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32nd Annual Conference of the International Society for Environmental Epidemiology

ABSTRACT E-BOOK

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Advancing Environmental Health in a Changing World

ISEE 2020

August 24-27, 2020

KENES GROUP

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INTERNATIONAL SOCIETY FOR ENVIRONMENTAL EPIDEMIOLOGY
ISEE
STUDYING HUMAN HEALTH AND THE ENVIRONMENT

32nd Annual Conference of the International Society for Environmental Epidemiology

Advancing Environmental Health in a Changing World

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ABSTRACT E-BOOK

SESSION ABSTRACTS

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EMS Sessions

ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 1
KEYNOTE SESSION 1

Advancing Environmental Health in a Changing World

Keynote Speaker: Michelle Bachelet Jeria, United Nations Human Rights, Office of the High Commissioner, Chile

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Urban Living and Health Equity: Opportunities for Environmental Health Research

Keynote Speaker: Ana Diez Roux, Drexel University Dornsife School Of Public Health, Philadelphia, United States

This lecture will review the ways in which urban living may impact health and the roles of physical and social environments in generating inequities between and within cities. It will identify opportunities for environmental health research highlighting new questions and methodologic approaches. It will preview the SALURBAL Study (Salud Urbana en America Latina/Urban Health in Latin America) as an interdisciplinary multisite effort to generate the evidence and actions needed to make cities healthier, more equitable and environmentally sustainable.

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Human Rights and Environment

Keynote Speaker: Soledad García Muñoz, Oas, Cidh, Washington D.c. 20006, United States

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 2
SYMPOSIUM 1
Translation of Environmental Epidemiology into Public Health Action: An International Perspective
Chairs: Fuyuen Yip, US & Erik Svendsen, US

Translation of Environmental Epidemiology into Public Health Action: An International Perspective titled The Perspective of the Pan American Health Organization for the Region of the Americas.

Presenter: Marcelo Korc, Pan American Health Organization/World Health Organization, Washington, USA

The Region of the Americas is diverse, complex, and unequal. About 13% of premature deaths in high-income countries and 19% in low- and middle-income countries are attributed to known avoidable environmental risks, amounting to about 1,016,000 deaths each year. The impact of these risks on premature mortality differs significantly among countries, ranging from 8% in Canada to 23% in Haiti. Important advances have been made to protect people's health from environmental risks. Nonetheless, uneven development has left behind large populations across the Region.

Environmental public health has suffered of an invisibility crisis in several countries. Roles and responsibilities of government agencies are unclear, surveillance systems are weak, the health sector has not assumed its environmental responsibilities, and cities and communities have only partially addressed the challenges of environmental determinants of health. Knowledge gaps, insufficient research to fill these gaps and limited research translation and communication continue to prevent efficient and effective implementation of public health actions.

To address these challenges, the Pan American Health Organization has proposed an integrated and evidence-informed regional plan of action to systematize the response within the health sector and across sectors. The objective is to reduce the burden of disease and inequity in health attributable to environmental risks with emphasis on air pollution, chemical-related impacts, climate change-related impacts, and unsafe food, water, and sanitation. The implementation of the plan would follow four strategic lines of action: Improve the performance of environmental public health programs; strengthen environmental public health surveillance; foster an environmentally responsible and resilient health sector; and promote environmentally healthy and resilient communities.

This is a call to action for intersectoral and multisectoral collaboration with a significant support from the academic community to close the existing knowledge gaps and help translate environmental epidemiology into public health action in the Americas.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 2
SYMPOSIUM 1
Translation of Environmental Epidemiology into Public Health Action: An International Perspective
Chairs: Fuyuen Yip, US & Erik Svendsen, US

Establishing and extending EPHT capacity in England: governance and operational aspects

Presenter: Giovanni S Leonardi, Public Health England, Chilton, Oxon, United Kingdom

Authors: G. S. Leonardi, H. Crabbe, R. Close, T. Fletcher, T. Owodunni, O. Adedire, R. Duarte-Davidson, D. Rhodes;
Public Health England, Chilton, Oxon, UNITED KINGDOM.

