicaid spending, and opioid overdose mortality have been increasing with the highest rates of opioid overdose death occurring in the 45-54-year-old population. The study hypothesis was that American Indian/Alaska Native 45-54-year-old population (AI/AN 45-54) mortality is increasing, and is associated with Oklahoma Medicaid prescription opioid spending. Methods: Oklahoma AI/AN 45-54 annual mortality data were collected from the Centers for Disease Control & Prevention Wonder Detailed Mortality database, by male and female age categories. Annual Medicaid opioid spending (1999-2008) data were obtained from the Medicaid Analytic eXtract MAX Rx database. Time trend graphs were generated, and statistical analyses for correlations were performed. Results: Oklahoma all-cause, medical-cause, and external/behavioral-cause mortality rates (1999-2016) are increasing in the male and female AI/AN 45-54 populations. The AI/AN 45-54 all-cause mortality trend period effects align with non-Hispanic white all-cause mortality and annual Oklahoma Medicaid prescription opioid spending fluctuations. Conclusions: Medical-cause, and external/behavioral-cause mortality rates are increasing in both the male and female AI/AN 45-54 populations. Oklahoma AI/AN 45-54 all-cause mortality is increasing, and period effects in annual mortality have a non-random component and are similar to those of non-Hispanic white all-cause mortality and Oklahoma Medicaid prescription opioid spending fluctuations.
ANALYSIS OF MORTALITY AMONG NEONATES AND CHILDREN WITH SPINA BIFIDA, AN INTERNATIONAL REGISTRY-BASED STUDY, 2001-2012
Vijaya Kancherla* Vijaya Kancherla, Marian K. Bakker, Mark A. Canfield, Eva Bermejo-Sanchez, Janet D. Cragan, Saeed Dastgiri, Hermien de Walle, Marcia L. Feldkamp, Boris Groisman, Miriam Gatt, Paula Hurtado-Villa, Kärin Kallén, Danielle Landau, Nathalie Lelong, Jorge Lopez-Camelo, Laura Martinez, Margery Morgan, Osvaldo M Mutchinick, Wendy N Nembhard, Anna Pierini, Anke Rissmann, Antonin Sipek, Elena Szabova, Giovanna Tagliabue, Wladimir Wertelecki, Ignacio Zarante, Pierpaolo Mastroiacovo, (Department of Epidemiology, Emory University Rollins School of Public Health, Atlanta, Georgia, USA)

Objective: We examined stillbirth and postnatal mortality among those affected by spina bifida using birth defects surveillance data from registries in multiple countries. Methods: Twenty four population- and hospital-based surveillance registries in 18 countries contributing as members of the International Clearinghouse for Birth Defects Surveillance and Research (ICBDSR) between years 1974 and 2015, and covering approximately 28 million births and 14,000 cases of spina bifida. Cases of spina bifida that resulted in livebirths, stillbirths from 20 weeks’ gestation, or elective termination of pregnancy for fetal anomaly (ETOPFA) at any gestation were included. Mortality among infants born with spina bifida was examined between 2001 and 2012, when most programs provided mortality data, through linkages to death records. Among live born spina bifida cases, we calculated age-specific mortality as number of deaths among live born cases divided by total number of live born cases with spina bifida, at different ages after birth (day of birth, day 2-6, day 7-27, day 28-1 year, 1-4 years, 5 years or greater). Results: Between years 2001 and 2012, the overall first week mortality proportion was 6.9% (95% CI = 6.3% to 7.7%) and was lower in programs operating in countries with policies that allowed ETOPFA compared to their counterparts (5.9% vs. 8.4%). The majority of first week mortality occurred on the first day of life. In programs where information on long term mortality (>1 year) was available, survival at 1-4 years was 90-96% in Europe, and 86-96% in North America. In most European programs in the recent decades, we observed an increase in ETOPFA proportion, in parallel to a decrease in the proportions of stillbirths and first week mortality. Conclusions: Stillbirths and postnatal mortality is a major concern for those with spina bifida. Effective folic acid interventions could reduce morbidity and mortality associated with spina bifida.

S/P indicates work done while a student/postdoc
THE COUNTY-LEVEL ASSOCIATION BETWEEN MEDICAID SPENDING AND NATIVE AMERICAN 45-54-YEAR-OLD MORTALITY (1999-2016): AN OKLAHOMA ECOLOGICAL STUDY
Mark Brandenburg* Mark Brandenburg, (Bristow Medical Center)

Introduction: Native Americans in the US have suffered the greatest increase, among racial groups, in opioid-related morbidity and mortality over the past 20 years. Oklahoma (with 9% Native Americans) is consistently a leading state in prescription opioid-related overdoses, with the highest rates of opioid overdose mortality in the 45-54-year-old population. Medicaid prescription opioids are well-known to be associated with opioid-overdose mortality. The study hypothesis was that Native American 45-54-year-old (NA45-54) mortality at the county-level in Oklahoma is associated with Medicaid spending. Methods: Data at the county-level were collected on Annual Per Capita Medicaid Spending (APCMS), NA45-54 and Non-Hispanic White (NHW45-54) mortality, and Per Capita Medicare Opioid Claims, poverty, smoking, and obesity, and aggregated. Multiple linear regression analyses using solely NA45 mortality data at the county-level were unable to be performed due to sparse data; therefore, NA45 mortality data were combined with NHW45-54 mortality data. Regression analyses were then compared to those with only NHW45-54 data. Results: At the county-level, NA/NHW45-54 mortality is associated with Mean APCMS, adjusted for Mean Annual Per Capita Medicare Opioid Claims, poverty, smoking, and obesity. In the NA/NHW45-54 populations combined, (Coefficient 0.141, R2 0.567, CI95 0.052 0.229, P-value <0.001) and (Coefficient 0.330, R2 0.719, CI95 0.208, 0.451, P-value < 0.001), females and males respectively. In the NHW45-54 population alone, (Coefficient 0.177, R2 0.563, CI95 0.081, 0.273, P-value < 0.001) and (Coefficient 0.346, R2 0.768, CI95 0.234, 0.459, P-value < 0.001), females and males respectively. Conclusions: At the county-level in Oklahoma, Medicaid spending is a risk factor for all-cause mortality in the combined NA/NHW45-54 population, for both males and females. This association is very similar to that in the NHW45-54 population alone.

Oklahoma Counties
Male All-Cause Mortality

![Graph showing Oklahoma Counties Male All-Cause Mortality](image)

S/P indicates work done while a student/postdoc
BACKGROUND: Midday naps and nocturnal sleep disturbances have several effects on cardiovascular and humoral factors, such as blood pressure, heart rate, platelet aggregability and blood viscosity. Previous studies that described the association between sleep duration and the incidence of stroke suffered from limitations regarding specification of sleep habits and the assessment of confounders. Based on the Heinz Nixdorf Recall Study, a population-based prospective cohort study, our aim is to examine the association between sleep-related characteristics such as regularity and duration of midday napping and nocturnal sleep disturbances and the occurrence of strokes, accounting for several cardiovascular confounders. METHODS: We included data from 4,636 participants aged 45-76 years and examined the association between self-reported sleep characteristics and stroke using Cox proportional hazards regression. We adjusted for several potential confounders based on causal diagram analysis. The outcome variable included ischemic and hemorrhagic strokes. RESULTS: Overall, 175 of 4,636 participants (3.8%) suffered from stroke during a mean follow-up time of 13.4 years. Regular long midday nap (5-7 naps per week > 60 min) was associated with an increased adjusted hazard ratio for strokes among men and women (HR 3.20, 95% CI: 1.92-5.32), but no association was observed for regular short nap (HR 1.09, 95% CI: 0.73-1.63) compared to irregular or no nap, respectively. Regular (nearly every night) difficulties falling asleep showed an association with stroke (HR 1.64, 95% CI: 1.05-2.56), but no influence was observed for difficulties maintaining sleep (HR 0.91, 95% CI: 0.66-1.25) and early morning arousal (HR 0.92, 95% CI: 0.54-1.56). Conclusions: Long midday naps and difficulties falling asleep are associated with the incidence of stroke, which should be adequately addressed in future research on sleep hygiene recommendations.
Background: Conflicting evidence remains in the association of testosterone therapy (TTh) with incident prostate cancer (PCa). This inconsistency maybe due, in part, to the small sample sizes from previous studies and an incomplete assessment of comorbidities, particularly diabetes. Objective: To investigate the association of TTh use (injection or gel) with risk of PCa and to determine whether this association varies by presence of diabetes at baseline in a large, nationally representative, commercially insured cohort. Methods: We conducted a retrospective cohort study of 189,491 men aged 40-60 years old in the IBM MarketScan® Commercial Database, which included 1,424 PCa cases diagnosed from 2011 to 2014. TTh was defined using CPT codes from inpatient and outpatient, and NDC codes from pharmacy claims. We estimated multivariable hazard ratios (HR) for incident PCa after adjusting for age, erectile dysfunction, CCI comorbidity, hypogonadism, osteoporosis, use of statin and PSA, plus other potential confounders. Stratified analysis by diabetes status was also conducted. Results: We found a 33% decreased risk of PCa after comparing the highest category (>12) of TTh injections with the lowest (1-2) category (HR = 0.67, 95% CI: 0.54-0.82, P trend 330 versus 1-60 days’ supply, P trend <0.0001). Among non-diabetics we found an inverse association between TTh use and PCa (P trend <0.0001 for injection and gel), but a weak interaction between TTh injections and diabetes (P for interaction = 0.05). Conclusion: Overall, increased use of TTh injections and topical gels among TTh users reduced the risk of PCa, and this remained significant only among non-diabetics. These findings warrant further investigation in large randomized placebo-controlled trials to infer any health benefit by TTh.

<table>
<thead>
<tr>
<th>Testosterone Dosage Categories</th>
<th>Injection Only</th>
<th>Gel Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=80,629</td>
<td>N=66,100</td>
</tr>
<tr>
<td></td>
<td>HR 95% CI</td>
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<td></td>
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<td>P-trend</td>
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<tr>
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<tr>
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<td>0.78 (0.63, 0.97)</td>
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<tr>
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<td>0.80 (0.65, 0.98)</td>
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<tr>
<td>&gt;330</td>
<td>0.59 (0.48, 0.72)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

*Adjusted for CCI Comorbidity, hypogonadism, hypertension, muscular wasting and disuse atrophy, malaise and fatigue, chronic fatigue syndrome, other malaise and fatigue, osteoporosis, erectile dysfunction, depressive disorder, anterior pituitary disorder, decreased libido, use of insulin, use of statin, and PSA

S/P indicates work done while a student/postdoc

Background: Respondent-driven sampling (RDS) is widely used for collecting data on hard-to-reach populations such as drug users. The structure of the social networks (e.g. the number of partners per person) among these people has a great impact on disease transmission. While the biases in population proportion estimation (e.g. % HIV positive population) from RDS have been well studied, little is known for the biases in network structure estimation from RDS. Methods: A simulation platform was developed in R to mimic the RDS process. Original networks with different structures were simulated with exponential random graph models. Parameters describing RDS process such as the number of coupons were randomly drawn for each RDS simulation. The three major network statistics of network density, homophily (similarity of attributes between partners), and transitivity (the tendency of “the friend of my friend is more likely to be my friend”), were compared between original networks and RDS sample networks. Generalized linear models were used to predict the network statistics of the original network based on the network statistics of the sample network and sampling parameters. K-fold cross validation was used to select the best models considering four error metrics. Results: RDS significantly over-estimated network density, slightly exaggerated homophily, and under-estimated transitivity. The predictive models have great predicting power for network density, improved the estimation of homophily, but need further improvement on network transitivity. Conclusion: RDS introduces significant bias in network structure estimation. Studies should not directly use RDS data to reconstruct networks. Predictive models with RDS parameters provide a means for the bias correction.

S/P indicates work done while a student/postdoc
DOES SELF-RATED HEALTH STATUS INFLUENCE RECEIPT OF AN ANNUAL FLU VACCINATION  Ian Watson* Ian Watson, S. Cristina Oancea, (UND School of Medicine & Health Sciences)

During the 2017-18 season the CDC estimates that the influenza (flu) virus caused approximately 959,000 hospitalizations and 79,400 deaths. Unfortunately, less than 50% of US adults received an annual flu vaccination (AFV). Self-rated health status (SRH) is part of the CDC’s health-related quality of life HRQOL-4 “Healthy Days” scale. Prior research has shown SRH is associated with physical and mental health status, health behaviors, healthcare utilization and can be used a proxy indicator for the presence of chronic diseases and co-morbidities. The current study aims to determine if an association exists between SRH and their receipt of an AFV among US individuals. Among respondents of the 2017 Behavioral Risk Factor Surveillance System survey (BRFSS) (N=319,316), 39.1% had received a flu vaccination within the last 12 months. There was a statistically significant difference (p=0.007) between the vaccination rates of men (35.7%) and women (42.4%). There was a significant weighted and adjusted positive association between SRH and AFV for individuals who self-reported a SRH of either “Fair” (AOR 1.19 [95% CI 1.12-1.27]) or “Poor” (AOR 1.24 [95% CI 1.14-1.35]). For respondents who reported an SRH status of “Fair” there was a significant positive association for both men (AOR 1.20 [95% CI 1.10-1.32]) and women (AOR 1.17 [95% CI 1.08-1.28]). An association was also found for men (AOR 1.20 [95% CI 1.09-1.39]) and women (AOR 1.23 [95% CI 1.09-1.39]) who reported their SRH as “Poor”. Only women showed a significant association (AOR 1.12 [95% CI 1.04-1.20]) among those whose SRH was “Good”. No association was found for individuals who reported SRH as “Very Good” or “Excellent”. These findings are of interest to health policy makers as it indicates that there remains work to be done to convince individuals with a high SRH that they too need to receive an AFV.
MENINGIOMA INCIDENCE IN THE UNITED STATES: CURRENT AND FUTURE TRENDS
Sonia Bhala*, Sonia Bhala, Ana F. Best, Victoria Kennerley, Valentina I. Petkov, Martha S. Linet, Douglas R. Stewart, Philip S. Rosenberg, (Clinical Genetics Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, NIH)

Background: Benign meningiomas are the most frequently reported CNS tumor, with increasing incidence rates in recent decades. We analyzed U.S. trends and patterns since initial required cancer registration in 2004.

Methods: We analyzed benign meningioma incidence rates identified histologically or radiographically in the Surveillance Epidemiology and End Results (SEER) population-based cancer registries among 35-84-year-olds during 2004-2015 using age-period-cohort models stratified by sex and race/ethnicity. We estimated incidence and burden (absolute number of cases in the United States (US)) for 2016-2025 using modelled incidence rates and US census projections. Results: Meningioma incidence increased during 2004-2009/2011 in all demographic groups, then stabilized in 2009/2011-2015. This stabilization was reflected in declines in the incidence trend (%/yr) over time (%/yr per year; %yr/yr); greater among white women (-0.31%/yr/yr, 95%CI: (-0.42,-0.20)) and white men (-0.28%/yr/yr (-0.46,-0.10)) and black women (-0.53%/yr/yr (-0.80,-0.26)) and black men (-0.47%/yr/yr (-0.93,-0.01)). JoinPoint analysis of cohort rate-ratios identified an acceleration in white women born before versus after 1971 (from 2.2 to 5.3% per birth year) and a period of stability among white men born during 1939-1957. We forecast that meningioma incidence rates through 2025 will be stable or decreasing among 55–64-year-olds and stable or modestly decreasing among 35–54-year-olds. Total meningioma burden is expected to increase from 25,400 cases in 2016 to 26,700 in 2025. Conclusions: Between 2004-2015, meningioma incidence first rose, then stabilized or modestly declined in all demographic groups. For 2016-2025, we expect meningioma incidence will decrease at older ages and remain stable at younger ages.
THE ASSOCIATION BETWEEN COUNTY-LEVEL JAIL INCARCERATION AND COUNTY-LEVEL MORTALITY Seth J. Prins* Sandhya Kajeepeta, Caroline Rutherford, Katherine Keyes, Seth Prins, (Columbia University)

Mass incarceration is hypothesized to have collateral health consequences not only for incarcerated individuals, but also their families and communities, by eroding social and economic resources and the ability of communities to collectively build safe environments. For the first time, we conducted a longitudinal analysis of national administrative data from 1987-2016 to evaluate the relationship between county jail incarceration rates and mortality rates across the United States. Jail data were obtained from the Bureau of Justice Statistics. Mortality data were obtained from the Centers for Disease Control and Prevention. We fit lagged fixed effects Poisson regression models to control for all unmeasured stable county characteristics that may confound the relationship of interest, as well as measured time-varying confounders. Time-varying confounders included county poverty rate, crime rate, and racial demographics, and were drawn from the Census and other public sources. Compared to the lowest quartile, jail incarceration rates in the highest quartile were associated with a 4.8% increase in county mortality rate after adjusting for county and year fixed effects and time-varying confounders (PR=1.05; 95% CI:1.04, 1.06). Further, a dose-response relationship was observed: the second and third quartiles of jail incarceration rates were associated with stepwise increases in associated mortality rates (adjusted PR=1.02; 95% CI:1.01, 1.02 and adjusted PR=1.04; 95% CI:1.03, 1.04, respectively). This association was stronger with respect to mortality of 15-34-year-olds. The findings demonstrate that jail incarceration rates are associated with community mortality rates. The magnitude of the association is similar to that of other adverse environmental exposures. Our findings provide further empirical evidence for the harms of current criminal justice policy, which can be leveraged by criminal justice reform movements as they develop strategies to end mass incarceration.
PREGNANCY AND HPV VACCINE  Jaahnavi Badeti* Vinay K. Cheruvu, Jaahnavi Badeti, (College of Public Health, Kent State University)

The human papilloma virus (HPV) vaccine provides protection against certain high-risk oncogenic HPV types. While safety of the vaccine is well established, research on receipt of the HPV vaccine and its impact on fertility in women has been mixed and limited. Therefore, the current study investigates the association between receipt of the HPV vaccine and fertility in a population-based sample of women in the US. Data from 2008-2016 National Health and Nutrition Examination Survey (NHANES) were used in this study. The population of interest consisted of female participants who were between the ages 25 and 29 years at the time of the surveys (n = 890). Weighted prevalence estimates and corresponding 95% confidence interval (CI) were computed to describe the study population. Association between receipt of the HPV vaccine and fertility was examined by fitting several nested logistic regression models to identify potential confounding factors. All analyses were performed using SAS® version 9.4 (Cary, NC, USA) survey procedures to account for the complex sampling design of the NHANES data. Overall, the prevalence of receipt of the HPV vaccine and having been pregnant in the population of interest was 21.5% (95% CI: 18.3 – 24.6) and 55.8% (95% CI: 51.0 – 60.6) correspondingly. A significantly higher proportion of females who did not receive the HPV vaccine reported being married (50.8%) compared to those who did receive the HPV vaccine (32.5%). Marital status was a significant confounder in determining the null association between the receipt of the HPV vaccine and having been pregnant (Adjusted Odds Ratio (AOR): 0.63 (95% CI: 0.40 - 1.02). When stratified by marital status, this association was significantly confounded by education and birth control [Married: AOR 0.49 (95% CI: 0.20 - 1.05); Unmarried: AOR 0.68 (95% CI: 0.40 - 1.10)]. The current study found no evidence to conclude that receipt of the HPV vaccine negatively impacts fertility in 25 to 29 years old women.
PERFLUOROALKYL SUBSTANCES AND THYROID HORMONES IN EARLY PREGNANCY; FINDINGS IN THE DANISH NATIONAL BIRTH COHORT (DNBC) Kosuke Inoue* Kosuke Inoue, Stine Linding Andersen, Beate Ritz, Cecilia Ramlau-Hansen, Birgit Bjerre Høyer, Bodil Hammer Bech, Tine Brink Henriksen, Eva Cecilie Bonefeld-Jørgensen, Jørn Olsen, Zeyan Liew, (UCLA, Department of Epidemiology)

BACKGROUND: Thyroid hormones (THs) during pregnancy are essential for fetal brain development. Perfluoroalkyl substances (PFASs), synthetic chemicals widely applied in a variety of industrial and consumer products, have been demonstrated to interfere with thyroid function in adults. We evaluated the associations between six types of PFASs and thyroid function in early pregnancy using samples collected in the Danish National Birth Cohort (DNBC) during 1996-2002. METHODS: A cross-sectional analysis was conducted using 1,366 maternal blood samples collected in the DNBC during week 5 to 19 of gestation (median 8.3 week). We estimated changes of serum thyrotropin (TSH) and free thyroxine (fT4) levels according to each of the six PFASs plasma concentrations (ng/mL) analyzed per inter-quartile range (IQR) increase or by exposure quartiles, adjusting for gestational week of blood sampling and other potential confounders. We also estimated the gestational-week-specific relationship between PFASs and TSH or fT4. Binary outcomes for hyper- or hypo-thyroid profiles were also evaluated. RESULTS: Overall, there was no apparent association between each of the PFASs and the TSH or fT4 levels or the risk for subclinical hyper- or hypo-thyroid status. However, the gestational-week-specific analyses suggested possible dynamic differences in TSH comparing the highest quartile for several PFASs to the lower quartiles; the TSH values were higher for PFOS, PFOA, PFHxS and PFHpS from gestational week 5 to 10 but the trend reversed after gestational week 10. CONCLUSIONS: We did not find strong associations between PFASs and TSH or fT4 values among women enrolled in the DNBC most of whom were healthy and without thyroid disorders. We observed possible gestational-week-specific relationships for high PFASs exposures and TSH in early gestation, but replication is needed for these results that were less precise and unexpected a priory.

