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MATERNAL SEDENTARY BEHAVIOR DURING PRE-PREGNANCY AND EARLY PREGNANCY AND OFFSPRING BIRTH SIZE

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Background: Sedentary behavior has been associated with adverse health outcomes in the general population. During pregnancy, associations of maternal sedentary behavior with offspring birth size are inconsistent. Previous research suggests that male and female fetuses respond differently to maternal behaviors, such as physical activity. However, the role of infant sex in sedentary behavior-birth size associations has not been examined. **Methods:** Participants (N=1,535) in the Omega study, a pregnancy cohort in Washington State (1996-2008), reported leisure time sedentary behavior (non-work time spent sitting, LTSB) duration in the year before pregnancy and in early pregnancy (mean 15 weeks). Offspring birth size was abstracted from delivery records. Non-parametric calibration weighting was used to match the distribution of sociodemographic and medical characteristics of participants with available LTSB data to the full cohort (N=4,128). Linear regression models were used to estimate mean differences in offspring birthweight, head circumference, and ponderal index (birthweight/length³) associated with LTSB. Regression models were run overall and stratified by offspring sex. **Results:** On average, women spent 2.3 and 2.6 hours per day in LTSB during pre-pregnancy and early pregnancy, respectively. Each additional hour of pre-pregnancy or early pregnancy LTSB was associated with 19g (95% CI: -35, -2) or 10g (95% CI: -24, 3) lower birthweight, respectively. Women in the highest quartile for pre-pregnancy or early pregnancy (3-13 hours/day) LTSB had offspring with 71g (95% CI: -133,-9) or 64g (95% CI: -123, -5) lower birthweight than women in the lowest quartile (0-1.5 hours/day), respectively. There were no associations of LTSB with head circumference or ponderal index. Associations of LTSB with offspring birth size did not differ by offspring sex. **Conclusion:** We observed associations of pre-pregnancy and early pregnancy LTSB with lower offspring birthweight.

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RISK FACTORS FOR MEASLES AMONG ADULTS IN TIANJIN, CHINA: WHO SHOULD BE CONTROLS IN A CASE-CONTROL STUDY?

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Background. We enrolled measles cases and controls in Tianjin, China, between 2011 and 2015, and examined risk factors for disease in adults by comparing cases to both measles IgG-negative controls and to all community controls (i.e. IgG negatives and positives). **Methods.** Cases were randomly sampled from the notifiable disease registry, and controls were enrolled from community population registries. Risk factors were entered into logistic regression models, with separate models for IgG-negative controls and all controls. **Results.** The study included 1,980 adults 20 to 49 years of age: 384 cases and 1,596 community controls, of whom 194 were measles IgG negative. Individuals who visited hospitals within the exposure period had higher odds of measles case status, which varied by hospital type: adults who visited a specialty hospital had the increased odds of measles compared to those who did not visit a hospital (compared to IgG-negative controls: OR: 4.53, 95% CI:1.28, 16.03); compared to all controls: OR: 5.27, 95% CI: 2.73, 10.18). The two different control groups resulted in models with different sets of covariates; for example, age was an important predictor of measles case status when using all controls, but not only IgG-negative controls. **Conclusions.** Because visiting a hospital was one of the strongest risk factors for measles disease, there is a need to improve hospital infection control practices to limit nosocomial transmission, particularly in tertiary or specialty hospitals. Case-control studies examining risk factors for infectious diseases should consider using antibody-negative controls, instead of the general population, to limit biases.

“-S/P” indicates work done while a student/postdoc

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USING A BAYESIAN METHOD TO ASSESS GOOGLE, TWITTER, AND WIKIPEDIA FOR INFLUENZA SURVEILLANCE

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Introduction: Traditional influenza surveillance relies on reports of influenza-like illness (ILI) by healthcare providers, capturing individuals who seek medical care and missing those who may search, post, and tweet about their illnesses instead. Existing research has shown some promise of using Google, Twitter, and Wikipedia for influenza surveillance, but with conflicting findings, studies have only evaluated these web-based sources individually or dually without comparing all three. **Objective:** To comparatively analyze Google, Twitter, and Wikipedia by evaluating how well change points detected in each web-based source correspond to change points detected in CDC ILI data. **Methods:** Publicly available, de-identified data was collected from the CDC ILINet system, Google Flu Trends, HealthTweets.org, and Wikipedia for the 2012-2015 influenza seasons. Bayesian change point analysis was the method used to detect change points, or seasonal changes, in each of the web-data sources for comparison to change points in CDC ILI data. All analyses were conducted using the R package *change* v4.0.0 in RStudio v0.99.484. Sensitivity and positive predictive values (PPV) were calculated. **Results:** During the 2012-2015 influenza seasons, a high sensitivity of 92% was found for Google, while the PPV for Google was 85%. A low sensitivity of 50% was found for Twitter; a low PPV of 43% was found for Twitter also. Wikipedia had the lowest sensitivity of 33% and lowest PPV of 40%. **Conclusions:** Google had the best combination of sensitivity and PPV in detecting change points; however, none of the web-based sources detected all changes in CDC data, which could indicate limitations of the web-based data or signify that the Bayesian method is not adequately sensitive. These three web-based sources need to be further studied and compared using other statistical methods before being incorporated as surveillance data to complement traditional systems.