Within Public Health England (PHE), an Environmental Public Health Tracking (EPHT) programme was established that includes several activities on surveillance of environmental hazards, exposures and health outcomes. We aim to account for key aspects of EPHT governance and operations in England. We describe the process for selecting topics to be included in EPHT and managing its data. This core infrastructure of EPHT within PHE has delivered capacity to support activities on ongoing concerns regarding hazardous pollutants and chemicals in drinking water, land, food and air, as well as linking with novel interpretative frameworks derived from research programmes in collaboration with external research groups. The English EPHT programme has adopted an approach providing common governance for disparate themes, this includes a EPHT board accountable to PHE's executive via an environmental hazards programme board, a strategic advisory group, stakeholder consultations, and PHE working groups with the remit to establish surveillance structures and functions appropriate to specific information needs. This process has produced activities on population exposure estimation of arsenic in private water supplies, the burden of disease of carbon monoxide poisoning, lead exposure in children, fluoridation monitoring, and guidance for investigating non-infectious disease clusters from potential environmental causes. Recent developments include national systems for enhanced air pollution exposure surveillance and access to weather data for public health use. Studies of distribution of vectors, climate variability and infectious disease, coastal changes and toxin-producing algae, social factors affecting use of green spaces and related health benefits, all illustrate novel interpretative frameworks that were first tested and documented in a research setting, and having been co-designed and co-produced with public health agencies, their relevance for EPHT can more easily be considered. In conclusion, EPHT in England is a programme that enables both activities on well-known environmental factors, and the capacity to integrate emerging concerns.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 2
SYMPOSIUM 1
Translation of Environmental Epidemiology into Public Health Action: An International Perspective
Chairs: Fuyuen Yip, US & Erik Svendsen, US

Translation of scientific research into Public Health Action: in the case of National Institute of Public Health, Japan

Presenter: Ichiro Yamaguchi, National Institute of Public Health, Saitama, Japan

Authors: Ichiro YAMAGUCHI, Hiroshi TERADA, Tsutomu SHIMURA, Yohei INABA, Akira USHIYAMA

Background: The National Institute of Public Health (NIPH) conducts investigative public health science research to provide national and local public health sectors with scientific basis and specialized training courses.
Objectives: To evaluate the training course for medical radiation inspectors in NIPH.
Methods: To assess the self confidentially and the knowledge, we compared the responses for the self-administered questionnaire and basic radiation safety knowledge test before and after the course in 2016, 2018 and 2019. To evaluate the basic attitude on public health action regarding radiation, the ethical aspects regarding thyroid mass screenings in Fukushima were discussed during this course.
Results: Before the course, 72 % of participants (n=46) were not confident on basic knowledge of radiation shielding design evaluation. After the course, 55 % of participants were confident. The average score for basic radiation safety knowledge was increased from 4.4 to 7.8 out of 10-point tests. Regarding thyroid mass screening, doubts were raised at the beginning of each course, participants gained an understanding of the scientific explanations.
Discussions: With the promotion of decentralization, basic local governments are becoming finer, and securing professional human resources has become an issue so that local agencies often do not have opportunity to inform research activities owing to challenges such as skills, resources, and time. Therefore, we provide various training courses for local agencies. Although the explanation on cons of the thyroid-screening test would not be easy even for local public health officials to understand, they recognized the honest attitudes of the facilitators and eventually understood our explanations.
Conclusions: The Fukushima nuclear accident has had also an inevitable impact on issues related to protection from medical radiation. However, sound risk communication activations on radiation are being accelerated on the premise of various experiences triggered by unfortunate accident in Japan.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 3
ORAL SESSION 1
Recent Issues on Environmental Risk Factors and Health in Asia
Chairs: Eunhee Ha,South Korea & Chu-Chih Chen, Taiwan

Policy options for India to minimize air pollution exposure and its health burden

Presenter: Sagnik Dey, Indian Institute of Technology Delhi, New Delhi, India

Authors: S. Dey[1], A. Upadhyay[1], S. Chowdhury[1], R. Kumar[2], P. Goyal[1];
[1]Indian Institute of Technology Delhi, New Delhi, INDIA, [2]National Center for Atmsopheric Research, Boulder, CO.