S/P indicates work done while a student/postdoc
VIOLENT CRIME AND ALCOHOL CONSUMPTION AMONG ADULT BRAZILIAN RESIDENTS: RESULTS FROM A NATIONAL LEVEL STUDY S. Cristina Oancea* S. Cristina Oancea, Christopher Mark, Luciana B. Nucci, (University of North Dakota, School of Medicine and Health Sciences, Department of Population Health)

Introduction: Being the victim of a violent crime can have acute and chronic outcomes, both physically and psychologically that said individual may not be able to properly treat. One such potential outcome is binge or heavy drinking in response to trauma. The goal of the present study is to investigate the association between being a victim of a violent crime and binge or heavy drinking among adult individuals residing in Brazil, as this research is very limited at national and regional levels. Methods: Participants (N = 59,060) were selected from the 2013 National Health Survey of Brazil. The exposure of interest was the experience of violent crime either by known or unknown perpetrator. The outcome of interest was either binge or heavy drinking. Multivariable weighted and adjusted logistic regression models were used to investigate the 4 models at the national and regional level. Brazilian regions were considered as following: North, Northeast, Central West, Southeast, and South. Adjustment was done for: age, gender, race, education and insurance. Results: When compared to not experiencing any violent attack, the odds of binge drinking increase by 52% (AOR 1.52, 95% CI 1.24 – 1.88) and 70% (AOR 1.70, 95% CI 1.33 – 2.18), and the odds of heavy drinking increase by 70% (AOR 1.70, 95% CI 1.22 – 2.35) and 126% (AOR 2.26, 95% CI 1.48 – 3.46), following a violent experience from an unknown and known offender, respectively. Regional associations between the exposure and outcome are similar to those at the national level, although they vary significantly between regions. Conclusions: Based on our evidence, binge and heavy drinking may serve as coping mechanisms for an individual after he/she experiences a violent attack, from known/unknown offenders. Further investigations that explore problematic alcohol use, as well as treatment protocols for those afflicted with problematic drinking habits are warranted at the regional levels in Brazil.

S/P indicates work done while a student/postdoc
MALE REPRODUCTIVE FACTORS AND PROSTATE CANCER RISK IN THE UNITED KINGDOM
Eboney Nicole Butler* Eboney Nicole Butler, Scott P. Kelly, Michael B. Cook, (National Cancer Institute)

Background. Medical conditions of the male reproductive system may serve as proxies for hormonal dysregulation or inflammatory mechanisms that could be linked to prostate cancer risk. In this study, we examined associations between six reproductive conditions (varicocele, vasectomy, infertility, erectile dysfunction, prostatitis, and sexually transmitted infections (STI)) and prostate cancer incidence in the United Kingdom (UK). Methods. We identified prostate cancer patients in the Clinical Practice Research Datalink, newly diagnosed between 1987 and 2013, aged 30 years and older. Using a nested case-control study design, we matched cases to controls at a ratio of 1:4 on date and age at diagnosis, primary care practice, and time enrolled in the practice. We ascertained case and exposure status by identifying medical codes in the patient's electronic healthcare records that were indicative of a primary prostate cancer diagnosis or exposure to one or more reproductive conditions. Finally, we used conditional logistic regression to examine the association between each reproductive condition and prostate cancer risk; multivariate models included adjustment for screening history, metabolic risk factors, and family history of prostate cancer. Results. Our study included 58,283 cases and 221,673 matched controls. Prostatitis was associated with a 44 percent increased risk of disease (OR=1.44; 95% CI: 1.32, 1.24). Our piecewise regression analysis demonstrated that prostatitis exposure within 5 years of diagnosis was associated with a doubling of the risk (OR=2.54; 95% CI: 2.25, 2.85). Prostatitis exposure 5–10 or 10+ years prior to diagnosis was also associated with elevated prostate cancer risk; however, the magnitude of these associations attenuated with time, indicating a possible diagnostic bias. We observed null associations for the remaining reproductive conditions. Conclusions. Prostatitis may be linked with a modest higher risk of prostate cancer among UK men.
IMPACT OF PATERNAL ADULTHOOD WEIGHT GAIN ON OFFSPRING’S BIRTH WEIGHT: A PROSPECTIVE BIRTH COHORT STUDY

Minshan Lu* Minshan Lu, Xueling Wei, Jinhua Lu, Peiyuan Huang, Songying Shen, Mingyang Yuan, Lifang Zhang, Niannian Chen, Huimin Xia, Xiu Qiu, (Division of Birth Cohort Study, Guangzhou Women and Children’s Medical Center, Guangzhou Medical University, Guangzhou, China)

Background: Compared with the abundant evidence on the influence of maternal pre-pregnancy weight gain on offspring’s birth weight, evidence on the effect from the paternal side is still sparse and inconclusive. The aim of this study was to explore the impact of paternal adulthood weight gain on neonatal birth weight. Methods: A total of 7933 singleton births and their parents were included from the Born in Guangzhou Cohort Study, a prospective study in China. Paternal weight and height at both age 18 and conception, parental characteristics, and neonatal birth anthropometric data were collected. Paternal adulthood weight gain (PAWG, kg) was represented by weight difference between age 18 and conception. PAWG rate (kg/year) was calculated by dividing PAWG by corresponding years. Offspring’s birth weight Z score (BWZ) was calculated on the basis of the INTERGROWTH-21st Century Standard. Multiple linear and logistic regression analyses were performed to assess the associations of PAWG with BWZ, small for gestational age (SGA) birth and large for gestational age (LGA) birth. Results: Rates of paternal overweight or obesity (Body mass index ≥24.0 kg/m2) at their age 18 and conception (average age of 31) were 8.0% and 42.3%, respectively. On average, the PAWG was 9.87 kg with a rate of 0.81 kg/year. Faster PAWG rate was associated with increased offspring’s BWZ [β: 0.07; 95% Confidence Interval (CI): 0.02-0.12]. Comparing the highest (>1.19 kg/year) to the lowest (≤0.32 kg/year) quartiles of PAWG rate, adjusted odds ratios (95% CIs) were 0.59 (0.46-0.77) for SGA birth and 1.45 (1.10-1.91) for LGA birth. Conclusion: Higher and faster paternal adulthood weight gain was associated with increased offspring’s birth weight, lower odds of SGA and higher odds of LGA. The results underscore the importance for expanding the research to the role of paternal weight in birth outcomes and the underlying mechanisms.
OCCUPATIONAL RADIATION EXPOSURE AND SOLID CANCER INCIDENCE AMONG MEDICAL RADIATION WORKERS IN SOUTH KOREA, 1996-2015

Won Jin Lee, Won Jin Lee, Seulki Ko, Yeongchull Choi, Dale L. Preston, (Korea University College of Medicine)

Background: Medical radiation workers occupy the largest group of radiation workers and the nature of the radiation exposures is similar to those received by the general population. The objective of this presentation is to examine radiation effects on cancer risk among medical radiation workers. Methods: Data on all diagnostic medical radiation workers enrolled at the national dose registry between 1996 and 2011 (n=94,396) were merged with the death and cancer incidence data until 2015. We reconstructed historical radiation doses and estimated organ-specific doses for all workers. The cancer risks were calculated using standardized incidence ratios (SIRs), relative risks (RRs), and excess relative risk (ERR). Results: Overall, 2,758 of first primary cancer cases for all sites were reported among 93,922 medical radiation workers (53,585 male and 40,337 female). Average cumulative colon dose was 4.3 mGy which ranged from the minimum detectable level to 262.7 mGy (median 0.7 mGy). The SIR for solid cancer significantly decreased in men (SIR 0.90, 95% confidence interval [CI] 0.85 to 0.94) and significantly elevated in women (SIR 1.11, 95% CI 1.04 to 1.18). However, RRs for solid cancer of job title and duration of employment showed no particular pattern among diagnostic medical radiation workers. There were no indications of a significant radiation dose effect on solid cancer rate for either men (ERR/100 mG 0.28, 95% CI -0.13 to 0.86) or women (ERR/100 mG -0.14, 95% CI -0.95 to 1.35). The findings were similar when limited to workers employed for at least one year. Conclusions: We found no significant association between occupational radiation exposure and solid cancer rates. Our findings contribute to a better understanding of the observed cancer risk in Asian medical workers. Additional follow-up together with consideration of other risk factors should provide useful information on solid cancer rates in this cohort.
Background: Stomach cancer is the fifth most common cancer worldwide and the third leading cause of cancer death, with a poor prognosis resulting from late stage at diagnosis. Ghrelin is a hormone produced in the oxyntic glands of the stomach. Previous work by this group in western populations found that low serum ghrelin is associated with an increased risk of gastric cancer. The current analysis is the first conducted in China, a region with a very high burden of esophageal and gastric cancer. Methods: We conducted a gastric cancer evaluation in two prospective Chinese studies: the Nutritional Intervention Trial (NIT; n=258 cases), and the Shanghai Women’s Health Study (SWHS; n=249 cases), to examine the relationship between serum or plasma ghrelin concentration and the risk of gastric cancer. Ghrelin was measured using radioimmunoassay. Hazard ratios (NIT case-cohort study), odds ratios (SWHS case-control study), and 95% confidence intervals (95% CI) were calculated using conditional multivariable adjusted logistic regression with adjustment for potential confounders, including Helicobacter pylori seropositivity and serum concentration of pepsinogens 1 and 2. Results: Low serum ghrelin concentrations were associated with a significantly increased risk of gastric cancer in NIT HR=1.09 (95% CI=1.01-1.20). In SWHS, the association was of similar magnitude OR=1.15 (95% CI=1.00-1.32). Individuals in the lowest quartile of serum ghrelin had a significantly increased risk of gastric cancer relative to those in the highest quartile (NIT: HRQ1:Q4=1.36 (95% CI: 0.89-2.07; p-trend=0.02) & SWHS: ORQ1:Q4=1.68 (95% CI: 1.03-2.74; p-trend=0.05). Conclusion: Low baseline ghrelin concentrations were associated with an increased risk for GNCA and GCA in the NIT and the SWHS. Alterations in serum ghrelin levels occurred over ten years before the development of clinically evident gastric and esophageal cancers, raising the possibility that it might be useful as a risk stratification or early detection marker.
GLYCEMIC INDEX, GLYCEMIC LOAD, AND OVARIAN CANCER OUTCOMES: A PROSPECTIVE COHORT STUDY Jennifer Mongiovi* Jennifer Mongiovi, Susan McCann, Jo Freudenheim, Kirsten Moysich, (University at Buffalo)

Background: Increased glucose uptake is a hallmark of cancer. Glycemic responses to dietary intake can be classified as glycemic index (GI) for quantity and glycemic load (GL) for quality and quantity. The relationships between GI/GL and ovarian cancer (OvCa) have not been examined using prospective data from a U.S. population. Therefore, we examined the association between both GI and GL with OvCa within the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial. Methods: Participants enrolled between 1993 and 2001 were followed for a median of 10.3 years. Diet was assessed using a 124-item food frequency questionnaire (FFQ). Cox proportional hazards models were applied to calculate hazard ratios (HR) and 95% confidence intervals (95% CI). GI and GL were modeled as quartiles. OvCa risk models were adjusted for age, study arm, study center, body mass index (BMI), oral contraceptive use, hormone use, parity, age at menarche, alcohol, and quartile of fiber. Survival models included age, stage, grade, histotype, and BMI. Results: 290 incident and 154 fatal cases along with 46,745 female controls were included in analyses. Compared to the lowest quartile, neither high GI nor GL were associated with risk of OvCa (HR=0.85, 95% CI: 0.60-1.20; HR=1.07, 0.75-1.52), or with all-cause mortality among cases (HR=0.71, 95% CI: 0.44-1.13 and HR=0.73, 95% CI: 0.46-1.18; GI and GL, respectively). The trend among quartiles of GI and GL were not significant in all models. Discussion: Contrary to existing literature, GL does not appear associated with increased risk of OvCa in these data. Our findings further contrast with evidence that suggests increasing GI is associated with worse survival. However, this study population had lower mean GI and GL compared to other female cohorts. Given the limited existing evidence, further investigation is needed in order to clarify the nature of these associations.

Table 1 Risk of ovarian cancer (F=47,316) and all-cause mortality among cases (F=296)

<table>
<thead>
<tr>
<th>Hazard ratio (95% CI)</th>
<th>Incident ovarian cancer</th>
<th>All-cause mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1†</td>
<td>Model 2†</td>
<td>Silber et al. 2002†</td>
</tr>
<tr>
<td>Case/deaths (total)</td>
<td>291 (47,316)</td>
<td>281 (45,056)</td>
</tr>
<tr>
<td>Glycemic index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AID</td>
<td>0.83 (0.60-1.12)</td>
<td>0.85 (0.60-1.20)</td>
</tr>
<tr>
<td>2-D GL</td>
<td>1.00 (0.81-1.23)</td>
<td>1.09 (0.81-1.45)</td>
</tr>
<tr>
<td>Q1 (44-651.5)</td>
<td>0.76 (0.54-1.07)</td>
<td>0.85 (0.66-1.12)</td>
</tr>
<tr>
<td>Q2 (51.5-63.7)</td>
<td>0.82 (0.59-1.15)</td>
<td>0.85 (0.64-1.12)</td>
</tr>
<tr>
<td>Q3 (63.7-66.6)</td>
<td>0.80 (0.56-1.07)</td>
<td>0.85 (0.64-1.12)</td>
</tr>
<tr>
<td>Q4 (66.6-69.9)</td>
<td>0.89 (0.60-1.31)</td>
<td>0.85 (0.64-1.12)</td>
</tr>
<tr>
<td>P for trend</td>
<td>0.21</td>
<td>0.39</td>
</tr>
<tr>
<td>Continuous measure</td>
<td>0.97 (0.84-1.13)</td>
<td>0.96 (0.64-1.12)</td>
</tr>
<tr>
<td>Glycemic load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AID</td>
<td>0.69 (0.52-0.91)</td>
<td>0.71 (0.58-0.94)</td>
</tr>
<tr>
<td>2-D GL</td>
<td>0.49 (0.31-0.76)</td>
<td>0.53 (0.32-0.89)</td>
</tr>
<tr>
<td>Q1 (0.49-9.74)</td>
<td>1.00 (0.80-1.24)</td>
<td>1.00 (0.80-1.24)</td>
</tr>
<tr>
<td>Q2 (5.9-103.2)</td>
<td>1.00 (0.80-1.24)</td>
<td>1.00 (0.80-1.24)</td>
</tr>
<tr>
<td>Q3 (104-139.3)</td>
<td>1.00 (0.80-1.24)</td>
<td>1.00 (0.80-1.24)</td>
</tr>
<tr>
<td>Q4 (134.3-299.5)</td>
<td>1.00 (0.80-1.24)</td>
<td>1.00 (0.80-1.24)</td>
</tr>
<tr>
<td>P for trend</td>
<td>0.76</td>
<td>0.98</td>
</tr>
<tr>
<td>Continuous measure</td>
<td>1.00 (0.80-1.24)</td>
<td>1.00 (0.80-1.24)</td>
</tr>
</tbody>
</table>

*Adjusted for: age at completion of FFQ, randomization arm, study center, BMI in left<25, 25-29, 30, oral contraceptive use, ever taken hormone, number of live births, age at menarche, alcohol, quartile of energy-adjusted fiber intake (not included – menopausal status (N/A), physical activity due to large percent missing) (Silber et al. 2007)

†Adjusted for age at completion of FFQ, randomization arm, study center, BMI in left<25, 25-29, 30, oral contraceptive use, ever taken hormone, number of live births, age at menarche, menopausal status at baseline, alcohol, total energy intake, and participation in vigorous physical activity

‡Adjusted for age at completion of FFQ

§Adjusted for age at diagnosis, stage, grade, subtype, smoking status, and BMI in left<25, 25-29, 30, oral contraceptive use, ever taken hormone, number of live births, age at menarche, menopausal status at baseline, alcohol, total energy intake, and participation in vigorous physical activity due to large percent missing) (Play et al. 2017)

#Adjusted for age at diagnosis, stage, amount of residual disease, grade, subtype, smoking status, BMI, physical activity index, and daily caloric intake

S/P indicates work done while a student/postdoc
ASSOCIATIONS BETWEEN SERUM 25-HYDROXYVITAMIN D LEVELS AND ALLERGIC SENSITIZATION IN EARLY CHILDHOOD Yong Guo*, Yong Guo, Guangdong Women and Children Hospital

Background: Vitamin D status may be related to allergen sensitizations, but the evidence is inconsistent. The objective of this study was to assess whether serum 25-hydroxyvitamin D (25(OH)D) levels were associated with allergic sensitizations in early childhood. Methods: Data were collected from 2642 children who visited the Guangdong Women and Children’s Hospital from January 2016 to May 2017 for routine health check-ups. Serum 25(OH)D levels were tested by electrochemiluminescence immunoassay. Allergic sensitizations including food and inhalant allergens were tested for specific IgE antibodies at 1 and 2 years of age. Results: The mean level of serum 25(OH)D was 86.47 ± 27.55 nmol/L with a high prevalence of vitamin D insufficiency (<75 nmol/L) in children aged 0-2 years (36.8%). Low serum 25(OH)D level was associated with elevated total IgE. The common sensitization to allergens in children aged 0-2 years were milk (44.2%), cat epithelium (26.4%), egg (13.1%), dog epithelium (12.7%) and Dermatophagoides farinae (6.7%). After multivariate adjustment, data in 25(OH)D treated as a continuous variable or categories, no consistent associations were found between 25(OH)D levels and allergen-specific IgEs. Conclusions: Serum 25(OH)D level showed an inverse relationship with total IgE level in early childhood. However, there is lack of evidence to support associations between low 25(OH)D levels and allergic sensitization to various allergens.