004

USING BAYESIAN PROFILE REGRESSION TO ANALYZE HEALTH EFFECTS OF CHEMICAL MIXTURES

Eric Coker, Brenda Eskenazi (UC Berkeley)

Background: Statistical modelling of the health effects from multiple highly correlated exposures, such as environmental chemical mixtures, is challenging due to instability in effect estimates, in addition to a loss of statistical power related to a large number of covariates relative to sample size. In this study we present a novel yet flexible statistical approach, known as Bayesian profile regression, that non-parametrically analyzes the joint distribution of exposure to evaluate which clusters of exposure profiles are associated with a health outcome. **Methods:** We demonstrate this method using data on agricultural use of 10 highly correlated pesticides within 1km of maternal residences during pregnancy. Specifically, we used Bayesian profile regression to examine associations between prenatal exposure profiles of agricultural pesticides and deficits in childhood Full-Scale Intelligence Quotient (FSIQ) among a small (N=255) cohort of children living in an agricultural community. **Results:** Our analysis found seven clusters of pesticide mixtures (or exposure profiles). Two of these clusters exhibited the highest summed pesticide use and were further characterized by having the largest deficits in FSIQ and highest probabilities (95% and 81%) for FSIQ deficit compared to the study population average FSIQ. Additionally, these highest pesticide exposure profile clusters showed probabilities of 99% and 94% for a FSIQ deficit relative to the lowest exposure profile cluster. **Conclusion:** Using a highly correlated set of pesticide exposures, Bayesian profile regression was able to identify pesticide mixtures that were associated with FSIQ deficit in a cohort of school-aged children. Bayesian profile regression is shown to be a promising statistical tool to evaluate the health effects of chemical mixtures. This approach may also be flexibly extended to other types of epidemiologic analyses that incorporate highly correlated exposures unrelated to chemical exposure. Balancing demands of professional and domestic spheres in the contemporary society could be highly relevant in the management of treatment of headache. Findings on gender differences deserve further investigation.

EXPLORE ASSOCIATION BETWEEN AMBIENT AIR PM_{2.5} COMPONENT AND CARDIOVASCULAR DISEASES IN KARACHI, PAKISTAN Yi Lu, Shao Lin, Haider Khwaja (Environmental Health Science, School of Public Health, University at Albany, SUNY)

[Introduction] Increasing economic and health burden due to heart disease in Pakistan is of concern, especially in any metropolitan area. As extremely high PM_{2.5} levels are recorded in Karachi, a factor found to be associated with an elevated risk of cardiovascular diseases (CVDs) in our previous research, this study aims to investigate the CVDs risk associated with different chemical components of PM_{2.5}, and to identify important pollution sources. **[Method]** Daily levels of nineteen chemical components of PM_{2.5} were analyzed using 24-hour samples collected at two sites in Karachi during a six-week period in each season from fall 2008 to summer 2009. Hospitalization and outpatients visits due to CVDs were collected during the same period from the National Institute of Cardiovascular Disease (NICVD) in Karachi. Negative Binomial Regression was used to estimate the association between pollutants and the risk of CVDs adjusting for socioeconomic and meteorological variables. **[Result]** The most common CVDs among our cases are Hypertension (22%), Acute Coronary Syndrome (11%), and Myocardial infarction (10%). Monitored chemical component levels at the Korangi site are much higher than at the Tibet site. The most consistent associations were found between CVDs and levels of Sulfur and Nickel for cases near the Korangi site; and levels of Sulfur and Zinc for cases near the Tibet site. One IQR increase in the pollutants listed above were associated with increased CVD risks ranging from 5% to 15%. **[Conclusion]** Incomplete combustion of fuel from vehicles, industrial emissions, and wind-blown dust are major sources of the chemical compounds that are associated with an increased CVDs risk. Targeting strategies should be developed and enforced, especially in winter.

ON MODELING AND ESTIMATION FOR THE RELATIVE RISK AND RISK DIFFERENCE Linbo Wang, Thomas Richardson, James Robins (Harvard University)

A common problem in formulating models for the relative risk and risk difference is the variation dependence between these parameters and the baseline risk, which is a nuisance model. We address this problem by proposing the conditional log odds-product as a preferred nuisance model. This novel nuisance model facilitates maximum-likelihood estimation, but also permits doubly-robust estimation for the parameters of interest. Our approach is illustrated via simulations and a data analysis.