Background:Air pollution has been identified as the largest environmental health risk factor in India. Objective:This work explores policy options for India which are feasible and sustainable. Results:India has already implemented Pradhan Mantri Ujjwala Yojana welfare scheme where clean fuel is being supplied to millions of poor households to curb household emissions. Estimates suggest that complete mitigation of household emissions (from cooking, lighting and heating) would reduce the ambient $PM_{2.5}$ exposure by 30% (in addition to complete reduction of household exposure) that translates into almost 13% reduction in mortality burden. In near future, India needs to turn attention to key outdoor sources. If India follows current legislative emission pathway, ambient $PM_{2.5}$ exposure is expected to rise by 40.6% and 47.5% in 2030 under RCP4.5 and RCP8.5 scenarios, respectively. On the contrary, short-lived climate pollutant (SLCP) mitigation emission pathway would contain ambient $PM_{2.5}$ exposure in 2030 similar to the 2010 level. The mortality burden attributable to ambient $PM_{2.5}$ is expected to increase by 88.7% (5-95 UI 62%-118%) in 2030 from 2010 for the current legislative emission pathway. Switching to SLCP mitigation emission would save 380,000 (270,000-510,000) lives in 2030. This benefit would come at the expense of an additional 0.3-0.5 degree C temperature rise, but is also expected to enhance precipitation. Discussion:Though this is not enough to meet United Nations sustainable development goal targets, achieving this by successfully implementing National Clean Air Program would be a big step forward for India. Further aggressive measures are required if it were to reduce the staggering health burden attributable to air pollution.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 3
ORAL SESSION 1
Recent Issues on Environmental Risk Factors and Health in Asia
Chairs: Eunhee Ha,South Korea & Chu-Chih Chen, Taiwan

Impact of the exclusive median bus lane system on air pollution concentrations in Seoul, Korea

Presenter: Sun-Young Kim, National Cancer Center, Goyang, Korea, Republic of

Authors: S. Kim[1], Y. Kim[2];
[1]National Cancer Center, Goyang, KOREA, REPUBLIC OF, [2]Korea Transport Institute, Sejong, KOREA, REPUBLIC OF.

Since many previous studies reported the health effect of air pollution and indicated traffic as a major pollution source, significant policy efforts have been made to control traffic to reduce air pollution. However, there have been few studies that evaluated such policy implementation. In Seoul, Korea, the exclusive median bus lane system was implemented in 2004, and the metropolitan government applied air pollution reduction policies such as conversion of diesel buses to compressed natural gas buses and installation of emission control devices. This paper aimed to investigate the impact of the exclusive median bus lane system on air pollution reduction. Using hourly concentrations of particulate matter (PM_{10}) and nitrogen dioxide (NO_2) measured at 131 regulatory monitoring sites in Seoul and Gyeonggi-do for 2001-2014, we calculated annual and daily average concentrations at each site. We assessed the impact of the policy using differences-in-differences analysis by annual and daily average models after adjusting for geographic and/or meteorological variables. This method divides population into treatment and control groups with and without policy application, and compares the difference between the two time periods before and after the policy implementation in the treatment group with the difference in the control group. We classified all monitoring sites into treatment and control groups using two definitions: 1) Seoul vs. Gyeonggi; 2) within vs. outside 300 meters from the median bus lane. Pre- and post-policy periods were defined as 2001-2005 and 2006-2014, and 2004 and 2014 in the annual and daily models, respectively. The decrease in PM_{10} concentrations between the two periods across monitoring sites in the treatment group was larger by 1.73-5.88 $\mu g/m^3$ than in the control group. NO_2 also showed the decrease without statistical significance. Our findings suggest that an efficient public transport policy combined with pollution abatement policies can contribute to reduction in air pollution.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 3
ORAL SESSION 1
Recent Issues on Environmental Risk Factors and Health in Asia
Chairs: Eunhee Ha,South Korea & Chu-Chih Chen, Taiwan

Particulate air pollution and risk of ALRI hospital admission among young children in Ho Chi Minh city

Presenter: Thi Mai Ly Luong, Vietnam National University, Hanoi, Viet Nam

Authors: T. Luong[1], T. Dang[2], N. Huong[3], D. Phung[4], L. K. Tran[5], D. Dung[3], P. K. Thai[6];
[1]Vietnam National University, Hanoi, VIET NAM, [2]Duy Tan University, Da Nang, VIET NAM, [3]University of Medicine and Pharmacy, Ho Chi Minh, VIET NAM, [4]Griffith University, Brisbane, AUSTRALIA, [5]Queensland University of Technology, Brisbane, AUSTRALIA, [6]The University of Queensland, Brisbane, AUSTRALIA.