S/P indicates work done while a student/postdoc
FERTILITY DRUG USE AND CUTANEOUS MELANOMA RISK: A FRENCH PROSPECTIVE COHORT STUDY

Iris Cervenka* Iris Cervenka, Marie Al Rahmoun, Yahya Mahamat-Saleh, Marie-Christine Boutron-Ruault, Agnes Fournier, Marina Kvaskoff, (CESP, Fac. de médecine - Univ. Paris-Sud, Fac. de médecine - UVSQ, INSERM, Université Paris-Saclay, 94805, Villejuif, France ; and Gustave Roussy, F-94805, Villejuif, France)

Cutaneous melanoma has been suspected to be influenced by female sex hormones. A review of the literature in 2018 indicated that fertility drug (FD) use was associated with melanoma risk among parous women only. However, all studies so far were based on a retrospective design and small numbers of cases, and the current evidence is unclear. We sought to prospectively investigate the associations between FD use and melanoma risk in women. E3N is a prospective cohort of 98,995 French women aged 40-65 years at inclusion in 1990. Information on use of FD, including duration and time of administration, was assessed through self-administered questionnaires. We used Cox proportional hazards regression models adjusted for age and skin cancer risk factors. Over 1990-2008, 611 melanoma cases were ascertained among 86,653 women. Compared with never use, ever use of FD was not associated with melanoma risk overall (hazard ratio (HR)=1.15, 95% confidence intervals (CI)=0.75-1.74), nor among parous women (HR=1.08, 95% CI=0.67-1.73). Among ever users of FDs, duration of use and age at first use was not associated with melanoma risk. Associations were similar after adjustment for UV exposure, although FD users were more likely to report tanning bed use than never-users (odds ratio (OR)=1.50, CI=1.01-2.22) in a sub-sample with recreational UV exposure data. Our data do not support an association between FD use and melanoma risk and underlie the importance of taking into consideration potential confounding from sun exposure in future research.
LIFETIME CUMULATIVE EXOGENOUS HORMONE USE AND CUTANEOUS MELANOMA RISK: A FRENCH PROSPECTIVE COHORT STUDY Iris Cervenka* Iris Cervenka, Marie Al Rahmoun, Yahya Mahamat-Saleh, Marie-Christine Boutron-Ruault, Agnes Fournier, Marina Kvaskoff, (CESP, Fac. de médecine - Univ. Paris-Sud, Fac. de médecine - UVSQ, INSERM, Université Paris-Saclay, 94805, Villejuif, France ; and Gustave Roussy, F-94805, Villejuif, France)

Several studies reported positive associations between exogenous hormone use for contraception or menopausal therapy and melanoma risk. However, no previous research has examined lifetime cumulative use of exogenous hormones. We sought to explore the associations between lifetime use of hormonal therapies (oral contraception, other premenopausal progestogens, and menopausal hormone therapy) and melanoma risk in women. E3N is a prospective cohort of 98,995 French women aged 40-65 years in 1990. Hormone use was assessed through biennial self-administered questionnaires. We used Cox proportional hazards regression models adjusted for age and skin cancer risk factors. Over 1990-2008, 435 melanoma cases were ascertained among 71,894 postmenopausal women. Compared with never users, women using several types of hormone therapies during their lifetime were at higher melanoma risk, with a positive dose-response relationship with number of treatments (one vs. none: HR=1.25, 95% CI=0.88-1.78; two vs. none: HR=1.53, CI=1.08-2.19; three vs. none: HR=1.77, CI=1.20-2.61; P_trend=0.002). However, there was no linear association with cumulative duration of exogenous hormone use (P_trend=0.12). We observed no heterogeneity across tumor types (P=0.77) or location (P=0.28), although the use of three therapies was strongly associated with melanoma on the head and neck (HR=4.46, CI=1.50-13.24). Associations were similar after adjustment for UV exposure, although women who used three categories of therapies compared to none were more likely to use sunscreen (OR=2.14, CI=1.51-3.04), tanning beds (OR=2.04, CI=1.21-3.44), to report more sunburns in adulthood (P_trend=0.04 across increasing number of sunburns in summer), and less hours of residential UV exposure (P_trend<0.01 across tertiles). Our results suggest intentional UV exposure in exogenous hormone users and thus question the hypothesis of a hormonal influence on melanoma risk.
INCREASED RISK OF POOR SELF-RATED HEALTH AND SERIOUS MENTAL ILLNESS AMONG WOMEN CARING FOR BOTH CHILDREN AND ADULT FAMILY MEMBERS IN JAPAN, BASED ON THE NATIONWIDE SURVEY Yuka Suzuki* Yuka Suzuki, Kaori Honjo, (Social and Behavioral Sciences, Faculty of Medicine, Osaka Medical College)

As the age of giving birth rapidly increases, more Japanese women are expected to informally care for both their children and adult family members (AFM) at the same time. Due to the accumulated burden, people caring for both of them might have higher risk for detrimental health outcomes compared to those who care for children only or AFM only. Therefore, we aim to examine the degree of effects of this double burden, i.e. caring for both children and AFM on self-rated health (SRH) and serious mental illness (SMI). We analyzed the nationwide, self-administrated questionnaire data of the 2013 Comprehensive Survey of Living Conditions for 143,920 women aged 20-59. We defined child raising as living with her child under 18 years old, and caring for an AFM as being the main caregiver for her family member who needs support. We divided women into 4 groups based on whom they care for; 1) nobody, 2) children only, 3) AFM only, and 4) both of them. Poor SRH was defined if she answered her current health status as “not so good” or “not good.” SMI was measured by K6, of which score 13 or higher was considered to be SMI. The ORs for poor SRH and SMI according to the caring patterns were calculated by multivariable logistic regression. After adjusting for age group, highest education, job class of the most income earners of the household, and marital status, the ORs (95% CI) for poor SRH were 1.00 (0.95-1.04) for group 2, 1.36 (1.25-1.49) for group 3, and 1.51 (1.31-1.74) for group 4, compared to group 1. The ORs (95% CI) for SMI for each group were 0.93 (0.87-0.99), 1.71 (1.51-1.94), 1.85 (1.54-2.22), respectively. Women who care for their AFM have significantly higher risk of having poor SRH and SMI, compared to those who care for nobody, and those who care for their children as well have even higher risk. This suggests the importance to address physical and mental health of women who care for AFM, and those who care for their children as well need extra attention.
DEPRESSION, ITS SUB-FACTOR, AND AUGMENTATION INDEX: MODIFYING EFFECTS ACCORDING TO INFLAMMATORY MARKERS YE JIN JEON* YE JIN JEON, Hyeon Chang Kim, Sun Jae Jung, (Department of Public Health, Yonsei University)

[Objective] The association between depressive symptoms and arterial stiffness is known by previous studies. However, few studies investigated its sub-factors, such as cognitive or somatic-affective factors of depression. The purpose of our study was to investigate the association between depression and augmentation index (AIx), and further analyze whether there are different patterns by inflammatory maker. [Methods] This study included 458 men and 815 women (mean age: 49.35) from the Cardiovascular and Metabolic Diseases Etiology Research Center (CMERC) Cohort. Korean-Beck Depression Inventory-II (BDI-II) were used to assess depressive symptoms during the past 2-week. Arterial stiffness was evaluated with AIx normalized to 75 beats/min. high sensitivity C-reactive protein (hs CRP) and Interleukin 6 (IL-6) were measured in blood. We conducted a factor analysis for BDI-II 2 factors with varimax rotation. Multiple regression models were used after adjusting for age, systolic blood pressure, socio-economic status, diabetes history, body mass index, smoking/drinking status, and physical activity. We further conducted subgroup analyses of inflammatory marker with cutoffs of 75 percentiles and 90 percentiles for sensitivity analyses. [Results] There was a significant association between BDI-II score and arterial stiffness (β= 0.09, p-value=0.037). In women, the somatic-affective factor shows higher association (β= 0.20, p-value=0.018) than cognitive factor (β= 0.12, p-value=0.148) with arterial stiffness. There was no significant association in men (β= -0.01, p-value=0.943). In subgroup analyses, women within lower IL-6 shows association between depression and the somatic affective factor in both inflammatory markers (IL-6: β= 0.17, p-value=0.039, hs CRP: β= 0.17, p-value=0.094) [Conclusion] Depression and its somatic-affective factor were associated with augmentation index in women. IL-6 is an effect modifier for the association between depression, its sub- factors and augmentation index.
MORTALITY IMPACT OF RESTRICTIVE ABORTION LEGISLATION IN THE UNITED STATES
Sarah McKetta* Sarah McKetta, Katherine M. Keyes, (Columbia University Department of Epidemiology)

Rationale: Over the past 40 years, many states passed restrictive abortion laws which target both abortion demand and supply; these may also impact women’s access to prenatal and primary care. It is unknown how abortion legislation impacts health beside abortion access. Methods: We examine the impact of state-level restrictive abortion laws from 1973-2013 on age-adjusted rates of all-cause and cause-specific mortality (infant, child, maternal, gynecologic/breast cancer), controlling for state income, population, public opinion and religious beliefs, and partisan control of government. In models of adult mortality we additionally control for birth rate among women of reproductive age and calculate rates per 100,000 people. Infant outcomes are calculated as rates per 100,000 live births. Using Poisson regression to estimate the within-state change in mortality risk, we examine the effects of the number of laws as well as the types of laws (supply- vs. demand-side). We anticipate that restrictive abortion policies will have increased risk of all-cause and cause-specific mortality, and that these effects are most pronounced in minority women and children. Results: Adjusted models show evidence that each additional restrictive abortion law is associated with small but significant increases in all-cause mortality (RR: 1.010, 95% CI 1.001, 1.020), infant mortality (RR: 1.018, 95% CI 1.008, 1.027), and breast cancer mortality (RR: 1.016, 95% CI 1.010, 1.021). Demand side laws (e.g., restrictions on funding and minors) had stronger effects than supply side laws (e.g., facility licensing restrictions). We find no association between restrictive abortion laws and maternal, child, or reproductive cancer mortality. Interpretation: Restrictive abortion laws may be impacting women’s health in ways other than abortion access, and demand side laws are more impactful than supply side laws. Further effects will be examined by race to see if these laws contribute to health disparities.
HEALTH-RELATED FITNESS SURVEILLANCE IN NEW YORK CITY PUBLIC SCHOOL YOUTH, 2006-2017

Emily M. D’Agostino* Emily D’Agostino, Sophia E. Day, Kevin J. Konty, (Miami-Dade Department of Parks, Recreation and Open Spaces)

The National Academy of Medicine has called for population-level youth fitness surveillance to inform scientific research, physical activity programming/interventions, and clinical arenas, although prior research has not explored school-based fitness testing to achieve this aim. The purpose of this study was to demonstrate the utility of the New York City (NYC) Fitnessgram as a surveillance tool to monitor health-related fitness levels in public school youth in grades 4-12, 2006-2017 (n=5,613,228 observations; 510,293 per year). Data were drawn from the NYC Fitnessgram dataset jointly managed by NYC Department of Education (DOE) and Department of Health and Mental Hygiene (DOHMH). The primary outcome was a binary variable representing whether the student met the highest performance criteria for healthy fitness according to the Cooper Institute’s sex- and age-specific Healthy Fitness Zones for the pacer, pushup, and curlup tests. Observations with complete gender, date of birth, pacer, pushup, and curlup assessments were weighted to be representative of NYC public school 4th-12th grade enrollment across all neighborhoods for each school year, accounting for student age, gender, race, language, birthplace, home and school poverty and clustering at the school-level. Spatial analyses were performed on student fitness attainment across 1) area-level access to physical activity resources; 2) neighborhood-level poverty. Results show a significant increasing trend in the prevalence of NYC students in grades 4-12 from 2006 to 2017 who met the highest criteria for healthy fitness (15.5% [95%CI: 13.9%-17.0%] in 2006 to 23.3% [95%CI: 22.2%-24.4%] in 2017), although disparities persist across neighborhood poverty (e.g., 30.1% [95%CI: 28.0%-32.1%] in low vs. 19.7% [95%CI: 18.7%-20.7%] in high poverty areas). These findings demonstrate surveillance utility of school-based fitness testing to monitor youth health patterns at a population level, over time, and across subpopulations.

S/P indicates work done while a student/postdoc
DISRUPTION OF EMPLOYMENT OR SCHOOL DUE TO CANCER LEADS TO ADVERSE FINANCIAL OUTCOMES FOR FEMALE YOUNG ADULT CANCER SURVIVORS Clare Meernik*
Clare Meernik, Anne C. Kirchoff, Chelsea Anderson, Teresa P. Edwards, Allison Deal, Chris Baggett, Lawrence H. Kushi, Chun Chao, Hazel Nichols, (University of North Carolina Gillings School of Global Public Health)

Young adult (YA) cancer survivors may be especially vulnerable to financial problems after diagnosis due to changes in work status or educational opportunities at a critical time. We examined the association between work or school disruption due to cancer and financial burden in YA female cancer survivors diagnosed at ages 19-39. YA women diagnosed with breast, lymphoma, melanoma, thyroid, or gynecologic cancers during 2004-2015 were identified from the North Carolina Central Cancer Registry (NC CCR). Cancer-related experiences were assessed by an online survey and clinical factors by linkage to the NC CCR. Any adverse financial outcome was defined as borrowing money, going into debt, or filing bankruptcy (material conditions), or worrying about medical bills (psychological response). Multivariable prevalence differences (PD) and 95% confidence intervals (CI) of adverse financial outcomes comparing YA cancer survivors with and without work/school disruption were estimated using Poisson regression models with robust variance. We analyzed data from 782 respondents who reported working (83.5%), being in school (6%), or both (10.5%) at the time of diagnosis. Of these, 31.5% reported work/school disruption (leaving or reducing hours) and 66% had adverse financial outcomes (material=33%; psychological=64.5%) related to their cancer. After adjustment for clinical and demographic factors, women with disrupted work/school had a higher prevalence of adverse financial outcomes (any PD=0.13; 95% CI, 0.06-0.21; material PD=0.19; 95% CI, 0.11-0.27; psychological PD=0.13; 95% CI, 0.05-0.20) compared to those without disruption. Among women with disrupted work/school, 23% borrowed or incurred debt of $25,000 or more, compared to 9% without work/school disruption. Financial strain among YA cancer survivors can be substantial; financial navigation services may present an important opportunity to improve cancer survivorship care.
A SIMPLIFIED SCORING TOOL TO ASSESS NEED FOR PHARMACOLOGIC TREATMENT IN NEONATAL ABSTINENCE SYNDROME (NAS) Janis L. Breeze* Janis L. Breeze, Norma Terrin, Lori A. Devlin, Enrique Gomez, Jessica K. Paulus, Barry Lester, Jonathan M. Davis, (Tufts Medical Center)

Introduction: The Finnegan Neonatal Abstinence Scoring Tool (FNAST) is a 21-item screening tool (Figure) used to assess severity of withdrawal in opioid-exposed newborns and guide pharmacotherapy, but includes some signs that are rarely observed. While there is no gold standard to determine which newborns require treatment, this study aimed to simplify and improve the clinical utility of the FNAST by identifying key signs that contribute to the decision to treat. Methods: The study population consisted of opioid-exposed neonates ≥37 weeks gestation evaluated for NAS. Data were derived from medical record review at 2 Kentucky hospitals, and multisite prospective studies led by Tufts. The analysis used a single FNAST score for each infant: highest score on first day of treatment, or highest on the 3rd day of life if untreated. Each item was dichotomized and a reduced set of items was selected via stepwise logistic regression. New scores were calculated based on the reduced set. Variation in endorsement of items across the cohorts was also evaluated. Results: The dataset included 238 treated and 210 untreated infants. In a multivariable model to discriminate treated from untreated, the original FNAST had an AUC of 0.90. A model limited to the 12 items that were independently associated (p<0.05) with treatment discriminated almost as well (AUC=0.89). 40% of variation in endorsement of the crying item was attributable to variation across cohorts. Eliminating this item and combining two tremor items resulted in a 10-item scale with a slightly reduced AUC (0.87). Treatment thresholds were identified for the new score corresponding to the original FNAST thresholds. Discussion: A simplified FNAST scale with 10 binary items (Figure) should reduce the burden among clinical staff performing the assessments every four hours, and improve reliability of the tool, which has been shown to be poor. Next steps include validation of these results in a large external cohort of infants.