LABORATORY DIAGNOSTIC OF IRON DEFICIENCY ANEMIA AMONG PRESCHOOL-AGED CHILDREN IN GOVERNADOR VALADARES CITY, MINAS GERAIS, BRAZIL Marildes Freitas, Gulnara Borja Cabrera, Michel Peanha, Itamar Almeida, Marcio Souza (Universidade Vale do Rio Doce)

Iron deficiency anemia is a condition in which there is a significant reduction of total body iron. This article aims to analyze the distribution of the number of cases of this anemia in attended preschool at Bioesp Laboratory from Governador Valadares, MG, by age group using the hematological and hematology data from erythrograms. Participated in this study 886 children which 51.4% were male and 47.9% female. By linking the hematological and biochemical parameters with hematology findings, we observed that the prevalence of iron deficiency anemia was 3.5% in children from 0-6 years old and 60.8% were suggestive of iron deficiency anemia to present the indices the mean corpuscular volume and mean corpuscular hemoglobin below normal, but the group had normal values of hemoglobin, and mean corpuscular volume and mean corpuscular hemoglobin showed a strong correlation. The results reinforces the literature that children as a very vulnerable group to iron deficiency. The cutoff points recommended by WHO for hemoglobin level and others parameters when used alone, are not enough to diagnose iron deficiency anemia, pointing to the importance of using more than one hematological index in the investigation of anemia, contributing their differential diagnosis.

HAND HYGIENE IN THE NICU: HOW GOOD IS GOOD ENOUGH TO STOP THE SPREAD OF MRSA? Neal Goldstein, Stephen Eppes, Amy Mackley, David Paul (Department of Pediatrics & Value Institute, Christiana Care Health System)

Background: Agent-based models have been used to simulate methicillin-resistant *Staphylococcus aureus* (MRSA) transmission within a healthcare setting. While these models have been useful for investigating different transmission prevention paradigms, including hand hygiene, they have been limited by their ability to accurately model patient-provider interactions and also ignore the acuity of the patient that directly relates to amount of care provided. **Methods:** Using a novel class of network based models, we created a simulated neonatal intensive care unit (NICU) and tuned the model parameters to empiric data. These models represent potential for per hour infant-infant MRSA transmission via the healthcare worker as an intermediary resulting in subsequent colonization. The number of initially colonized infants varied from 2-10, by 2, corresponding to an upper limit based on hospital surveillance data, and hand hygiene was evaluated as a potential intervening factor, ranging from 0% (none) to 88% (complete, acknowledging an 88% efficacy at removing MRSA from the hands). **Results:** Based on care provided within a one-hour period in the NICU, the mean number of infant-infant MRSA transmissible opportunities per hour was 1.3. Preterm infants (<37 weeks gestation) had ~20% more connections to other infants in the unit, and ventilated infants had ~30% more connections to other infants in the unit. Compared to no hand hygiene and averaged across all initial colonization states, prevalence was reduced by about 25%, 45%, 60%, and 75% for the respective levels of hygiene 24%, 48%, 68%, 88%. Preterm infants had a 23% increase in MRSA colonization compared to term births and mechanically ventilated infants had a 52% increase compared to non-intubated infants. **Conclusion:** Even under optimal hygiene conditions, horizontal transmission of MRSA is possible. Additional prevention paradigms should focus on infants of highest acuity, as they are at greatest risk.

QUANTIFYING DENTAL CARIES LONGITUDINALLY: THE DMFS INCREMENT VS. AVERAGE AREA UNDER THE DMFS CURVE

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Objective: Caries are measured in primary teeth by summing caries-affected surfaces, creating a decayed, missing, filled surfaces (dmfs) score. Researchers attenuate the measure's strength when they calculate increments from longitudinal data. Avoiding bias induced from complete-case measures, area under the curve methodology offers an alternative approach for creating a singular longitudinally-based measure. This investigation compared associations between toothbrushing frequency and caries outcomes, increments and average area under the dmfs curve, dmfsaAUC, values, independently.

Methods: The dmfs scores were collected via visual oral exams yearly for up to 5 years in high-caries risk, young African Americans (baseline: 8-15 months). Increments were calculated by subtracting baseline values from 5-year scores (N = 66 (complete cases)). The dmfsaAUC values were quantified using the trapezoidal rule to measure areas under dmfs trajectories and dividing them by observation days to adjust for varied follow-up times (N = 85 (66 complete, 19 incomplete cases)). Daily toothbrushing frequency (less frequent: < 2, frequent: ≥ 2) was determined from baseline questionnaires and individually evaluated with both outcomes, using Kruskal-Wallis tests. **Results:** Investigating toothbrushing frequency, there was significantly more disease indicated with less frequent (mean rank = 46.19) than frequent (mean rank = 34.39) brushing with dmfsaAUC values ($\chi^2(1) = 3.89, p = 0.049$). When increments measured disease, toothbrushing frequency was not related to caries experience ($\chi^2(1) = 3.03, p = 0.082$). **Conclusions:** Increments omit trajectory data, restricting to complete cases which can limit inferences. AUC methodology uses all repeated measures to produce an accurate measure with the greatest sample size. So, when caries risk factors are investigated, longitudinal disease quantification data must be maximized to realistically capture disease burdens so associations are not overlooked.