Background: High levels of air pollutants in Vietnam, especially particulate matters including PM2.5, can be important risk factors for respiratory diseases among children of the country. However, few studies on the effects of ambient air pollution on human health have been conducted in Vietnam so far.
Aim: The aim of this study is to examine the association between PM2.5 and hospital admission due to acute lower respiratory infection (ALRI) among children aged < 5 years old in Ho Chi Minh city, the largest city of Vietnam.
Methods: Data relating PM2.5 and hospital admission were collected from February 2016 - December 2017 and a time series regression analysis was performed to examine the relationship between PM2.5 and hospital admission including the delayed effect up to three days prior to the admission.
Results: We found that each 10 µg/m3 increase in PM2.5 was associated with an increase of 3.51 (95%CI: 0.96 - 6.12) risk of ALRI admission among children. According to the analysis, male children are more sensitive to exposure to PM2.5 than females, while children exposed to PM2.5 are more likely to be infected with acute bronchiolitis than with pneumonia.
Conclusions: The study demonstrated that young children in HCMC are at increased risk of ALRI admissions due to the high level of PM2.5 concentration in the city´s ambient air.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 3
ORAL SESSION 1
Recent Issues on Environmental Risk Factors and Health in Asia
Chairs: Eunhee Ha,South Korea & Chu-Chih Chen, Taiwan

Assessment of multiple air pollutant exposures using a mobile monitoring approach: a comparison of spatial modeling with multiple regression algorithms

Presenter: Jia Xu, State Key Laboratory of Environmental Criteria and Risk Assessment, Chinese Research Academy of Environmental Sciences, Beijing, China

Authors: J. Xu[1], S. Vedal[2], W. Yang[1], Z. Bai[1], M. Wang[3], T. Zhu[4];
[1]State Key Laboratory of Environmental Criteria and Risk Assessment, Chinese Research Academy of Environmental Sciences, Beijing, CHINA, [2]Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA, [3]Department of Epidemiology and Environmental Health, University at Buffalo, Buffalo, NY, [4]State Key Joint Laboratory for Environmental Simulation and Pollution Control, College of Environmental Sciences and Engineering, Peking University, Beijing, CHINA.

Background/Aim: Geo-statistical models have been widely applied to assess fine-scale air pollution exposures in epidemiological studies, most of which were developed for criteria pollutants rather than other toxic air pollutants that may also be harmful for human health. Furthermore, the predictive ability of different algorithms in air pollution models have rarely been compared. We aim to develop short-term spatial models for 11 air exposure metrics and compare their performances using 6 modeling algorithms. Methods: We used a mobile laboratory with fast-response monitors to measure multiple gaseous pollutants (nitrogen dioxide, carbon monoxide, sulfur dioxide, ozone, benzene, toluene, methanol) and PM species (black carbon, surface area, and count- and volume-concentrations of ultrafine particles) in the Beijing metropolitan area. Data were collected from 130 repeated short-term monitoring locations for up to 31 days between July and September during the 2008 summer Olympics period and were calibrated with a central fixed site. We developed 6 spatial models for each pollutant using linear regression, dimension reduction, non-linear regression (NLR) and machine learning (ML) algorithms and included extensive geographic variables. Best models were selected using ten-fold cross-validation (CV). Results: The best models based on the largest CV R^2 explained more than 60% of the variation for all the exposure metrics (range: 0.61 for methanol to 0.88 for ozone). Among the algorithms, random forest (RF, a ML algorithm) and the generalized additive model (GAM, a NLR algorithm) outperformed the other approaches for most of the pollutants (6 pollutants for RF and 3 for GAM). Incorporating a kriging model for model residuals improved the CV R^2 by 3%~39%. Conclusions: Exposure models, especially based on ML and NLR algorithms, captured spatial variability of short-term average concentrations, had adequate predictive validity, and could be successfully applied to existing human health studies carried out during the Beijing Olympics period.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:30 / Parallel 3
ORAL SESSION 1
Recent Issues on Environmental Risk Factors and Health in Asia
Chairs: Eunhee Ha,South Korea & Chu-Chih Chen, Taiwan

Assessing the meteorological triggers of childhood asthma: A season-stratified time-series analysis

Presenter: Shilu Tong, shanghai children's medical center, shanghai, China

Authors: Y. Hu, F. Jiang, Y. Yin, S. Liu, S. Tong;
shanghai children's medical center, shanghai, CHINA.