<table>
<thead>
<tr>
<th>Original Item</th>
<th>Score</th>
<th>New Item</th>
<th>Score</th>
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<td>Sleeps &lt;3 Hours After Feeding</td>
<td>1</td>
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<td>Continuous High-Pitched Crying</td>
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<td>Hyperactive Moro Reflex</td>
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<td>Any Tremors</td>
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<td>Mild Tremors when Undisturbed</td>
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<td>Moderate-Severe Tremors when Undisturbed</td>
<td>4</td>
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<td>Increased Muscle Tone</td>
<td>1</td>
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<tr>
<td>Markedly Hyperactive Moro Reflex</td>
<td>3</td>
<td>Excoriation</td>
<td>1</td>
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<tr>
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<td>Myoclonic Jerks</td>
<td>3</td>
</tr>
<tr>
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<td>Generalized Convulsions</td>
<td>5</td>
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<tr>
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<td>Sweating</td>
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<td>Generalized Convulsions</td>
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<td>Sneezing ≥3 times/scoring interval</td>
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<td>Fever ≥38.4°C</td>
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<td>Respiratory Rate &gt;60/min</td>
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<tr>
<td>Motting</td>
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<td>Respiratory Rate &gt;60/min with retractions</td>
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<td>Loose Stools</td>
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<tr>
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<td>Watery Stools</td>
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<td>Loose or Watery Stools</td>
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</tr>
<tr>
<td>Respiratory Rate &gt;60/min with retractions</td>
<td>1</td>
<td></td>
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</table>
MATERNAL DIETARY PATTERNS AND DEPRESSIVE SYMPTOMS DURING PREGNANCY
Peiyuan Huang* Peiyuan Huang, Xueling Wei, Minshan Lu, Dongmei Wei, Jinhua Lu, Songying Shen, Mingyang Yuan, Niannian Chen, Huimin Xia, Xiu Qiu, (Division of Birth Cohort Study, Guangzhou Women and Children’s Medical Center, Guangzhou Medical University, Guangzhou, China)

Objective: To explore the associations between maternal dietary patterns and depressive symptoms in early and late pregnancy in a Chinese population. Methods: 17439 pregnant women from the Born in Guangzhou Cohort Study, a prospective cohort, were included. Maternal diet information was collected by a validated self-administered food frequency questionnaire at 24-27w of gestation. Dietary patterns were identified by cluster analysis. Depressive symptoms were measured by Self-rating Depression Scale in both early (<20w) and late (35-38w) pregnancy, with a score ≥53 defined as the presence of symptoms. Depressive symptoms during pregnancy were categorized as ‘absent’ (-/-), ‘early pregnancy only’ (+/-), ‘late pregnancy only’ (-/+), and ‘persistent’ (+/+). Multinomial logistic regression was used to explore the associations between dietary patterns and groups of depressive symptoms. Results: Six dietary patterns were identified: ‘Fruits and nuts’ (N=2242, 12.9%), ‘Meats’ (N=2956, 17.0%), ‘Varied’ (N=3868, 22.2%), ‘Traditional’ (N=2728, 15.6%), ‘Dairy and eggs’ (N=2376, 13.6%), and ‘Vegetables’ (N=3269, 18.8%). There were 12755 (73.1%), 1945 (11.2%), 1319 (7.6%), and 1420 (8.1%) women in the ‘absent’, ‘early pregnancy only’, ‘late pregnancy only’, and ‘persistent’ groups of depressive symptoms, respectively. When other groups were compared with the ‘absent’ group, women with ‘Varied’ pattern (richer in non-leafy and non-cruciferous vegetables, fish, seafood, sweets, and desserts) had a higher risk of having persistent depressive symptoms than those with ‘Fruits and nuts’ pattern (adjusted OR 1.24, 95% CI 1.02-1.51). Conclusion: Maternal dietary patterns were associated with depressive symptoms during pregnancy. A diet richer in fruits and nuts might contribute to a lower risk of persistent depressive symptoms in Chinese pregnant women. Further research is needed to explore potential interactions between nutrition and mental health during pregnancy.
NON-GENETIC MATERNAL RISK FACTORS FOR THE VACTERL ASSOCIATION: A EUROCAT CASE-CONTROL STUDY Romy van de Putte* Romy van de Putte, Iris A.L.M. van Rooij, Cynthia P. Haanappel, Maria Loane, Ingeborg Barisic, Hermien E.K. de Walle, Nel Roeleveld, Jorieke E.H. Bergman, (Radboudumc)

INTRODUCTION: The VACTERL association is the non-random occurrence of at least three of these birth defects: vertebral, anal, cardiac, tracheo-esophageal, renal, and limb defects. Other than indications for several risk factors, such as pregestational diabetes and assisted reproductive techniques (ART) from case-reports and small studies, the etiology remains largely unknown. VACTERL is hypothesized to have a multifactorial etiology in which genetic and non-genetic risk factors play a role. Our study aim was to identify non-genetic maternal risk factors for the VACTERL association in offspring. METHODS: A case-control study was performed using data from 25 EUROCAT registries over the period 1997–2015, ascertained through hospital records, birth and death certificates, questionnaires and/or post mortem examinations. We included 288 VACTERL cases and 43,583 controls with recognized syndromes or chromosomal abnormalities. Registries were excluded from the analyses of specific maternal factors when they had >75% missing data for that factor. Multivariable logistic regression analyses were performed to estimate maternal age and other confounder adjusted odds ratios (ORa) and 95% confidence intervals (95%CI). PRELIMINARY RESULTS: VACTERL patients were more often born from a first pregnancy than controls (ORa 1.5 [95%CI 1.1-1.9]). For couples who used ART, we found an increased risk of VACTERL (3.4 [2.0-5.7]) in offspring. This risk was slightly higher when non-invasive ART (artificial insemination or hormonal treatment) was used (4.4 [2.2-8.9]). Maternal chronic illnesses, such as pregestational diabetes (3.5 [1.3-9.7]) and chronic lower obstructive pulmonary diseases (3.9 [2.4-6.6]) also increased the risk of having a child with VACTERL. Twin pregnancies were not associated with VACTERL (0.6 [0.2-1.5]). CONCLUSION: In this large case-control study, we identified several maternal non-genetic risk factors for VACTERL in offspring, which fits a multifactorial etiology.
IS NEIGHBORHOOD FOOD ENVIRONMENT CAUSALLY RELATED TO CARDIOMETABOLIC RISKS? - NATURAL EXPERIMENT FROM THE 2011 GREAT EAST JAPAN EARTHQUAKE

Background: Causal inference is challenging in studies examining the influence of neighborhood food environment on health because of problems of residential selection and unobserved preferences. We aimed to estimate the causal effect of neighborhood food environment and cardiometabolic risk, using a natural experiment (involuntary residential relocation) in the aftermath of the 2011 Great East Japan Earthquake.

Methods: We used longitudinal data from a cohort of older adults aged 65 years or older living in Iwanuma city, Japan, located 80 km west of the earthquake epicenter. The baseline survey was conducted seven months before the earthquake (n = 5,058), while two follow-up surveys among survivors were performed approximately 2.5 and 5.5 years after. Among study participants, 131 subjects experienced forced relocation to temporary shelters after the disaster. A second relocation to permanent housing occurred a few months before the third wave of the survey. Subjects were linked to medical records with information on cardiometabolic biomarkers. The nearest distance to convenience store, fast food restaurant, and supermarket from each subject's home address was calculated at each of the three time points. We used fixed effect regression to adjust for all time-invariant and observed time-varying confounders.

Results: We found significant associations with increased waist circumference for each 1 km decrease in distance to the nearest convenience store (1.51 cm, 95% CI: 2.62 to 0.41) and fast food restaurant (1.91 cm, 95% CI: 3.07 to 0.76). The association between the proximity to a convenience store and waist circumference was robust when the analysis was restricted to individuals who experienced forced relocation (4.47cm, 95% CI: 8.37 to 0.57).

Discussion: Increased access to food outlets in the neighborhood may be causally linked to an increase in cardiometabolic risk profile of nearby residents.
IDENTIFYING SPATIAL PATTERNS AND PREDICTORS OF LIVER CANCER INCIDENCE WITHIN SMALL GEOGRAPHIC AREAS IN CALIFORNIA Purva Jain*, Purva Jain, Atsushi Nara, Atsushi Nara, Joseph Gibbons, Caroline Thompson, (San Diego State University + UC San Diego)

Introduction: Liver cancer rates have more than tripled since 1980. The burden disproportionately affects Hispanic and Asian Americans who have higher prevalence of known risk factors such as hepatitis, obesity, and alcohol consumption. There is limited knowledge on how liver cancer burden varies geospatially. We studied liver cancer in California at the medical study service area (MSSA) level and evaluated the magnitude of risk factors according to burden within an MSSA, relative to its neighbors. Methods: We used California Cancer Registry data to calculate age-standardized rates (ASRs) of liver cancer for 2010-2015 in 310 MSSAs. Sociodemographic characteristics and risk factor prevalence were included using the American Community Survey and CDC 500 Cities Project. Local Indicator of Spatial Autocorrelation and Getis-Ord-Gi analyses were run using ArcMap 10.6.1. Multivariable poisson regression models were used to model ASRs with known risk factors and interactions by regional level of burden using SAS 9.4. Results: The overall AIR was 19.1 per 100,000 (95% CI:12.2-29.7). In models adjusted for density, affluence, urbanicity, and healthcare access, higher IRRs were seen in predominately Hispanic (IRR=1.29; 95% CI:1.16-1.43) and mixed Hispanic/Asian (IRR=1.54; 95% CI:1.39-1.69) MSSAs. For every 10% increase in binge drinking there was a 24% increase in the IRR (95% CI:1.08-1.40). Rural MSSAs had a lower IRR (0.65; 95% CI:0.51-0.79) compared to Urban. IRRs varied according to overall burden in the MSSA. Conclusion: Liver cancer is a rapidly emerging problem and increases in incidence among minority populations. Geospatial statistics are useful to discern patterns to evaluate how risk factors vary across space. We studied known risk factors for liver cancer incidence in California and found differences across small geographic areas and identified patterns related to neighborhood racial composition and binge drinking, which may be a proxy for other unhealthy behaviors.
ASSOCIATION BETWEEN CHILD'S OBESITY AND OF MATERNAL PERCEPTION OF CHILD'S GENERAL HEALTH: A MULTI-RACIAL COHORT OF CHILDREN

JacKetta R Cobbs*, JacKetta R. Cobbs, Kelly Hunt, Pamela Ferguson, Adwoa Commodore, Danielle Stevens, John Vena, (Medical University of South Carolina)

Objective: Over the years, several studies have reported maternal misperceptions of child's obesity status, but few studies have examined the relationship between child’s measured obesity status and maternal perception of child's health. Therefore, our objective was to examine the association between child obesity and maternal perception of child’s general health. Methods: A cross-sectional study of the Environmental Influences on Child Health Outcomes NICHD Fetal Growth Studies was conducted. Child’s overweight (85th to 95th percentile) and obesity (≥ 95th percentile) status were based on measured BMI. The NIH 7-item PROMIS General Health v1.0 survey was used to assess mother’s perception of child’s overall health. Descriptive statistics and linear regression analyses were conducted. Results: Of the 720 children, 47.6% were female, 28.1% (non-Hispanic White), 30.8% (non-Hispanic Black), 28.1% (Hispanic), and 13.1% (Asian). The children were ages 4 to 8 years with a mean age of 6.7. Positive health scores in our cohort ranged from 12 to 29 with a mean score of 22.3. Overweight children had similar positive health scores as normal weight children regardless of race-ethnic group. However, obese children relative to normal weight children had lower positive health scores in non-Hispanic White [-1.65(95% CI: -3.17, -0.12)], non-Hispanic Black,[-1.26(95% CI: -2.14, -0.38)], and Hispanic[-1.10(95%CI: -1.91, -0.29)] children, but higher positive health scores in Asian [3.85(95%CI: 1.10, 6.61) children after adjustment for child’s age, child's gender, child’s race, mother’s education, and income. Conclusion: Maternal perception of child’s health varied depending on obesity status as well as racial-ethnic group. Future studies should identify cultural differences that may influence mother’s perception of child’s health as well as the relationship between obesity and health.

S/P indicates work done while a student/postdoc
IS PERCEIVED NEIGHBORHOOD SOCIAL ENVIRONMENT ASSOCIATED WITH TV VIEWING AMONG JACKSON HEART STUDY PARTICIPANTS? Kosuke Tamura, Kosuke Tamura, Ellen Cromley, Steven Langerman, Marcus Andrews, Joniqua Ceasar, Sophie Claudel, Mario Sims, Tiffany Powell-Wiley, (National Heart, Lung, and Blood Institute, National Institutes of Health)

Longer TV viewing is related to a greater risk of cardiovascular disease (CVD), disproportionately impacting African Americans (AA). However, little is known about how neighborhood social environments impact sedentary behavior, such as TV viewing. The aim of this study was to examine the link between neighborhood social environment (NSE) and TV viewing. Data for 5,190 Jackson Heart Study participants (mean age=55.4y; 63.4% female) were utilized to create one binary TV viewing outcome: ≥4 hours/day vs. <4 h/d. Perceived NSE variables included neighborhood social cohesion (higher score=more favorable neighborhood perception), neighborhood violence and problems (e.g., trash, noise; higher scores=more unfavorable neighborhood perception). Covariates included individual characteristics (age, smoking), and objective built environment variables (population density). Generalized linear mixed models were used to examine associations between NSE and TV viewing adjusting for covariates. Adjusting for individual characteristics only, perceived neighborhood violence (OR=2.83; 95%CI=1.61, 4.97) and problems (OR=2.18; 95%CI=1.48-3.22) were positively associated with TV viewing. Neighborhood social cohesion was negatively associated with TV viewing (OR=0.52; 95%CI=0.28-0.98). Additionally, adjusting for three objective built environment variables, neighborhood violence (OR=2.14; 95%CI=1.23-4.04) and problems (OR=1.74; 95%CI=1.10-2.75) remained significantly associated with TV viewing, but neighborhood social cohesion did not. Adjusting for all covariates, perceived neighborhood violence and neighborhood problems were positively related to TV viewing, while neighborhood social cohesion was not. Our findings suggest that multi-level interventions to reduce sedentary time and improve CV health should consider improving neighborhood social environment as a target. Future research should determine potential psychosocial factors that may mediate this association.

Figure. Associations between neighborhood social environment (OR with 95% CI) and TV viewing (≥4 hours/day vs. <4 h/d) adjusting for all individual characteristics and the objective built environment.
TWO SIMPLE BIAS ANALYSIS METHODS TO CORRECT FOR OUTCOME MISCLASSIFICATION IN A MEDICAL RECORD TO MEASURE THE QUALITY OF OBSTETRIC SERVICES IN UGANDA. Min Kyung Kim* Min Kyung Kim, Joseph Egger, Joy Noel Baumgartner, Jennifer Headley, Julius Kirya, James Kaggwa, (Duke Global Health Institute)

Background. In low resource settings, clinical quality data derived from medical records is known to exhibit high levels of misclassification. Understanding how misclassification can lead to biased estimates of occurrence and association would help to determine the appropriate use of the medical record. Objective. This study aimed to compare two methods – 1) direct assignment of positive predictive value (PPV)/negative predictive value (NPV) and 2) indirect assignment of PPV/NPV derived by sensitivity and specificity – to correct for outcome misclassification in an evaluation study of clinical training among six primary care clinics in Uganda. Methods. This study utilized external validation data of the same target population to estimate four bias parameters: sensitivity; specificity; PPV; and NPV. For the validation data, 321 medical records and the direct observation (gold-standard) were collected on the same deliveries. For the evaluation data, 1,075 medical records of deliveries were collected to estimate the change in providers’ behavior before and after receiving the training. Exposure was defined as the time before and after receiving the training. One quality indicator, documentation of 1-minute APGAR score, was used to conduct two bias analysis methods. Results. In the figure, the summary table shows changes in PR and OR estimates using two methods from uncorrected to corrected data. Both methods changed the PR estimates while the indirect method only changed the OR estimate. Two by two tables of the uncorrected and two corrected data are shown in the figure. Conclusions. Direct and indirect methods correcting for outcome misclassification resulted in significantly different estimates due to different absolute values of prevalence and relative changes in the prevalence of the outcome due to the training. Clinical researchers should be aware of these varying outputs when conducting bias corrected analyses using medical record data in low resource settings.
ORAL CONTRACEPTIVE USE AND ANTI-MÜLLERIAN HORMONE CONCENTRATIONS IN PREMENOPAUSAL WOMEN: A POOLED ANALYSIS OF FOUR COHORTS Lauren A. Wise* Lauren A. Wise, Tanran R. Wang, Enrique F. Schisterman, Bernard L. Harlow, Sunni L. Mumford, Geralyn Messerlian, Ellen M. Mikkelsen, Elizabeth E. Hatch, (Boston University School of Public Health)

Background: There is inconsistent evidence regarding the association between oral contraceptive (OC) use and ovarian reserve. While some studies indicate that longer-term OC use (≥10 years) is associated with greater ovarian reserve, others show the opposite or no effect. Current or recent OC use has been associated with transiently reduced biomarkers of ovarian reserve. Methods: We examined the association between self-reported history of OC use and anti-müllerian hormone (AMH), a biomarker for ovarian reserve, in four prospective cohort studies of non-contracepting premenopausal women aged 18-45 years: Harvard Study of Moods & Cycles (1995-1999; N=371); EAGeR (2007-2011; N=1,198); Snart Foraeldre (2013-2018; N=83); and PRESTO (2015-2018; N=120). AMH was measured using Ansh (picoAMH and ultrasensitive) or Beckman Coulter (GEN II) assays, depending on the cohort. We used linear regression to estimate percent differences in mean AMH concentrations (β) and 95% CIs across OC categories, adjusting for age, BMI, smoking, age at menarche, last method of contraception, and assay method. OC duration and recency were mutually adjusted. Women with PCOS were excluded and data were pooled using random effect models. Results: Of 1,772 women, 1,490 (84%) reported ever use of OCs. Relative to never use of OCs, ever use of OCs was not appreciably associated with AMH concentrations (β=-3.8%, CI: -15.7%, 8.2%). Among ever users of OCs, β (CI) for OC durations of 2-4, 5-7, 8-10 and >10 years versus <2 years were 5.5% (-6.1%, 17.1%), -6.5% (-22.5%, 9.5%), -3.5% (-23.8%, 16.8%) and -17.3% (-36.5%, 1.9%), respectively. β (CI) for time since last OC use of 24 months were -17.0% (-40.9%, 6.8%), -13.7% (-28.1%, 0.7%), 0.1% (-15.4%, 15.6%) and -4.6% (-10.7, 11.6%), respectively. Conclusion: In this pooled analysis, both recent and long-term OC use were associated with modestly reduced AMH concentrations, though no monotonic associations were observed.

