ISEE-0900

Application of Two Probabilistic Models, Using Either Environmental Monitoring or Human Biomonitoring Data, to Estimate Human Health Risk due to Mercury Exposure in a Small Scale Gold Mining Region in Central Nicaragua

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Objective: To compare predicted mercury concentrations in cord blood (Hg-PC_{cb}) of women of childbearing age living in a small-scale gold mining town and the probability by which Hg-PC_{cb} would exceed international proposed benchmark dose levels (BMDLs), from two difference models, which use either environmental monitoring or human biomonitoring data.

Method: We built two models: 1) In the first model, we used available field measurements of mercury from the local river water and sediments, as point of origin to estimate Hg-PC_{cb} by applying proposed toxicocinetic models for stream organisms (fish and macroinvertebrates) and humans. Then, we predicted Hg concentration in whole and cord blood, assuming humans were solely exposed to Hg trough fish consumption. We obtained data on fish consumption rates in the general population from reports published by US EPA; 2. In the second model Hg-PC_{cb} was estimated based on available measurements of mercury concentration in whole blood from general population. Probability density functions (PDF) were calculated and fitted to the data from the two models, by Monte Carlo simulations.

Results: The Hg-PC_{cb} in women of childbearing age estimated by the model #1 is one order of magnitude lower than the estimated Hg-PC_{cb} resulting from model #2 (t-test, $P = 0.0001$). Consequently, the probability that a predicted Hg concentration in cord blood exceeds the benchmark values was also higher in model #1 than in model #2 (10%). A sensitivity analysis shown that fish consumption data is a major contributor to the observed variation in both models.

Conclusion: Results from an environmental monitoring based model and a human biomonitoring based model are comparable. The observed differences in model results might suggest that humans are exposed to Hg sources other than local fish or that the fish consumption rate of the population from the study area is higher compared to the literature.

ISEE-0901

Causal Models for Addressing the Healthy Worker Effect in an Occupational Cohort Study

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Background and Objective: Individuals who are hired and remain at work are generally healthier than those who are unemployed or leave work. Due to this healthy worker effect, potential health consequences of occupational exposures may be underestimated.

Methods: We present results obtained using three different methods to control for the healthy worker effect in a longitudinal mortality study which includes over 40,000 workers with potential exposure to metalworking fluids (MWF). Individuals who were hired between 1938 and 1981 in one of three Michigan automobile manufacturing plants were enrolled in the study. Their vital status and cause of death was ascertained using the National Death Index and state health records from 1941 to 1994. Date of birth, race and work history, including time off work, were obtained from company records. Annual exposure to mineral oil-based MWF was estimated based on work history and health status was approximated using the amount of time off work for every year of follow up. To adjust for time off work as a time-varying confounder, we applied standard Cox models and compared results with those obtained using two causal modeling approaches: Marginal Structural Models with Inverse Probability of Treatment Weights (IPTW) and Structural Nested Models using G-estimation. We considered exposure to straight MWF in relation to three outcomes: all-causes of death combined, all cancer mortality, and heart disease mortality.

Results: We will demonstrate that despite the lack of direct comparability between methods, since they estimate different parameters, standard methods based on cumulative exposure are biased. The bias arises because leaving work is associated with mortality, determines future exposure and is predicted by past exposure and employment history.

Conclusion: The g-estimation method is unique in that it takes into account the fact that health status is both a confounder and an intermediate variable between exposure and disease.

ISEE-0903

Developing an Environmental Health Tracking Web Portal to Meet the Information and Communication Needs of Diverse Users

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Background and Objective: Public health is promoted by individuals from government, community and non-governmental organizations, academia, and the private sector. A major challenge in environmental health surveillance is communicating information in a way that is useful, understandable, and accessible to this range of users. We sought to develop a public web portal that makes environmental health data available and informative to a diverse audience.

Methods: First, we conducted needs assessments via surveys and focus groups to learn about environmental health information needs of our stakeholders, including local governments, community and non-governmental organizations, and academia. Based on results, we developed portal components, including data query and web tools; data displays; text-based content; and page design and navigation. Finally, we conducted evaluations to obtain feedback on the utility of the portal, including functionality and usability surveys.

Results: We found that the portal had broad utility, but applicability of its components differed depending on user need. Maps, tables, and charts produced by data queries were most useful for routine activities of local government agencies. Web tools, such as the traffic volume calculator, were useful for city planning decisions and epidemiological research. Interactive, neighborhood-level maps were of particular interest to community groups. While most information on the portal was not novel, users reported the integration of various data and tools to be valuable. For technical users, the portal freed time or resources for other activities. Others benefited because they lacked capacity to generate data themselves.