AbstractBackground: Although there has been increasing interest in identifying the adverse effects of outdoor environmental factors on asthma exacerbations (AE), few studies have examined the season-stratified effects of outdoor meteorological factors on childhood AE, especially in developing countries. Objective: We explored the effects of meteorological factors on childhood AE and the modification effects by season in Shanghai, China. Methods: We used a Poisson generalized linear regression model combined with a distributed lag nonlinear model to examine the lagged and nonlinear effects of meteorological factors on childhood AE in Shanghai from 2008 to 2017. We also performed a season-stratified analysis to determine the modification effects of meteorological conditions by season on AE after adjustment for a range of potential confounders.Results: There were 23,103 emergency department visits (EDVs) for childhood AE, including 15,466 boys and 7,637 girls. Both non-optimal temperatures and relative humidity (RH) were significantly associated with daily EDVs for childhood AE (e.g., cumulative relative risk ($CRR_{lag0-28}$) for the 95th percentile of temperature: 2.196, 95% CI: 1.128, 4.286; $CRR_{lag0-28}$ for the 5th percentile of RH: 3.217, 95% CI: 1.734, 6.365). In the cold season, lower temperatures were related to elevated CRR for childhood AE, while in the warm season, higher temperatures were associated with increased CRR for childhood AE. Lower levels of RH elevated the risk of childhood AE in both cold and warm seasons.Conclusion: Non-optimal temperatures and relative humidity were major triggers of emergency department visits for childhood AE. However, the effects of meteorological conditions on childhood AE varied by season. It is essential to develop season-specific, tailored strategies to prevent and control childhood AE.

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ABSTRACT E-BOOK

August 24, 2020 / 08:00 - 09:00 / Parallel 5
EMS 1
Chronic Kidney Disease of Uncertain Etiology: A Summary of Current Knowledge and Recommendations Relevant for Env.Epi.
Chair: Jennifer Crowe, Costa Rica

Chronic kidney disease of uncertain etiology: A summary of current knowledge and recommendations relevant for environmental epidemiology

Authors: Jennifer Crowe, National University of Costa Rica, Regional Institute for Studies on Toxic Substances (IRET), Heredia, Costa Rica; Vidhya Venogupal, Sri Ramachandra University, Chennai, India; Bonnie Joubert, NIEHS, Durham, United States; Madeleine Scammell, Boston University, United States; Agnes Soares de Silva, PAHO, Washington, United States; Susan Mendley, NIDDK, United States; Jill Lebov, RTI, United States; Andrés Cardenas, University of California, Berkeley, United States

Chronic kidney disease of uncertain etiology (CKDu), also known as Mesoamerican Nephropathy or chronic kidney disease of non-traditional etiology (CKDnt), characterizes a pattern of diseases that have been most extensively described in agricultural populations in the Pacific Coast of Mesoamerica and in specific regions of Sri Lanka and India. The causes of CKDu remain unknown and it is unclear whether the disease is the same in all regions of the world. Clinically, CKDu patients are typically men in the third or fourth decade of life, without previous diagnosis of diabetes, hypertension, or glomerulonephritis. This disease is characterized by reduced glomerular filtration rate with mild or no proteinuria and fast progression to end stage of renal disease. CKDu has devastated communities and overwhelmed healthcare systems in affected countries. Despite ongoing international research efforts, CKDu persists as a critical public health issue. Advances in research, patient care, and psychosocial and economic interventions are urgently needed and can only be appropriately addressed through international and interdisciplinary collaboration. In this spirit, CENCAM (Consortium on the Epidemic of Nephropathy in Central America and Mexico), SALTRA (Central American Program for Health, Work and Environment), NIEHS, NIDDK PAHO and SEARO collaborated to organize the Third International Workshop on Chronic Kidney Diseases of Uncertain/Non-traditional Etiology in Mesoamerica and Other Regions. The workshop included 137 experts from different fields in 15 different countries. This session will include commentary from workshop participants from four countries including three with a high burden of CKDu. Discussion will summarize: 1)the methodology used during the meeting to create a report (forthcoming); 2) key take home messages from the meeting with a particular focus on topics relevant for environmental epidemiology; and 3)recommendations for future research and collaboration.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 2
New Geostatistical Models for Large Scale Air Pollution Exposure
Chairs: Itai Kloog,US & Massimo Stafoggia, Italy

Modelling daily PM10 concentrations at high spatio-temporal resolution across South Africa.