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OCCUPATIONAL RADIATION EXPOSURE AND CARDIOVASCULAR RISK FACTORS AMONG MALE INTERVENTIONAL MEDICAL WORKERS Ye Jin Bang*, Ye Jin Bang, Sung Bum Cho, Won Jin Lee, (Department of Preventive Medicine, Korea University College of Medicine)

Background: Although interventional medical workers receive considerably high dose of radiation, few studies have investigated the effects of radiation worldwide. This study aims to investigate the association between occupational radiation exposure and cardiovascular risk factors among interventional medical workers. Methods: We conducted a cross-sectional study of the 73 male interventional medical workers (52 radiologists, 21 radiologic technologists) in 2017 and the survey data was linked with the National Dose Registries (NDRs) data. The study included detailed questionnaires, laboratory findings of the risk factors for cardiovascular disease, and ultrasonography examinations. Results: The mean cumulative occupational radiation doses were 25.1 mSv and 15.7 mSv for radiologists and radiologic technologists, respectively. Non-significant decline was observed in level of HDL-cholesterol (coeff=-1.176; p=0.738), whereas those of LDL-cholesterol was increase among radiologists than radiologic technologists (coeff=6.522; p=0.391) after adjustment for age, smoking, and body mass index. In addition, the right posterior common carotid artery intima-media thickness was significantly increased for radiologist than radiologic technologist (coeff=0.064; p=0.010). There was increased of level of high-sensitivity C-reactive protein (coeff=0.014; p=0.740) was associated with cumulative occupational radiation doses (per 100 mSv) in all workers. Conclusions: Our findings provide a possible association between cardiovascular risk factors and occupational radiation exposure among Korean interventional medical workers. For more in-depth investigation of health effects from radiation effects, the additional analysis of early effect biomarkers for cardiovascular disease is ongoing.
A substantial proportion of pregnancies have indications that suggest intervention to deliver prior to 39 weeks’ gestation through labor induction or prelabor cesarean delivery. While some conditions clearly call for delivery, many require a week-by-week judgment to balance mother and infant risks. We conducted a study at a large tertiary care women’s hospital to examine the association of intervention vs. no intervention between 34 and 38 weeks’ gestation on health outcomes in pregnancies affected by non-severe hypertensive disorders. Detailed medical record abstracts of 5096 pregnancies were analyzed using imputation of potential outcomes based on propensity scores splines and linear adjustments in an attempt to isolate the causal effect of the intervention itself from indications for interventional delivery. Comparing measures of infant health (NICU admission, respiratory problems, prolonged postpartum hospital stay, index of adverse outcomes) and maternal health (Cesarean delivery, prolonged hospital stay) for each week of gestation suggested strong adverse effects of intervention across all outcomes, with marked diminution in crude associations as gestation progressed. Propensity score adjustment attenuated the associations for all outcomes except Cesarean delivery, with a sharp decline in the magnitude of adjusted association at 37 weeks’ gestation. At week 36, for example, intervention was associated with 16 per 100 more NICU admissions, 9 per 100 more infant respiratory problems, and 16 per 100 more prolonged infant hospital stays after adjustment (likely resulting directly from their gestational age). At 37 weeks, corresponding estimates were 5, 6, and 2 per 100 additional events with intervention. Despite inclusion of detailed clinical information to remove confounding by indication, the residual effect estimates suggest either an inability to fully control confounding or a possible adverse effect of the intervention itself.
LEVELS OF RISK: SOCIAL MEDIA AND DEPRESSIVE SYMPTOMS ARE NOT ASSOCIATED FOR MOST ADOLESCENTS IN THE US POPULATION  Noah Kreski* Noah Kreski, Katherine M. Keyes, Jonathan Platt, (Mailman School of Public Health, Columbia University)

Depressive episodes, loneliness, and suicidality have increased among US adolescents since 2010, especially among girls. Popular and academic literatures suggest that social media may contribute, but the selection of adolescents with high propensity to depression into daily social media use remains a threat to validity. We assessed associations of social media use with depressive symptoms in annual cross-sectional surveys of 8th and 10th grade students Monitoring the Future, years 2009 to 2016 (N=49922 (boys) and 52772 (girls)). Depressive symptoms were measured with a four-item scale based on agreement with statements such as “The future often seems hopeless”; total score range: 4 to 20. Dichotomization at a score of ≥10 was assessed as high depressive symptoms (HDS), representing 30.01% of the sample. Social network use was dichotomized into daily (68.62%) and not daily use. We created linear predicted models of five levels of propensity for HDS based on 26 covariates highly associated with HDS (e.g., GPA, self-esteem, alcohol consumption), and controlled for demographics and year and fixed effects. Before stratification by predicted depression score, adjusting for fixed effects, daily social media use was not associated with HDS among boys (OR = 0.97, CI: 0.93,1.01) and slightly higher among girls (OR = 1.06, CI: 1.01, 1.11). Among subclasses of predicted HDS, elevated odds of high depressive affect were observed for girls at the lowest predicted risk for HDS (OR = 1.09, CI: 1.01, 1.18) and the second lowest risk group of boys (OR = 1.24, CI: 1.07, 1.43). Among groups at high risk for HDS, there were no differences based on social media use. In summary, these results indicate that concerns about mental health consequences of social media use among adolescent youth are largely unfounded based on evidence; effects sizes are small, and predict increased risk only among adolescents who by and large exhibit no other risk factors for depression.
SOME INSIGHTS INTO CHARACTERISTICS OF PARENTS WHOSE REASON FOR “NO-INTENT” TO VACCINATE FEMALE ADOLESCENTS AGAINST HUMAN PAPILLOMAVIRUS WAS SPECIAL NEEDS: IMPORTANCE OF PHYSICIAN RECOMMENDATION

Vinay K. Cheruvu, Jaahnavi Badeti, (College of Public Health, Kent State University)

Research on Human Papilloma Virus (HPV) vaccination among adolescents with special needs is limited. This study aims to describe the characteristics of parents who cited “special needs child” as a reason for “no-intent” and the association with provider recommendation for the HPV vaccine. National Immunization Survey – Teen surveys 2008-2016 data were used in this study. The population of interest was of parents who cited “Special Needs” as a reason for “no-intent” to vaccinate their daughters against HPV in the next 12 months (n = 189). Weighted prevalence estimates and 95% confidence intervals (CI) were computed to describe the characteristics of the study population. Association between provider recommendation and parents’ characteristics was examined using weighted and adjusted logistic regression. Parents who cited “Special Needs” as a reason for “no-intent” to vaccinate their daughters against HPV were predominantly White non-Hispanic (76.3%), with some college or college graduate (73.3%), married (76.7%), forty-five years of age or older (57.1%), with an annual income < $75,000 (61.3%), with two or more children ≤ 18 years old (54.4%), and an average of 4 people in the household. Four percent of these parents also cited safety, knowledge, vaccine misinformation as additional reasons for “no-intent”. Sixty eight percent of the female adolescents did not receive provider recommendation for the HPV vaccine series. Less than six percent (5.6%) of non-Hispanic other or multiple race female adolescents received provider recommendation, followed by non-Hispanic Black (15.6%), White (33.9%), and Hispanic (59.3%). The number of persons in the household was negatively associated with receipt of physician recommendation for the HPV vaccine series (Odds Ratio 0.42 (95% CI: 0.20 - 0.88). Findings highlight the need for uptake in provider recommendation and programs to educate parents of special needs child about the benefits of the HPV vaccine.
THE “SWEET SPOT” REVISITED: OPTIMAL RECALL RATES FOR CANCER DETECTION WITH 2D AND 3D DIGITAL SCREENING MAMMOGRAPHY IN THE METRO CHICAGO BREAST CANCER REGISTRY

Garth H Rauscher, Garth H Rauscher, Anne Marie Murphy, Therese A Dolecek, Teresita Macarol, Hai Nguyen, Katherine Tossas-Milligan, Yanyang Liu, Nila Alsheik, (Division of Epidemiology and Biostatistics, University of Illinois at Chicago)

In breast cancer screening, high recall rates for mammography have large public health implications in terms of the sheer number of women that have to undergo the psychological, physical and financial burden of additional imaging. A recent U.S. study suggested that “the sweet spot for optimal cancer detection is in the recall rate range 12% to less than 14%” but this study did not account for the potential negative trade-offs related to higher biopsy recommendation rates. We replicated and extended this analysis using data from community radiologists in the Metro Chicago Breast Cancer Registry. The goal was to provide accurate data-driven visual aids that demonstrate the trade-offs between cancer detection and biopsy recommendation among community radiologists across a large multi-site healthcare system with multiple radiologist groups. We included 2D and 3D digital screening mammograms among women aged 40-79 years for 2005-2017. Eligible radiologists (N=90) read > 1000 screening mammograms. Radiologist-specific mean recall rates (abnormal interpretations/1000 mammograms), cancer detection rates (screen-detected in situ and invasive cancers/1000 mammograms) and biopsy recommendation rates were statistically adjusted for differences in patient mix (age, race/ethnicity, prior mammography, use of comparison film, biopsy history, family history, and breast density). We then regressed radiologist-specific cancer detection and biopsy recommendation rates against recall rates using best fitting fractional polynomials. Among 1,243,051 digital (2D and 3D) screening mammograms, mean recall rate was 12.0%, cancer detection rate was 0.49% and biopsy recommendation rate was 1.76%. Recall rates between 5-7% appeared to maximize cancer detection while minimizing biopsies; recall rates above 7% increased biopsies with little increase in cancer detection. New methods are urgently needed to reduce recall rates and the associated psychological, physical and financial burden.

Figure 1. Plots of adjusted radiologist-level mean cancer detection (squares) and biopsy recommendation rates (circles) as a function of recall rates (x-axis). Larger circles and squares represent larger screening volumes. (A) All screening mammograms; (B) 2D digital mammograms; (C) 3D tomosynthesis exams.

S/P indicates work done while a student/postdoc
Introduction The opioid crisis is growing daily. Prevention and access to treatment for opioid addiction and overdose reversal drugs are critical to fighting this epidemic. Primary care settings have increasingly become a gateway to better care for individuals with both behavioral health (including substance use) and primary care needs. Methods Over 100,000 deidentified, state-level patient claims records were analyzed to assess the likelihood of an opioid complication after receiving a prescription for opioids. Patient cohorts were defined as any patient who received at least one opioid as defined by the NDC database (n=9,088). Outcome variable was opioid complications and were defined as ICD-10 diagnosis categories of opioid poisoning or opioid abuse or opioid dependence. Independent variables included previous diagnosis of behavioral health issues, whether a patient was an adolescent between the ages of 12-17, gender, race, and geographic location. Descriptive statistics were reported on all variables and binary logistic regression was used to determine the likelihood of opioid complications in patients prescribed at least one opioid adjusting for age, gender, race, and behavioral health diagnosis. Results Results showed that patients who have a behavioral health diagnosis are more than 35 times more likely to have an opioid complication if prescribed opioids than patients without such a diagnosis. (OR=35.26 CI:[12.45,147.53]). A decision tree also showed similar results. Machine learning models were applied and yielded no significant findings. Conclusion Electronic medical records should identify patients who had a previous behavioral health diagnosis to receive alternative therapies to opioids for pain management. Intervention at this patient level is crucial to stemming the opioid crisis in potentially vulnerable patient cohorts.
FEASIBILITY OF ONLINE RECRUITMENT AND RETENTION OF A LARGE-SCALE OBSERVATIONAL PSYCHIATRIC INITIATIVE
Anne-Mary Salib* Anne-Mary Salib, Janie Shelton, Shirin Fuller, Elizabeth Noblin, Joyce Tung, (23ANDME, INC.)

Methods: From August 2017 to November 2017, 25,000 new and existing 23andMe research participants enrolled in a 9-month longitudinal study on Major Depressive Disorder (MDD) and Bipolar Disorder (BD). Participants were recruited internally and externally using a public-facing recruitment landing page and a social media strategy. The recruitment goal entailed enrolling and genotyping 15,000 MDD cases and 10,000 BD cases. Inclusion criteria, based on self-reported data, included being 18-50 years of age, diagnosed with MDD and/or BD by a licensed healthcare professional, and prescribed medication for their condition(s). Participants were screened for a subset of exclusionary conditions. Our largest social media recruitment efforts were done through customized audiences and targeted study ads. Web-administered study sessions comprised 2-4 tasks, surfaced to eligible participants every four weeks for nine months, within their 23andMe accounts. Results: All 25,000 participants completed the first monthly study session and were genotyped within six months of the study launch. While females represent ~60% of the 23andMe research participant database, females represented more than 80% of both MDD and BD arms, which differs from known condition prevalences. Longitudinal retention and drop off categorized by sex, self-reported age, computed ethnicity, and self-reported condition(s) will be presented in the analysis. The role of social media in the volume and speed of recruitment will be discussed in the context of demographics, study arm, and retention across the duration of the study. Hallmarks of this recruitment and retention effort will be compared to that of other longitudinal 23andMe web-based studies. Conclusions: Toggling social media targeting criteria can refine and inform the subsequent demographics in audience targeting. Based on our online recruitment efforts, social media may be a cost- and time-effective method of engaging conditions that are more prevalent in female populations.
SELENIUM AND VITAMIN E SUPPLEMENTATION AND RISK OF NON-MELANOMA SKIN CANCER AND CHRONIC DISEASE MORTALITIES: RESULTS FROM A RANDOMIZED CLINICAL TRIAL Xuan Hui* Xuan Hui, Maria Argos, Lin Tong, Mahfuzar Rahman, Faruque Parvez, Hasan Shahriar, James J. Dignam, Tariqul Islam, Iftekhar Quasem, Samar Kumar Hore, Ahmed Talat Haider, Zahid Hossain, Tazul Islam Patwary, Muhammad Rakibuz-Zaman, Md. Tariqul Islam, Golam Sarwar, Judith Harjes, Kristen Anton, Muhammad G. Kibriya, Farzana Jasmine, Rashed Khan, Mohammed Kamal, Christopher R. Shea, Muhammad Yunus, John A. Baron, Habibul Ahsan, (Department of Public Health Sciences, University of Chicago)

Epidemiologic and randomized controlled (RCTs) studies have indicated inconsistent effects of selenium and vitamin E supplementations on non-melanoma skin cancer (NMSC) and mortality outcomes. We therefore conducted the Bangladesh Vitamin E and Selenium Trial (BEST) to thoroughly evaluate these inconsistencies in a high-risk population exposed to arsenic through naturally contaminated drinking water. BEST is a 2x2 factorial chemoprevention RCT evaluating the effects of long-term daily supplementation of vitamin E (100mg α-tocopherol) and selenium (200µg L-selenomethionine) on NMSC risk and cause-specific mortality. In total, 7000 eligible and consented participants were randomized and followed-up every ~2 years for a median total follow-up of 5.91 years. Active surveillance through semi-weekly home visits were conducted to ensure compliance and ascertain study outcomes. Discrete time hazards model (DTHM) was used to quantify the treatment effects on NMSC incidence. Cox proportional hazards model was performed to assess mortality outcomes. A total of 402 NMSC cases and 513 deaths were ascertained over the study period. Overall, DTHM revealed statistically non-significant protective effects on NMSC for selenium and vitamin E, alone and in combination. Among underweight people (BMI<median) the NMSC protective effects during first 2-year follow-up cycle stood out for selenium (HR=0.46, p=0.047) and vitamin E (HR=0.45, p=0.043), which were strongest in women (40-80% hazards reduction). Among underweight people, selenium supplementation reduced CVD death hazards by 48% (p=0.013). Six-year vitamin E and selenium supplementation did not reduce NMSC or mortality in this high-risk population. However, the agents reduced NMSC incidence during the first ~2-year period among underweight people, suggesting a potentially beneficial effect on tumor promotion. Beneficial effects of selenium on CVD deaths in underweight population is intriguing and may have significant impact.
Purpose There is limited literature regarding the association between acquired hearing loss (AHL) and current depression (D) in South American countries. The purpose of this study was to investigate the relationship between AHL and D among adult Brazilians. This study consisted of a large, representative sample of young (YA; 18-39 years old), middle-aged (MAA; 40-59 years old), and older adults (OA; 60+ years old) residing in Brazil. Methods The 2013 Brazilian National Health Survey data was utilized for this cross-sectional study. Pregnant women, individuals born with hearing loss, and those using hearing aids were excluded from the study. The exposure was self-reported AHL, and the outcome was D measured by the Personal Health Questionnaire depression scale (PHQ-8). To investigate the relationship between AHL and D, multivariable weighted and adjusted logistic regression models were conducted while adjusting for sociodemographic and health related factors. Results In the final study sample (N=59,092; YA=27,751, MAA=20,312) of adult Brazilians, the prevalence of D was 7.99% and of AHL was 1.94%. Those with AHL had 103% significant increase in the odds of depression (adjusted odds ratio (AOR)=2.03, 95%CI: 1.55-2.67) compared to those without AHL. Among YA there was no significant association between AHL and D (AOR=2.15, 95%CI: 0.73-6.28). On the other hand, there was a significant association among MAA (AOR=2.39, 95%CI: 1.50-3.80) and OA (AOR=1.82, 95%CI: 1.25-2.66). Conclusions Brazilian adults 40+ years old with AHL experience significantly higher odds of having D. Those with AHL are a unique group of individuals and therefore, interventions should be tailored to them. These individuals may benefit from auditory rehabilitation such as the use of hearing aids. Further investigation is necessary to better understand this association and to incorporate relevant psychiatric assessments.
RECOVERY DESERTS: IDENTIFYING NEIGHBORHOODS UNDERSERVED BY OPIOID TREATMENT AND RECOVERY SERVICES Ayaz Hyder* Ayaz Hyder, Jinhyung Lee, Ashley Dundon, Lauren Southerland, Adam Porr, Vincent Sabino, Gretchen Hammond, David All, Harvey J. Miller, (College of Public Health, The Ohio State University)

Recovery in the aftermath of an opioid overdose remains challenging due to multiple barriers associated with social determinants of health including transportation. The purpose of this study is to holistically capture these barriers to treatment after an opioid overdose event using the concept of an Opioid Recovery Desert. In this study, we identified areas where supply of treatment providers is low and demand for treatment providers is high—our definition of an Opioid Recovery Desert. We obtained street address-level data on opioid overdose events in the community setting in Franklin County, Ohio, which consists of the City of Columbus and surrounding suburbs, from 2013-2017 to calculate overdose rates at the census tract level. We compiled data on various characteristics of treatment facilities that an individual may seek treatment at after an overdose event. We used GIS methods and spatial regression models to calculate average travel time at census-tract level and examine the association between overdose rate and travel time by mode of transportation (car or public transit) and type of treatment facility (opioids, substance abuse, mixture, mental health, or detox). The overall opioid overdose rate was 18.26 per 10,000 with a range of 2.57-164.60 per 10,000 using data on over 80% of all overdose encounter in Franklin County, Ohio. The average travel time by cars to the closest facility type was of 11 minutes (range: 5 - 250 minutes). Using median value of overdose rate and travel time as threshold value for categorizing areas as opioid recovery deserts we identified several opioid recovery deserts, up to 62 areas or 37% of the 168 census tracts for which we had sufficient data for analysis. The number of opioid recovery deserts differed by treatment facility type and by mode of transportation. In light of our findings we discuss several theoretical and practical implications of the concept of opioid recovery deserts in terms of their etiology, value for organizations (e.g., local public
THE ASSOCIATION BETWEEN PERIODONTAL DISEASE AND BREAST CANCER IN A PROSPECTIVE COHORT STUDY

Mengmeng Jia* Mengmeng Jia, Emily Vogtmann, Katie M. O’Brien, Clarice R. Weinberg, Dale P. Sandler, Gretchen L. Gierach, (Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, Maryland)