Conclusion: The iterative approach of needs assessments, development, and evaluation allowed us to prioritize the most common requests and the interests of users with least access to data resources. Communicating and disseminating information in a manner useful to a range of users enables environmental health surveillance data to be actionable for policy and public health.

ISEE-0905

Associations Between Maternal PBDE Serum Concentrations and Child Neurodevelopment in the Chamacos Cohort

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ORAL PRESENTATIONS

ISEE-0003

What Measure of Temperature is the Best Predictor of Mortality?

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Background and Objective: Hot and cold temperatures significantly increase the risk of death in many regions of the world. Different measures of temperature, including minimum, maximum and apparent temperature, have been used in previous research. Which temperature measure is the best predictor of mortality is not known.

Methods: We used mortality data from 106 cities in the US NMMAPS study (years 1987–2000). We examined the association between temperature and mortality using Poisson regression and fitted a non-linear spline for temperature. We examined five measures of temperature, the effect of including relative humidity, and various degrees of freedom for the temperature spline. The best model was defined as that with the minimum absolute residual. The residuals were calculated using cross-validation.

Results: Maximum temperature was selected as the best temperature measure the most often (40 cities in the ≥65-year age group), and apparent temperature the least often (8 cities in the <65-year age group). Maximum temperature was the best measure in 10 out of 12 months in both age groups. Geographically, maximum temperature was the best measure in cold regions, and minimum temperature in warm regions. Humidity was important in almost every city in the ≥65 year age group. The seasonal variation in humidity showed a surprising peak in usefulness in winter.

Conclusion: Apparent temperature is no better than standard measures of temperature in predicting mortality. Maximum temperature was generally the best measure in cold climates and minimum temperature in warm climates. Humidity is an important predictor of mortality in the elderly and its effect should be estimated separately from temperature.

ISEE-0005

Investigation of Nephrolithiasis in Children with Tainted Chinese Dairy Product Consumption in Taiwan

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Background: Little is known about the renal effects of melamine in humans. We evaluated risk factors, clinical manifestations, exposure patterns, and biomarkers for nephrolithiasis in children who consumed melamine-contaminated dairy products.

Methods: From September 24 to October 31 in 2008, 1222 children whose parents were concerned that they may have consumed melamine-contaminated dairy products were investigated at Department of Health hospitals in Taiwan. The high exposure group was those who consumed China-brand dairy products with melamine levels >2.5 ppm. The low exposure group was those who consumed dairy products imported from China with melamine levels 0.05–2.5 ppm. Our control group was those who consumed dairy products without detected melamine levels <0.05 ppm. Clinical presentation, urinalysis, urine calcium, creatinine, and renal ultrasonography were evaluated. Urine melamine tests were checked for those with nephrolithiasis and age- and gender-matched controls selected from the study population.

Results: No hematuria, hypercalciuria, flank pain, or acute renal failure was noted in the high exposure group. Nine out of the 14 nephrolithiasis cases had a history of having resided in China and China-brand dairy product consumption. The age of children with nephrolithiasis in the high exposure group was younger than those without nephrolithiasis ($P = 0.011$). The duration of contaminated product consumption was longer in children with nephrolithiasis in the high exposure group than those without nephrolithiasis ($P = 0.017$). The risk of nephrolithiasis was found to increase with estimate melamine exposure levels (P for trend <0.001). Of the 10 nephrolithiasis cases that received urine melamine analysis, two had elevated levels. Comparatively, age- and gender-matched controls were all lower than the detection limit.

Conclusions: Due to lack of symptoms and signs, we recommend renal ultrasonography for children with high melamine exposure. Urine melamine tests might be helpful in confirming the diagnosis of melamine related nephrolithiasis.

ISEE-0008

The Association Between Socioeconomic Status and Exposure to Mobile Telecommunication Networks in Children and Adolescents

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Background: A potential association between socioeconomic status (SES) and self-reported use of mobile phones has been investigated in a few studies. Whether objective exposure to mobile phone networks differs by SES in children and adolescents has not yet been studied.

Methods: Data was taken from a cross-sectional study investigating a possible association between exposure to mobile phone networks and well-being in children and adolescents. In total, data of 1481 children and 1505 adolescents was used. During a Computer Assisted Personal