Background: Periodontal disease may be associated with increased breast cancer risk, but studies have not considered invasive breast cancer and ductal carcinoma in situ (DCIS) separately. We aimed to assess the relation between periodontal disease and breast cancer in a large prospective cohort study. Methods: The Sister Study followed women without prior breast cancer aged 35-74 years from 2003-2017 (N=49,653). Baseline periodontal disease was self-reported, and incident breast cancer then ascertained over a mean follow-up of 9.3 years. We estimated HRs and 95% CIs using Cox proportional hazards regression, adjusting for potential confounders: age, race/ethnicity, education, smoking, BMI, physical activity, recency of physical exam, diabetes, nonsteroidal anti-inflammatory drug use, menopausal hormone therapy use, age at menarche, and menopausal status. Case-only multivariable logistic regression was used to test for etiologic heterogeneity in risk for invasive breast cancer vs. DCIS. Results: 3,298 breast cancers (2,568 invasive, 730 DCIS) were identified. About 22% of participants reported a history of periodontal disease at baseline. There was no association between periodontal disease and overall breast cancer risk (HR=1.02, 95% CI: 0.94-1.11). However, we observed a suggestive increased risk of invasive breast cancer (HR=1.07, 95% CI: 0.98-1.18) and decreased risk of DCIS (HR=0.86, 95% CI: 0.71-1.04) associated with periodontal disease, with evidence for etiologic heterogeneity (OR for invasive vs. DCIS=1.27, 95% CI: 1.03-1.56; p-het=0.03). Conclusions: We observed no association between periodontal disease and overall breast cancer risk. However, heterogeneity in risk associations for invasive breast cancer vs. DCIS suggests an association with tumor characteristics. Our ongoing analyses will further explore this heterogeneity and potential causes, such as screening behaviors and medication use (e.g., aspirin, selective estrogen receptor modulators).
EVALUATION OF SEPSIS DEFINITIONS IN IMMUNOCOMPROMISED PATIENTS Margaret Lind*
Margaret Lind, Amanda Phipps, Steven Pergam, Catherine Liu, John Klassen, Chris Davis, (University of Washington)

Background: Sepsis, a life-threatening immunological response to an infection, is challenging to define and diagnosis due to the heterogeneity of its presentation. Because of this, sepsis is often clinically defined by an infected patient’s risk of mortality. Numerous screening criteria have been developed to help clinicians identify this risk and diagnose sepsis; but their ability to identify sepsis in high-risk, immunocompromised populations is unknown. Here, we evaluate two commonly used clinical criteria for sepsis among hematopoietic cell transplant recipients (HCT). Methods: We estimated the sensitivity and specificity of the Systemic Inflammatory Response Syndrome (SIRS) and quick-Sequential Organ Failure Assessment (qSOFA) criteria in relation to mortality for HCT recipients with suspected infections (SI). Data from the first 100 days post-transplant were retrospectively collected for patients transplanted between September 2010 to July 2017. We defined sepsis as a patient meeting 2+ criteria factors within 24 hours of a suspected infection and limited our analyses to patient’s first sepsis event (SE) or, in the absence of SE, last SI. Results: Of the 825 HCT recipients who experienced at least one suspected infection, 94 (11.4%) passed, including 51 (6.2%) within 28 days of their analyzed event. The sensitivity and specificity of SIRS for 28-day mortality was 87.5% (73.2-95.8%) and 22.9% (20.0-26.0%) and the AUC was 65.5% (56.5-74.5%). qSOFA had a sensitivity and specificity for 28-day mortality of 25.5% (14.3-39.6%) and 88.1% (85.6-90.3%) and an AUC of 63.9% (56.3-71.5%). Conclusion: SIRS criteria captured mortality well but had limited specificity whereas qSOFA had a higher specificity but lower sensitivity. The limited ability of these criteria to correctly identify clinically defined sepsis in these high-risk patients suggests the need for population-specific diagnostic tools.
SEAFOOD CONSUMPTION IS ASSOCIATED WITH GREATER FOLLICULAR FLUID ARSENIC AND MERCURY CONCENTRATIONS IN WOMEN UNDERGOING IVF


Human exposure to toxic trace elements (TTE), including arsenic (As), cadmium (Cd), mercury (Hg), and lead (Pb) is widespread, primarily through consumption of contaminated foods. At high levels, TTE have detrimental effects on reproductive function and existing literature suggests adverse reproductive impacts even at low-moderate levels of exposure. Yet, few studies have assessed associations between diet and TTE concentrations in human ovarian follicular fluid (FF), which may offer greater insight into biologically effective doses affecting fecundity than more commonly assessed blood and urine concentrations. Our objective was to identify dietary predictors of FF TTEs in n=56 women undergoing in vitro fertilization (IVF). We determined As, Cd, Hg, and Pb in 197 FF specimens, collected on the day of oocyte retrieval, using ICP-MS/MS. We employed principal components analysis (PCA) to distill components describing distinct weekly and annual diet “patterns” from responses to a comprehensive food frequency questionnaire. We calculated weighted sum scores, to serve as predictors in confounder-adjusted random intercept linear regression models of log-transformed FF TTEs. We found that greater weekly seafood consumption dominated by mollusks, shrimp, and bass was associated with greater FF As (β=0.39, 95% CI: 0.20, 0.57) and FF Hg (β=0.33, 95% CI: 0.11, 0.55) concentrations. Greater annual seafood consumption dominated by urchin, crab, and trout was associated with greater FF As (β=0.20, 95% CI: 0.06, 0.34) and FF Hg (β=0.21, 95% CI: 0.09, 0.32), concentrations. There were no associations for FF Cd and Pb. Overall, our results suggest that greater seafood consumption contributes to greater FF As and Hg concentrations, consistent with previous studies employing blood and urine biomarkers of exposure. Our findings may have important clinical implications, as diet is a modifiable risk factor for TTE exposure that may ultimately contribute to higher IVF live birth rates.

Figure 1. Predicted follicular fluid (FF) As and FF Hg concentrations according to low (25th %tile) and high (75th %tile) recent seafood consumption levels *

*Adjusted for maternal age, race, and cigarette smoking (in As models)
VARIATION IN NEWBORN HEARING SCREENING OUTCOME IN UPSTATE NEW YORK: IMPLICATIONS FOR RISK OF LANGUAGE DEPRIVATION\textsuperscript{*} Shazia Siddiqi, Wyatte Hall, Dongmei Li, Timothy Dye, (University of Rochester Medical Center)

Background: Early identification of newborns that need follow-up helps prevent language deprivation during the neurocritical period of language acquisition in the first five years of life. Inequities in accessing services attributable to differential hearing screening outcomes could lead to higher rates of language deprivation in populations where there are higher levels of Newborn Hearing Screening (NHS) referrals. Objective: To better understand social determinants of language deprivation, we sought to identify differential risk of NHS screening referral. Methods: The New York State Perinatal Data System records outcome (passed, referred) for newborn hearing screening. We ascertained risk of “referred” status (meaning, the infant requires follow-up testing) by maternal race, which was self-ascribed. We use SAS v9.4 to adjust odds ratios using logistic regression to control for confounding variables. The regional data holders and University of Rochester’s IRB approved this project. Results: 53,812 infants were screened. In total, 2.7% (1449) were referred for follow-up in one ear and 1.3% (687) were referred for both ears. Infants born to African-American women were significantly more likely to be referred (p<.0001; OR: 1.78; 95%CI: 1.60, 1.98) compared to non-African-American women. Significant risk remained after adjusting for infant birthweight and gender, and woman’s education and income (p<.0001; aOR: 1.60; 95%CI: 1.43, 1.79). Discussion: Infants born to African-American women experience higher rates of referrals for follow-up hearing screenings. With NYS lost-to-follow-up rates for referrals at 47%, this differential variation in NHS referral rates could result in risk of delayed identification of deaf or hard of hearing infants, and subsequently increase risk of language deprivation. Particular attention is required to ensure reduction of systemic barriers that could interfere with appropriate referrals, screening, and provision of language services.

\textsuperscript{*}S/P indicates work done while a student/postdoc
ARE RETAIL WORKERS MORE AT RISK FOR EXPOSURE TO BPA?: RESULTS FROM NHANES 2011-2012
Paulina Do* Paulina Do, Karyn Heavner, (Department of Public Health, Zuckerberg College of Health Sciences, University of Massachusetts-Lowell)

Background: Bisphenol A (BPA) is a widely used across many consumer and industrial products including plastics, food and beverage containers, and thermal paper receipts. BPA is a chemical developer on thermal receipts. Retail workers are likely to handle thermal receipts and be exposed to BPA due to the nature of their work. To our knowledge, studies focusing on the connection between retail workers and exposure to BPA are limited. Objective: This research sought to examine the association between workers in the retail trade industry and urinary BPA levels. Methods: We conducted a cross-sectional study analyzing subsample data from the National Health and Nutrition Examination Survey (NHANES) 2011-2012 among 858 working age subjects (16yrs+). Currently employed workers were dichotomized into retail or non-retail trade industries. A multivariable linear regression was conducted with the dependent variable as current occupational industry at the time of the survey and the independent variable urinary BPA measurements. The model was adjusted for age, gender, education, ethnicity/race, and creatinine. Survey sample weights were applied to account for the complex sampling strategy of NHANES. Results: Preliminary results indicate no increased risk of BPA exposure by occupational industry. Retail industry was not associated with increased BPA measurements (beta: -0.004 95%CI: -0.40, 0.39) compared to non-retail occupational industries. Conclusion: Preliminary results indicate occupational industry, specifically working in retail, does not increase occupational BPA exposure.
LONG-TERM STABILITY AND CHANGE IN PSYCHOLOGICAL DISTRESS: EVIDENCE FROM A NATIONALLY REPRESENTATIVE LONGITUDINAL SURVEY OF THE AUSTRALIAN POPULATION. Jenny Welsh* Jenny Welsh, Rosemary Korda, Emily Banks, Lyndall Strazdins, Grace Joshy, Peter Butterworth, (National Centre for Epidemiology and Population Health, Research School of Population Health, Australian National University)

Single assessments of psychological distress are often used in epidemiological research as indicators of more chronic mental health problems, but the within-person stability of distress over time is unclear. The aim of this study was to understand how single assessments of distress is related to longer term assessments by quantifying within-person change in psychological distress over eight years. We use data from the Household, Income and Labour Dynamics in Australia Survey, a nationally representative study of Australian adults. Psychological distress, assessed using Kessler 10 (K10) and categorised into low (scores:10-<12), mild (12-<16), moderate (16-<22) and high (22-50), was first included in the Survey in wave 7 and has subsequently been assessed biennially. We quantified two, four, six and eight year change in scores and categories according to initial category of distress among respondents who were ≥25 years and participated in all waves in which distress was measured. Average change in K10 scores was small overall. Two years following initial assessment, 94.1% of those with low distress initially had low or mild distress and 81.4% with high distress initially had moderate or high distress; proportions with an identical category of distress were 66.0% for low, 54.5% for mild, 44.0% for moderate and 50.3% for high. Proportions with consistent levels of distress did not change materially as follow-up time increased. Over the eight year follow-up period, 77.3% of individuals with high distress initially reported high distress on ≥1 follow-up occasion. Levels of psychological distress are generally stable over an up to eight-year period, with the majority of adults having the same or similar level of distress. In the absence of repeated measures, single assessments of distress are likely useful proxies for the longer term experience of distress.

S/P indicates work done while a student/postdoc
STATE-LEVEL SOCIAL CAPITAL AS A PREDICTOR OF ADULT ALL-CAUSE MORTALITY IN THE UNITED STATES: A MULTILEVEL ANALYSIS Justin Rodgers* Daniel Kim, Justin Rodgers, Daniel Kim, (Department of Health Sciences, Bouvé College of Health Sciences, Northeastern University, Boston, MA)

Background: From 2015 to 2017, the United States experienced the longest sustained decline in life expectancy since the time of the first world war. This alarming trend calls for increased efforts to identify the upstream drivers of mortality. Studies of social capital, a key social determinant that reflects the strength of social ties, have found evidence favoring protective effects for health. Yet we currently lack evidence on the impacts of area-level social capital on all-cause mortality. In a nationally-representative cohort of older Americans, we investigated the lagged associations between state-level social capital and individual all-cause mortality.

Methods: Using data from the Health and Retirement Study (n=11,762 adults aged 58 to 70 years in 2000), we examined an updated version of the Putnam state social capital index (derived from data on 14 social capital indicators in the 1990s) as a predictor of the relative hazards of all-cause mortality over the period 2000-2016. We employed Cox proportional hazards models, adjusting for state- and individual-level confounders and accounting for clustering of mortality within states. Results: Adults living in states within the top quartile of social capital had a 14% lower relative hazards of all-cause mortality (HR=0.86; 95% CI=0.80-0.98; p=0.01) compared to adults living in states within the lowest quartile. Moreover, we observed evidence of effect modification by gender (p=0.02 for interaction), but not by race/ethnicity or income. Women living in states within the top quartile of the social capital index had a 24% lower relative hazards of all-cause mortality (HR=0.76; 95% CI=0.64-0.91; p=0.02) compared to women living in states in the lowest quartile, while men did not show a similar association (HR=1.00; 95% CI=0.95-1.10; p=0.98). Conclusions: Policies and interventions that leverage levels of social capital may help to reduce the population burden of mortality in older Americans, particularly in women.
MATERNAL OBESITY AND RISK OF GESTATIONAL DIABETES IN THE MADRES PREGNANCY COHORT: A PROSPECTIVE COHORT STUDY IN PREDOMINANTLY LOW-INCOME HISPANIC WOMEN IN URBAN LOS ANGELES Thomas Chavez* Thomas Chavez, Tracy Bastain, Carrie Breton, (University of Southern California)

Introduction: Maternal pregnancy complications, such as gestational diabetes, are important both for maternal and fetal outcomes. Maternal obesity is an important risk factor for pregnancy complications and rates of maternal obesity are disproportionately high among women from underrepresented minority populations.

Methods: We investigated maternal factors associated with gestational diabetes in an ongoing cohort of 1000 predominantly low-income Hispanic pregnant women in Los Angeles called the Maternal and Developmental Risks from Environmental and Social Stressors (MADRES) cohort study. Women were enrolled prior to 30 weeks gestation at community health clinics and followed through 12 months postpartum with a series of in-person visits, records abstraction, and telephone questionnaires. Results: Among 264 participants without pre-existing diabetes mellitus who have had their records abstracted, there were a total of 18 cases of gestational diabetes documented by the provider on the participant's medical records. We examined univariate associations with pre-pregnancy body mass index (BMI), Hispanic ethnicity, maternal age, parity, preferred language, education, household income, and household size. We found that pre-pregnancy BMI was significantly associated with gestational diabetes diagnosis, after considering study site and maternal age at consent (odds ratio=1.11, 95% CI: 1.03–1.20). When we restricted the analysis to Hispanic women, the results were largely unchanged. Conclusions: Similar to prior research documenting the effects of maternal obesity on pregnancy complications, we found that pre-pregnancy BMI was significantly associated with a diagnosis with gestational diabetes after adjusting for study site and maternal age and this association remained the same when restricting to Hispanic women only.
ASSOCIATION BETWEEN NEIGHBORHOOD WALKABILITY AND DIABETES: THE NEW YORK UNIVERSITY WOMEN'S HEALTH STUDY

Byoungjun Kim* Byoungjun Kim, Yu Chen, Neloufar Rahai, Yelena Afanasyeva, Anne Zeleniuch-Jacquotte, Kathryn Neckerman, Andrew Rundle, (NYU Langone Health)

Aims and Background: Neighborhood walkability has been associated with lower rates of obesity-related disease. However, previous studies were limited to the use of crude measures of walkability at the county or metropolitan level. No studies have assessed the extent by which the association can be explained by differences in physical activity or obesity due to walkability. Methods: We conducted a cross-sectional study examining associations between neighborhood walkability and diabetes with walking metabolic equivalents (METs)-hour and body mass index (BMI) as mediators using baseline data of the New York University Women's Health Study, a prospective cohort study with 14,193 women. The residential addresses of the participants (1985-90) were geocoded, and neighborhood walkability of each participant was estimated using a measure that includes data on population, intersection, rail transit and business density. We fit generalized estimating equation (GEE) models to estimate odds ratios (ORs) for diabetes controlling for age, race, education, smoking status, and neighborhood socio-economic status variables. We also tested mediation effects due to walking and BMI using nonparametric analyses. Results: Each increasing quartile of neighborhood walkability was associated with a 15% reduced prevalence of diabetes (OR: 0.85). The association was attenuated when BMI and/or walking MET were included in the model (with BMI: OR 0.90 CI, with walking MET OR 0.86 CI, with both OR 0.91 CI [0.80-1.04]). Mediation analyses based on logistic regression models showed significant natural indirect effects (NIE) due to BMI (NIE = 0.93, p-value<0.01, proportion mediated = 0.35) and walking (NIE = 0.97, p-value=0.01, proportion mediated = 0.16). Conclusion Higher neighborhood walkability was associated with a lower prevalence of diabetes in women. And the association was mediated by BMI and amount of outdoor walking.
Global health research often describes studies conducted in or about low- and middle-income countries (LMICs). Many have called for greater inclusion of researchers from LMICs in such research, but the extent to which this occurs is unclear. Prior studies are largely journal- or subject-specific, rely on manual review, and yield varying estimates. We conducted a large-scale investigation of the contribution of researchers affiliated with LMICs to published global health research and examined whether this contribution differed over time. We searched the title, abstract, and keywords for the names of countries classified as low, lower-middle, or upper-middle income by the World Bank, and countries considered low or medium on the Human Development Index. We limited the search to items published from 2000-2017 and in journals indexed under a health-related field. Finally, we calculated the proportion of publications with any, first, and last, author affiliated with a LMIC, and conducted tests for trend using linear regression. Metadata for each publication were extracted using the Scopus application programming interface and analyzed in Stata statistical software. In total, 877,055 items met our search criteria; we present results from approximately 30% of items published from 2000-2010 for which data have been extracted. Among 269,798 publications, 80.4% included at least one LMIC-affiliated author, while 71.6% and 66.6% had a LMIC-affiliated first or last author, respectively. Although tests for trend in each category of any, first, and last author were statistically significant (p<0.0001), regression coefficients were small in magnitude, and ranged from 0.9 to 1.3 percentage point increase per year. Contributions of LMIC-affiliated authors to published global health research are considerable but remain stagnant over time. Future analyses will stratify results by precise LMIC income status and journal impact.
NEW INSIGHTS INTO RACIAL DISPARITIES IN BREAST CANCER OUTCOMES: ASSESSING RECEIPT OF GUIDELINE CONCORDANT CARE Lindsay J Collin*, Lindsay J Collin, Ming Yan, Kevin Ward, Keerthi Gogineni, Lauren E McCullough, (Emory University)

Background: Racial disparities in breast cancer (BC) outcomes persist, whereby black women are more likely to die from BC than white women. Although thought to be driven by triple negative BC, recent evidence suggests that more pronounced racial disparities in BC mortality are evident in prognostically favorable tumors. To better understand this disparity, we sought to evaluate if receipt of guideline concordant care contributes to the observed differences in BC mortality between black and white women in the metropolitan Atlanta area.

Methods: The study population was identified from the Georgia Cancer Registry. We included 4708 non-Hispanic white (NHW) and 3243 non-Hispanic black (NHB) women with a diagnosis of a stage I–III primary BC in Atlanta (2010–2014). Using the National Comprehensive Cancer Network guidelines for treatment decisions, we evaluated a patient’s receipt of guideline concordant care based on receipt of surgery, radiation therapy, chemotherapy, hormone therapy, and trastuzumab when indicated. We used Cox proportional hazard regression to calculate the hazard ratios (HRs) and 95% confidence intervals (CIs) comparing black vs. white BC mortality by guideline concordant care (yes/no), within each treatment modality.

Results: Overall, we found that 63% of NHW and 66% of NHB women received guideline concordant care for chemotherapy, and 80% of NHW and 73% of NHB women received guideline concordant care for radiation therapy. In age-adjusted models, among women with discordant chemotherapy therapy, NHB women had nearly twice the hazard of BC mortality compared to NHW women (HR=2.17, 95%CI 1.69, 2.77). We observed similar effect estimates among women with concordant chemotherapy (HR=2.13, 95%CI 1.71, 2.65). Conclusion: Our preliminary results suggest that guideline therapy for chemotherapy and radiation do not contribute to racial disparities in BC mortality, however future analyses examining overall guideline concordant care may provide further insight.
ASSOCIATION OF MULTIPLE PROTEINOPATHIES, COGNITIVE DECLINE, AND DEMENTIA IN A COMMUNITY-BASED AUTOPSY COHORT
Shama Karanth* Shama Karanth, Yuriko Katsumata, Richard J. Kryscio, Peter T. Nelson, David W. Fardo, Erin L. Abner, (Department of Epidemiology, University of Kentucky, Lexington, KY 40536, USA. Sanders-Brown Center on Aging, University of Kentucky, Lexington, KY 40536, USA)

Background: Abnormal accumulation of amyloidβ (Aβ) plaques and neurofibrillary tangles in the brain are the hallmark of Alzheimer’s disease (AD). However, it is important to recognize that AD pathology is frequently accompanied by additional neurodegenerative pathologies, specifically TDP43 and α-synuclein. We hypothesized that the co-occurrence of four misfolded proteins is common but under recognized in old age. This study aimed to determine the frequency of multiple proteinopathy among cases with at least one misfolded protein; evaluate demographic, neuropsychological, neuropathological characteristics; as well as evaluate cognitive trajectories over time. Methods: Data were analyzed from elderly, longitudinally evaluated participants in a community-based cohort study of aging and dementia who had undergone autopsy and satisfied criteria of having at least a misfolded tau. Cases definitions were based on the presence of the misfolded proteins: tau alone n=14, tau+TDP43, n=19, tau+ Aβ, n=138, tau+α-synuclein, n=59, tau+ Aβ+TDP43, n=68, tau+ Aβ+TDP43+α-synuclein, n=45. We examined the association between case groups and neuropsychological test scores, sex, age, years of education, clinical diagnosis, APOEε4, chronic comorbidities, additional neuropathologies, including cerebral infarctions, atherosclerosis, arteriolosclerosis and amyloid angiopathy. Results: A total of 343 autopsied participants were included. All 4 misfolded proteins were detected in 13.11%, 3 misfolded proteins were detected in 37% and 2 misfolded proteins in 46%. The participants with more proteinopathies had the lowest neuropsychological scores at death. The lowest MMSE scores, consistent with severe dementia, were observed in cases with all 4 proteins (Figure1). Conclusion: Multiple proteinopathy is common in aged brains. This has significant implications for public health, since strategies to prevent/cure AD may be complicated by the unrecognized presence of additional neurodegenerative pathologies.
Introduction: Adequate sleep (7-9 hours/day) is related to better health and well-being. However, many circumstances in young adulthood, such as employment, work hours, and parent status, may jointly constrain whether a person is able to obtain adequate sleep. Using a novel analytic approach called recursive partitioning, we examined the joint influences of work, social circumstances, and social identities (e.g., gender) on daily sleep to identify which young adults are most and least likely to achieve adequate sleep. Methods: Data for this cross-sectional analysis consisted of 1782 young adults surveyed in 2015-16 and were drawn from Project EAT-IV (Eating and Activity in Teens and Young Adults), a population-based study of adults aged 25-36 years. Measures for work and social circumstances included work status/hours, parent status, partner status, difficulty living on income, and student status. Sociodemographic measures included gender, race/ethnicity, U.S. nativity status, and age. Recursive partitioning (i.e., supervised machine learning with conditional inference trees [CITs]) was used to examine the joint influences of these measures on sleep duration (measured continuously and dichotomously [obtains 7-9 hours/day on average]). Results: Continuous sleep duration appeared to vary based on work status and gender with a number of social circumstances (e.g., parent status) playing a differentiating role for women, but not for men (see figure). CIT for dichotomous sleep suggested that nearly 80% of non-Hispanic White, non-Hispanic Asian, and Hispanic full-time workers (>30 hours/week) and caregivers were able to obtain the recommended 7-9 hours of sleep per night; whereas, <50% of part-time and unemployed workers without a partner met the recommendation (data not shown). Discussion: While work status appears to play the most differentiating role for sleep behavior among young adults, its influence on sleep varies based other social identities and circumstances.
TRENDS IN CERVICAL PRE-CANCERS BY RACE AND ETHNICITY DURING THE HUMAN PAPILLOMAVIRUS VACCINE ERA, HPV VACCINE IMPACT MONITORING PROJECT (HPV-IMPACT), UNITED STATES, 2008–2015

Julia Gargano* Julia Gargano, Rayleen Lewis, Nancy McClung, Nancy Bennett, Marie Griffin, Linda Niccolai, Monica Brackney, Mary Scahill, Manideepthi Pemmaraju, Angela Cleveland, Elizabeth Unger, Lauri Markowitz, (Centers for Disease Control and Prevention)

Background: Since human papillomavirus (HPV) vaccine introduction in the United States in 2006, cervical pre-cancer incidence has declined in young women, but incidence trends have not been reported by race/ethnicity. We evaluated trends in cervical pre-cancers from 2008–2015 in non-Hispanic (NH) white, NH black, NH Asian, and Hispanic women identified through active population-based surveillance in the Human Papillomavirus Vaccine Impact Monitoring Project (HPV-IMPACT). Methods: We analyzed data on cervical intraepithelial neoplasia (CIN) grades 2–3 and adenocarcinoma in situ (CIN2+) cases in women aged 20–39 years from three HPV-IMPACT sites. Annual CIN2+ rates per 100,000 women were calculated stratified by race/ethnicity in 5-year age groups, using multiple imputation to account for missing race/ethnicity (<10% missing). Rates were also calculated using estimated numbers of women screened for cervical cancer to control for known declines in screening. Trends were evaluated using JoinPoint software; average annual percent changes (AAPC) are presented. Results: A total of 10,247 CIN2+ cases (65% NH white, 19% NH black, 13% Hispanic, and 2% Asian) were reported from 2008–2015. CIN2+ rates among 20–24 year-olds declined significantly in all groups: NH white, AAPC: –15.3 (95% CI: –17.9, –12.5); NH black, AAPC: –14.1 (–19.0, –9.0); Asian, AAPC: –12.8 (–20.4, –4.5); Hispanic, AAPC: –15.7 (–18.0, –13.4) (Figure). In 25–29 year-olds, smaller declines were observed (AAPC: –2.1 to –4.3), and only significant in NH whites. No declines were seen in 30–34 or 35–39 year-olds. Among screened 20–24 year-olds, declines were smaller in magnitude (AAPC: –7.1 to –8.8); no declines were observed in screened 25–29 year-olds or older groups. Conclusion: In this first evaluation of CIN2+ trends by race/ethnicity during the HPV vaccine era, the similar declines in 20–24 year-olds across all groups, including among screened women, is consistent with equitable vaccine impact on CIN2+.
Objective: Few neighborhood attributes have been associated with child’s physical activity in prior studies. However, prior efforts have not assessed components of the home environment including access to recreational screens, or assessed which attributes of the built environment may be associated with measures of childhood adiposity. Study Design: A cross-sectional study design was used to assess the association between child's built environment, activity levels, and adiposity. Children were 4-8 years of age participating in the Environmental Influences on Child Health Outcomes NICHD Fetal Growth Studies (n=861). Built environment as well as child's activity levels were assessed via the Preschool-Age Physical Activity Questionnaire. Adiposity was ascertained by trained study staff. Multinomial logistic and linear regression models examined associations between child's built environment, activity levels, and adiposity. All models were adjusted for child's age, race, gender, maternal education, household poverty, and composite scores for the built environment (number of and access to recreational screens, neighborhood activities, neighborhood safety concerns, home activities, participation in organized activity, and eating meals in front of the TV). Results: For each additional neighborhood safety concern, the odds that the child was highly active was reduced by about 20% (OR [95%CI]: 0.81 [0.70, 0.95]). For each additional neighborhood safety concern, mean fat mass and waist circumference were both significantly increased (β [SE]: 0.59 [0.27], and β [SE]: 0.39 [0.20], respectively), but no association was seen with overweight/obesity or fat free mass. Other than sociodemographics, no other factors were consistently significantly associated with childhood adiposity. Conclusions: Parental perception of neighborhood safety may impact a child’s activity levels and adiposity. Future studies should identify which specific neighborhood safety concerns may be driving this association.
THE IMPACT OF A LIFESTYLE INTERVENTION ON POSTPARTUM BIOMARKERS OF INSULIN RESISTANCE AMONG HISPANIC WOMEN WITH A HISTORY OF ABNORMAL GLUCOSE TOLERANCE IN PREGNANCY

Vrinda Prakash* Vrinda Prakash, Megan Harvey, Tiffany Moore Simas, Bess H. Marcus, Penelope Pekow, Milagros C. Rosal, Katherine Tucker, Barry Braun, Joann Manson, Caren Solomon, Lisa Chasan-Taber, (University of Massachusetts Amherst)

Rates of gestational diabetes mellitus (GDM) are higher among Hispanics as compared to non-Hispanic whites. Recent studies have observed a rapid postpartum change in glucose tolerance women after a GDM pregnancy, with 50% of Hispanic women developing type 2 diabetes within 5 years. Prior studies suggest that lifestyle interventions can delay or prevent the onset of diabetes in women with a history of GDM but have included small numbers of Hispanic women who face higher rates of obesity and sedentary behavior than non-Hispanic whites. We therefore assessed the impact of a culturally modified, motivationally targeted, individually-tailored intervention on postpartum biomarkers of insulin resistance among participants in Estudio PARTO. Hispanic women who screened positive for GDM were randomized to a lifestyle intervention (n=100) or a comparison health and wellness intervention (n=104). The active phase of the intervention began 6 weeks postpartum (baseline) and consisted of face-to-face meetings, mailings, and booster telephone calls targeting exercise and healthy diet. Postpartum biomarkers for insulin resistance (i.e., glucose, insulin, HOMA-IR, HbA1C, tumor necrosis factor receptor 2 [TNFR2], leptin, and adiponectin) were assayed from blood draws at 6 weeks, 6 months, and 1 year postpartum. There were no significant differences between groups at baseline. At 1 year postpartum, TNFR2 decreased in the lifestyle group (mean change = -26.72, SD=403.4 pg/mL) and increased in the health and wellness group (mean change = 202.3, SD=423.9 pg/mL, Wilcoxon rank sum test p=0.018). There were no statistically significant differences in change in the other biomarkers of insulin resistance at 1 year. In this randomized trial among Hispanic women at increased risk for GDM, we found that a lifestyle intervention had a statistically significant impact on TNFR2, but not on other insulin resistance biomarkers.
RESIDENTIAL ROAD TRAFFIC NOISE AND MENTAL HEALTH IN ONE OF THE MOST DENSELY POPULATED CITIES IN THE WORLD: EVIDENCE FROM THE FAMILY COHORT

Jian Shi*, Jian Shi, Jennifer Wang, Jianxiang Huang, Mengdi Guo, Tsz Wai Wong, Chris Webster, Gabriel M. Leung, Michael Ni, (School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong Special Administrative Region, China.)

Background and Objective: Road traffic noise is an emerging and increasing environmental pollutant in cities. We sought to investigate the association between residential road traffic noise and depression and mental well-being in Hong Kong. Methods: We included 7,773 participants aged 15 years and above in the FAMILY Cohort, whom were interviewed from 2009 to 2013. Depression was measured by Patient Health Questionnaire-9 (PHQ-9), and mental well-being was measured by the Mental Component Scale (MCS) of the standard Short Form (SF-12 v2). The A-weighted household traffic noise was estimated based on the annual traffic volume, using 3D-geocoding and building floor plans to account for sound propagation in terms of vertical elevation, sound insulation of building walls, and directionality of sources. Noise was defined as daytime (LDAY), nighttime (LNIGHT), and 24-hour average (LDN). Associations between traffic noise and depression and mental well-being were examined using mixed effect models, adjusting for covariates including socio-demographic factors, proximity to green space and neighborhood characteristics, such as density, income, and Gini coefficient. Results: 79.1% of the participants at baseline (2009 to 2011) were exposed to LDN ≥ 55dB(A). Higher traffic noise (10 dB(A)) was associated with major depression during daytime (OR=1.13, 95% CI: 1.01 to 1.25), nighttime (OR=1.13, 95% CI: 1.01 to 1.26), and 24 hours (OR=1.13, 95% CI: 1.01 to 1.26). Higher traffic noise (10 dB(A)) was also associated with lower MCS during daytime (difference (D)= -0.36, 95% CI: -0.52 to -0.20), nighttime (D= -0.36, 95% CI: -0.52 to -0.20), and 24 hours (D= -0.36, 95% CI: -0.52 to -0.20). Conclusions: Residential road traffic noise was associated with depression and poor mental well-being, accounting for the three-dimensional vertical landscape in a highly densely populated city.
Background: Chronotype reflects individual preferences in daily activity and sleep-wake rhythm. Recent studies indicate that adults with late chronotypes are more prone to health-impairing behaviors, such as drug and alcohol use, than their early counterparts. Methods: Adult questionnaire data from the 2015-2016 cycle of the National Health and Nutrition Examination Survey (NHANES) were analyzed. Chronotype was determined by a respondent’s “midsleep,” defined as the midpoint of sleep onset and awakening. Current smokers were categorized into one of three groups based on chronotype tertiles: early, normal, and late. Among current smokers, outcomes of interest included past 30-day smoking intensity (cigarettes per day (CPD)) and frequency (number of days smoked), and nicotine dependence (time to first cigarette after waking). Three separate logistic regression models were fit to assess the association between each outcome of interest and chronotype, adjusting for sociodemographic and tobacco use behavior covariates. Results: Among 5,882 adults, 18.0% (1,060) were current smokers. Compared to early chronotypes, a larger proportion of late chronotypes were current smokers (21.58% vs. 18.56%) and smoked cigarettes within 5 minutes of waking (27.65% vs. 25.65%). In adjusted models, smokers with a late chronotype were 2.6 times more likely to have a higher nicotine dependence, 1.9 times more likely to be daily (versus nondaily) smokers, and 3.1 times more likely to be heavy (versus light) smokers, compared to smokers with an early chronotype. Conclusions: Late chronotype is significantly associated with increased nicotine dependence, increased CPD, and increased smoking frequency as compared to early chronotype. These findings highlight the need to understand the impact of circadian preference on tobacco and substance use, and to provide improved smoking cessation therapies among smokers with late chronotypes.
ENVIRONMENTAL AIR POLLUTION AND THE RISK OF REPORTED RESPIRATORY OUTCOMES: A MULTI-RACIAL COHORT OF CHILDREN

Adwoa Commodore*, Adwoa Commodore, Pamela Ferguson, JacKetta R. Cobbs, Danielle Stevens, John Vena, Kelly Hunt, (Medical University of South Carolina)

Background: Respiratory symptoms and asthma in children pose a significant clinical and public health burden. However, few studies have examined exposures to environmental air pollution in relationship to asthma or respiratory symptoms in children. Methods: A cross-sectional analysis evaluating the association between environmental air pollution and asthma was conducted on 747 children 4 to 8 years old who participated in the Environmental Influences on Child Health Outcomes Fetal Growth Study (ECHO-FGS) cohort. Respiratory symptoms (current asthma, cough, or wheezing) in the past 12 months and reported doctor diagnosed asthma were assessed by parental report using the validated ISAAC questionnaire. Reported exposure to neighborhood traffic and second hand smoke were examined in relationship to asthma and respiratory symptoms using logistic regression. Results: The prevalence of parental report of doctor-diagnosed asthma was 12.5%; asthma and/or wheeze symptoms was 17.7%; and asthma or any symptom was 21.4%. For 15.7% of children, parents responded “Agree” or “Strongly Agree” to “There is so much traffic along the streets that it makes it difficult or dangerous to walk with my child in my neighborhood”. Children exposed to moderate or high levels of neighborhood traffic had a higher odds of having asthma than children unexposed to neighborhood traffic [OR=1.78 (95% CI: 1.04, 3.04)] after controlling for race-ethnicity, age, gender, maternal education level and exposure to second hand smoke. African American children also had higher odds of having asthma than non-Hispanic white children [OR=3.10 (95% CI: 1.58, 6.09)]. Conclusions: Neighborhood traffic and minority status were associated with asthma and adverse respiratory symptoms. Better characterization of neighborhood traffic is needed since many children, particularly minority children at high risk of asthma, may live in close proximity to this source of environmental air pollution.

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<td>Asian</td>
<td>102 (13.85%)</td>
</tr>
<tr>
<td>Mother Education</td>
<td>High School</td>
</tr>
<tr>
<td>A</td>
<td>Some College</td>
</tr>
<tr>
<td>More than College</td>
<td>181 (24.35%)</td>
</tr>
<tr>
<td>Recent Tobacco Exposure</td>
<td>% Exposed</td>
</tr>
<tr>
<td>Child exposed to any second hand smoke (e.g. from mother, other relatives, daycare facilities, etc)</td>
<td>Yes</td>
</tr>
<tr>
<td>A</td>
<td>No</td>
</tr>
<tr>
<td>Child age in years (n=482)</td>
<td>Mean (Std Dev)</td>
</tr>
<tr>
<td>Range</td>
<td>4.7 - 8.8</td>
</tr>
</tbody>
</table>

*S/P indicates work done while a student/postdoc
COUNTY-LEVEL CHARACTERISTICS FROM THE AMERICAN COMMUNITY SURVEY IN RELATION TO COUNTY-CASE RATES OF HEPATITIS A IN KENTUCKY: AN ECOLOGIC STUDY

Natalie DuPre*, Natalie DuPre, Bert Little, Lyndsey Blair, Jeffrey Howard, (University of Louisville School of Public Health and Information Sciences)

Background: Within 97 of 120 Kentucky (KY) counties, several thousands of cases of Hepatitis A infection (HAV) have been reported since fall 2017. The outbreak is closely tied with the opioid epidemic that remains a public health problem. The objective of this ecologic study is to identify county-level characteristics that are associated with higher HAV case rates to describe factors related to the KY opioid epidemic. Methods: We linked 2012-2016 5-year estimates of county-level characteristics on social, economic and housing variables from the American Community Survey (ACS) to county rates of HAV per 100,000. Due to highly correlated ACS variables, we used a principal components analysis to identify seven patterns of marital status, education, disability, grandparent responsibility for children, income inequality index, residential mobility and poverty. We used Poisson Regression for HAV case rates per 100,000 to estimate Relative Risks (RR) and 95% CI for the principal components and additional county-level variables of interest. Results: Seven principal components explained 95.5% of the variation in socio-economic factors in KY. The extremely impoverished with low education and social support had a RR of 1.46 (95% CI 1.23, 1.73) that attenuated after adjustment for race, age, and manufacturing (RR=1.17 95% CI 0.97, 1.41). Those who were poor, with social capacity and residential mobility had higher case rates of HAV (RR=1.20 95% CI 1.01, 1.43). Those who were poor, with high disability and social and educational capacities had lower HAV case rates (RR=0.78 95% CI 0.61, 1.00). Counties with a higher proportion of White population had higher HAV rates (RR=1.14 95% CI 1.07, 1.21). Counties with higher proportion of the population in the manufacturing industry had slightly lower HAV rates (RR=0.97 95% CI 0.94, 1.00). Discussion: Several distinct county patterns were related to differential HAV case rates that describe the heterogeneity of the opioid epidemic in KY.

S/P indicates work done while a student/postdoc
IMPACT OF POLICY INTERVENTION ON COMBAT-RELATED MORTALITY REDUCTION AMONG U.S. SERVICE MEMBERS DEPLOYED IN THE AFGHANISTAN WAR: 2001-2014

Tuan D. Le, Jennifer M. Gurney, Elizabeth Mann-Salinas, Karan P. Singh, Stacy A. Shackelford, Kirby R. Gross, Shawn C. Nessen, Kevin K. Chung, Anthony E. Pusateri, (U.S. Army Institute of Surgical Research)

Background: Hemorrhage is the leading cause of preventable death from trauma. During the conflicts in the Middle East the DoD implemented two policy changes: tourniquet use (TQ) and evacuation time to surgical capability within 60-minutes or ‘the golden hour’ (GH). Additionally damage control resuscitation (DCR) was implemented throughout the medical force through a clinical practice guideline. Analysis of the effects of these battlefield paradigm shifts in trauma care delivery were never analyzed in terms of population based combat trends in mortality. Methods: Aggregate data from the Defense Manpower Data Center Defense Casualty Analysis System and DoD Trauma Registry from US service members (SM) who injured in Afghanistan in 2002-2014 were analyzed. Trends in case fatality rate (CFR), killed in action (KIA), and died of wounds (DOW) were modeled using time series analysis with autoregressive integrated moving average and weighted moving average method. The sufficient-component cause model and logistic regression were applied to estimate attributable fractions on life-saving by policy interventions. Results: Total 21,393 injured SM out of 550,000 person-years of SM occurrence were reviewed, including 1349 KIA (6.3%) and 461 DOW (2.3%), and CFR (8.5%) overall and KIA (11.3%), DOW (4.3%), and CFR (15.1%) after excluding returned-to-duty patients. Average injury severity score is 10.2 (±0.5) with a slope of 0.03 per year (P=0.07). CFR declined from 22% to 10% between 2002 and 2014 after broad implementation of TQ, DCR and GH, followed by sharp reduction in KIA, while DOW was unchanged. Compared to prior TQ implementation, a likelihood of mortality was 68% lower after TQ and DCR application and 73% lower after implementing TQ, DCR, and GH. Conclusion: The implementation of the specific policies on TQ, GH, and DCR likely contributed to substantial CFR decline primarily attributable to reduction in KIA despite a small increase in the severity of combat injuries.

S/P indicates work done while a student/postdoc
HAPPINESS AND MORTALITY AMONG 25,139 MEN AND WOMEN IN THE US NATIONAL HEALTH INTERVIEW SURVEY Steven D. Barger* Steven D. Barger, , (Northern Arizona University)

Better psychological well-being is associated with longevity. However, a very large study of UK women showed that the apparent survival advantage of well-being, as measured by happiness, is explained by perceived health status. It is unknown whether perceived health status also explains the happiness/mortality association in a more diverse sample of women and whether this finding generalizes to men. This study examined the happiness/longevity association in a diverse probability sample of men and women participating in the National Health Interview Survey. As in prior work I compared those who were unhappy (none, a little, and some of the time) to those who were happy all of the time. The analytic sample was restricted to participants free of baseline cardiovascular disease or cancer (N=25,705) with complete data on happiness and sociodemographic covariates (N=25,139). Vital status was ascertained after 14 years of follow up; data were publicly released in February, 2019. There were 2996 deaths. Age-adjusted unhappiness was associated with greater mortality risk relative to those who were happy all of the time (HR 1.27; 95% CI, 1.11–1.45) but was no longer associated with mortality when adding self-rated health to the model (HR 1.01; 95% CI, 0.88-1.16). Age-adjusted unhappiness was associated with increased mortality risk for women (HR 1.34; 95% CI, 1.11-1.61) and men (HR 1.33; 95% CI, 1.07-1.64) separately but adding self-rated health to the model reduced the association for both groups (HRwomen 1.12; 95% CI, 0.93-1.35; HRemen 1.05; 95% CI, 0.84-1.30). These sex-specific associations were further diluted by adjustment for race/ethnicity, education, smoking and home ownership. These findings replicate prior work showing that perceived health status underlies the happiness/mortality association and extend that work to a diverse sample of US men and women. Although happiness is an intrinsically useful well-being indicator it may be less prognostic for longevity.
ESTIMATION OF THE MISCLASSIFICATION ERROR-ADJUSTED PREVALENCE OF INJECTION DRUG USE AMONG INFECTIVE ENDOCARDITIS HOSPITALIZATIONS IN THE 2007-2016 NATIONAL INPATIENT SAMPLE

Kaitlin McGrew* Kaitlin McGrew, Tabitha Garwe, Douglas Drevets, S. Reza Jafarzadeh, Mary Williams, Yan Daniel Zhao, Hélène Carabin, (Department of Biostatistics & Epidemiology, University of Oklahoma Health Sciences Center, Oklahoma City, OK)

Introduction: The recent opioid crisis has led to outbreaks of infectious diseases linked to injection drug use (IDU). Administrative health databases are often used to monitor trends in IDU-associated infective endocarditis (IE) hospitalizations using International Classification of Diseases (ICD) code algorithms for drug use disorders and for Hepatitis C Virus (HCV) as surrogate measures for IDU. We estimated the annual prevalence of IDU among IE hospitalizations in the 2007-2016 National Inpatient Sample adjusting for misclassification by ICD algorithms, as no previous study had attempted it. Methods: This was a serial cross-sectional analysis of 70,899 unweighted hospitalizations for patients aged 18-64 years with an ICD diagnosis of IE. The unadjusted IDU prevalence was estimated with a drug algorithm (opioid/illicit drug abuse/dependence), an HCV algorithm, and a combination algorithm (drug and HCV). The 95% Bayesian probability intervals [BPI] of the misclassification error-adjusted IDU prevalence among IE were obtained using Bayesian latent class analyses by combining results from the drug and HCV algorithms. Priors for the sensitivity and specificity of ICD code algorithms were varied in sensitivity analyses. Results: The 95% BPI for the misclassification error-adjusted IDU prevalence among IE increased steadily between 2008 (6.3%, 14.7%) and 2016 (29.7%, 40.2%). Posterior estimates were fairly robust in the sensitivity analysis. By comparison, the combination algorithm consistently overestimated the IDU prevalence compared to the drug or HCV estimates. Conclusion: The adjusted prevalence of IDU among IE hospitalizations increased during the study period. Failure to correct for misclassification error by ICD algorithms, particularly the drug and HCV combination algorithm, may result in overestimating the IDU prevalence among IE hospitalizations, although unadjusted estimates still captured the increasing trend.
Background: The prevalence and burden of disease resulting from obesity have increased worldwide. In Brazil, more than half of population are now overweight. However, the impact of this growing risk factor on disease burden remains inexact. Objective: To estimate the burden attributable to high body mass index (BMI) and its trend in Brazil. Methods: We estimated the prevalence of obesity between 1990-2017 through standard GBD 2017 methodology, and the burden and attributable risk of high BMI (>20-25 kg/m2) using GBD’s comparative risk assessment. Results: The overall age-standardized prevalence of obesity in Brazil was higher in females (19.9%) than males (16.3%) in 2017, but males have had a higher annual increase (4.6%) than females (3.6%) since 1990. In 2017, high BMI was responsible for 12.3% (8.8-16.1%) of all deaths and 8.4% (6.3-10.7%) of total disability-adjusted life years (DALYs) lost, up from 7.2% (4.1-10.8%) and 4.6% (2.4-6.0%) in 1990, respectively. Most of this burden is expressed through cardiovascular diseases and diabetes. Over the period, the crude rate of lost DALYs attributable to high BMI increased 52%, while the age-standardized rate decreased 4%. Decomposition of causes of the change in total DALYs between 1990-2017 shows that population growth, population aging, and change in high BMI prevalence were responsible for increases of 42%, 96%, and 130% respectively, while the remaining, “risk-deleted” rate decreased of 152%. Conclusions: Brazil has a rapidly increasing age-standardized prevalence of obesity. High BMI makes a major and rising contribution to disease burden. Both population aging and increasing risk exposure are major causes of this rise in attributable burden. These results highlight the need for primary prevention and public health initiatives to control this epidemic of excess weight in Brazil.
HEALTH-RELATED QUALITY OF LIFE IN COPD ADULTS WITH EMERGENCY DEPARTMENT VISITS: OPPORTUNITIES TO PROMOTE SELF-MANAGEMENT PROGRAMS Stan Pokras* Vinay K. Cheruvu, Stan Pokras, Melissa D. Zullo, (College of Public Health, Kent State University)

Chronic obstructive pulmonary disease (COPD) in the US is a significant contributor to morbidity and mortality. The purpose of this study is i) to examine five indicators of health-related quality of life (HrQOL): General health; physical health; mental health; activity limitations, and COPD related quality of life in COPD adults who reported emergency department (ED) visit in the past 12 months because of COPD compared to those who did not report such an ED visit; and ii) characteristics of COPD adults associated with such an ED visit. Data from 2011-2012 Behavioral Risk Factor Surveillance System (BRFSS) were used in this study. The population of interest consisted of COPD adults diagnosed by spirometry (n = 14,364). Logistic regression analysis was performed to address the study objectives. All analyses were performed using SAS® survey procedures to account for the complex sampling design of the BRFSS data. After adjusting for possible confounders, COPD adults who reported an ED visit in the past 12 months because of COPD had a significantly lower HrQOL compared to those who did not report such an ED visit (p-value < 0.05). The following characteristics in COPD adults were associated with a higher likelihood to report such an ED visit: Black non-Hispanic, lower education, unemployment, medical cost, other chronic conditions, being on COPD medications, and having a COPD doctor. The current study showed poor HrQOL in COPD adults who reported an ED visit and identified characteristics of such adults for opportunities to promote self-management programs.
THE ASSOCIATION BETWEEN OUTDOOR AIR POLLUTANTS AND BLOOD PRESSURE: RESULTS FROM A CROSS-SECTIONAL ANALYSIS OF MONTREAL ADOLESCENTS Erica Marrone*, Erica Marrone, Cristina Longo, Jennifer O'Loughlin, Paul Villeneuve, Michael Zappitelli, Tracie Barnett, (Department of Family Medicine, McGill University)

Objective: In adults, air pollution is associated with elevated blood pressure (BP), but few studies have examined this relationship in youth. The objective of this cross-sectional study was to quantify the association between air pollution and systolic BP (SBP) among grade 11 adolescents from 10 high schools in Montreal, Canada.

Methods: Participants were students enrolled in the Nicotine Dependence in Teens study with available anthropometric and postal code data. Exposure included three air pollutant indices: area-based emissions of fine particulate matter [PM2.5]; land-use regression estimates of nitrogen dioxide [NO2]; and ground-level ozone [O3] using residential postal code level data from the Canadian Urban Environmental Health Research Consortium. Elevated SBP was defined as SBP≥75th percentile (computed using BP reference data from the American Academy of Pediatrics). Logistic regression models were used to estimate adjusted ORs for each pollutant with respect to elevated SBP. Missing covariate data was imputed using the nearest neighbour method.

Results: 664 adolescents were included (47% male). 82% of SBP values considered normal (<120 mmHg), 12% were elevated (120-129 mmHg), and 4% and 2% were in the stage 1 (130-139 mmHg) and stage 2 (≥140 mmHg) hypertension ranges, respectively. Mean levels of O3, PM2.5, and NO2 were 22.06 ppb, 10.16ug/m3, and 18.41ug/m3 respectively. For every interquartile range increase in residential O3 levels, the odds of being in the 75th SBP percentile or greater increased by 62% (OR: 1.62, 95% CI: 1.10-2.41). No significant association for PM2.5 or NO2 was detected. Being male and higher BMI were associated with higher SBP in all models.

Conclusion: These data support the presence of a relationship between exposure to ozone and SBP in adolescents. The association warrants further investigation using longitudinal data in youth, particularly as climate change is expected to exacerbate the production of O3.
OVERALL AND CENTRAL OBESITY DURING MIDLIFE IN RELATION TO SUBJECTIVE COGNITIVE FUNCTION IN LATER LIFE
Changzheng Yuan* Changzheng Yuan, Alberto Ascherio, Walter C. Willet, (Harvard T.H. Chan School of Public Health)

Background: Measures of obesity have been inconsistently associated with age-related cognitive impairment and dementia and these differences may be related to the method and timing of adiposity assessment. Methods: We used multinomial logistic regression to examine the relation of Body Mass Index (BMI) and waist circumference (WC) in midlife and risk of moderate and poor cognitive function in later life in 49,493 female nurses participating in the Nurses' Health Study (NHS) and 27,842 male health professionals in the Health Professionals Follow-up Study (HPFS). At baseline in 1984 for NHS and 1986 for HPFS and through biennial follow-up, information on BMI was collected. WC were reported in 1986 and updated twice. Self-reported subjective cognitive function (SCF) was assessed twice by a 6-item questionnaire on changes in memory and cognition in 2012-2014 for women and 2008-2012 for men; validity was supported by strong associations with APOE4 genotype. Summarized scores were categorized as “good” (0 points), “moderate” (0.5-2.5 points), and “poor” (3-6 points). Results: In the age-adjusted model for both women and men, compared to the averaged midlife BMI 23-24.9 kg/m2, obesity (BMI>=30 kg/m2) was associated with higher odds of poor SCF in later life (OR=1.11, 95% CI 1.01-1.23 in women and OR=1.34, 95% CI 1.12-1.60 in men). However, the associations were attenuated and non-significant after controlling for known lifestyle and clinical risk factors. In this multivariable model, greater WC was significantly associated with poor SCF. Those in the highest (≥ 95 cm in women and ≥ 107 cm in men) versus lowest (< 72 cm in women and < 89 cm in men) category of waist circumference had a 38% higher odds of poor SCF in women (OR=1.38, 95% CI 1.23-1.56) and a 25% higher odds of poor SCF in men (OR=1.25, 95% CI 1.05-1.48). Conclusion: Waist circumference, a measure of central obesity, is an important risk factor for late-life poor SCF in both women and men.

Figure 1. Odds Ratios (and 95% CI) for moderate and poor subjective cognitive function, compared with good cognitive function, associated with obesity measures.

In NHS, model was adjusted for baseline age (continuous) and height (continuous), race (white, other), education (registered nurse, bachelor’s degree, graduate degree), husband education (high school degree or less, college degree, or graduate degree), parental history of dementia, smoking status (never, 1-4 pack-years, 5-24 pack-years, 25+ pack-years), self-reported diagnosis of hypercholesterolemia, hypertension, cancer, cardiovascular disease), postmenopausal status and hormone replacement therapy use, parity (nulliparous, 1-2, >2) and depression, missing year of SCF measurement, Mediterranean diet pattern, multivitamin use (never, ever use). In HPFS, model was adjusted for baseline age (continuous) and height (continuous), race (white, other), profession, parental history of dementia, smoking status, self-reported diagnosis of hypercholesterolemia, hypertension, cancer, cardiovascular disease), and depression, missing year of SCF measurement, Mediterranean diet pattern, multivitamin use (never, ever use).
Background: In 2017, maternal mortality due to hypertensive disorders of pregnancy (HDP) in Brazil was estimated at 14 per 100,000 live births, which is 20 times higher than in high-income countries. The pharmacological approach has an important role in the management of HDP. However, few studies have examined the pattern of medication use in affected women in this country. Methods: We used data from the 2015 Pelotas Cohort, one of the largest birth cohorts among low and middle-income countries. Antihypertensive medications used during pregnancy were defined using the first level of the ATC classification system and the substance name. Descriptive analyses were used to describe the characteristics of this population. Patterns of use of antihypertensive medications were estimated by trimester. Results: A total of 4,328 women were included in our cohort, of which 1,105 had gestational hypertension (25.5%), 277 (6.4%) had preeclampsia/eclampsia, and 238 (21.5%) had pre-existing hypertension. The median age at start of pregnancy was 27.5 years (IQR 22.1, 32.6), 16.7% of women reported having smoked during pregnancy, the median gestational weight gain was 11.9 kg (IQR 8.0, 15.5), and 2.7% of pregnancies were multiple births. A total of 280, 395, and 558 cardiovascular drugs were used in the first, second and third trimester, respectively (5.8% of all drugs reported during pregnancy). Methyldopa, followed by omega-3 were the most commonly used medications, regardless of the trimester of initiation. Conclusion: The overall prevalence of hypertensive disorders of pregnancy is higher than other populations in developing countries. Patterns of use of methyldopa are concordant with Brazilian guidelines as first-line therapy for hypertensive disorders of pregnancy. Although omega-3 is commonly used in this population, there is a lack of evidence to support its effectiveness in reducing adverse outcomes in pregnancies complicated by hypertension.

Currently, two challenges exist within the field of social epidemiology. First, advancing health disparities research, as recently proposed by the National Institute of Minority Health and Health Disparities, requires measuring a health difference that adversely affects defined disadvantaged populations, based on one or more health outcomes. This idea is not new. Similarly, Syme, Marmot, and Cassel have argued for examining a set of diseases with similar characteristics. Second, neighborhood effects research has focused primarily on whether neighborhoods matter for health. This research advances development with regard to these two key challenges. First, we develop a definition of preventable mortality based on a systematic literature review and the ecosocial framework. Preventable mortality is a cause of death of an individual under 65 year of age that meets the following criteria: 1. Limited time necessary for exposure to result in death (less than 10 years); 2. Easily treatable or acuity is quickly modifiable; 3. Resources necessary for modification are obtained within a limited timeframe. Second, spatial and demographic trends in preventable mortality are examined in Alameda County from 2005 - 2017. Crude rates of preventable mortality are calculated and employ model-based direct adjustment using the R package 'epitools' to calculate exact confidence intervals, which is a conservative approach. Moran's I is also calculated, which measures the degree of spatial concentration, indicating spatial health disparities. I demonstrate preventable death has transitioned from inner-city areas to outlying areas of the County, such as Livermore, Fremont and San Leandro (see image). Differences between inner-city versus suburban tracts are statistically significant. Rates of preventable deaths also diverge between sexes and race identification. These findings suggest shifting location of health protective resources and developing policy relevant to the features of suburban ill health.