Presenter: Oluwaseyi Arowosegbe, Swiss Tropical and Public Health Institute, University of Basel, Basel, Switzerland, Basel, Switzerland

Authors: O. O. Arowosegbe[1], M. Röösli[1], A. Saucy[1], M. A. Dalvie[2], K. de Hoogh[1];
[1]Swiss Tropical and Public Health Institute, University of Basel, Basel, Switzerland, Basel, SWITZERLAND,
[2]Centre for Environmental and Occupational Health Research, School of Public Health and Family Medicine, Cape Town, SOUTH AFRICA.

Background
Air pollution is a major environmental risk to health, responsible for one in every nine deaths globally. Currently, limited spatiotemporal air pollution data is available to conduct large-scale epidemiological studies investigating the adverse health effects of air pollution in South Africa. Here we aim to model South Africa's daily average PM10 concentrations for years 2010 to 2016 using spatial and temporal predictor variables including South Africa's data from Moderate Resolution Imaging Spectroradiometer (MODIS) and Copernicus Atmosphere Monitoring Service (CAMS).
MethodsWe followed a two-stage modelling strategy. In stage 1, we imputed missing Aerosol Optical Depth (AOD) data, due mainly to cloud cover, by developing Random Forest (RF) models between AOD and CAMS AOD estimates also including additional large-scale spatiotemporal predictors. In stage 2, we developed RF models to explain the measured PM10 concentration using the imputed AOD data from stage 1 and spatiotemporal predictors including land cover, road density, population density, altitude, climatological zones, and meteorological variables.
Results
Preliminary analysis for 2016 shows that our stage 1 RF models can explain 96 percent in variability in the AOD data. In stage 2, our models explain 79% of the variation in measured ground level PM10 concentrations with the corresponding 10-fold cross-validation R^2 of 78%. The RF stage 2 model includes variables depicting some PM10 source related variables like day of the week, geographical coordinates, road density, altitude and meteorological predictor variables in the top 10 of influential predictor variables.
Conclusion
This is the first study showing the potential of earth observation data to develop models explaining fine scale (1x1 km) temporal (daily) variation of PM10 across South Africa. We developed models for years 2010 to 2016. The predicted PM10 concentrations will be made available to facilitate health research in South Africa.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 2
New Geostatistical Models for Large Scale Air Pollution Exposure
Chairs: Itai Kloog,US & Massimo Stafoggia, Italy

The satellite data revolution: How new satellite instruments can provide better estimates of NOx pollution

Presenter: Daniel Goldberg, George Washington University, Washington, United States

Authors: D. Goldberg, A. Mohegh, S. Anenberg, L. Lamsal, B. Duncan;
George Washington University, Washington, DC.

Measurements from satellite instruments orbiting Earth can be useful in quantifying the abundance of air pollution in locations with few or no monitors. Even in the United States, a country with 327 million people, there are fewer than 500 active NO_2 air quality monitors, representing ~1 monitor per 1 million residents. The typical downside of satellite instruments is that they acquire measurements of gaseous pollutants at spatial extents analogous to entire city sizes (>20 x 20 km^2). However more recently, an instrument launched by the European Space Agency (TROPOMI), is able to quantify NO_2 air pollution at sub-city spatial resolution (3.5 x 5.5 km^2) and with enhanced sensitivity. In this work, we use high-resolution data from TROPOMI to generate 2019 annual human exposure estimates to NO_2. This is accomplished by merging the satellite data with other variables, which are highly correlated with the spatial heterogeneities of NO_2, such as roadway density, population density, and atmospheric boundary layer depth. This new exposure estimate, at 1 x 1 km^2 spatial resolution, is developed by training to the existing network of ground measurements, where the quantities of NO_2 are well-known, and then is applied to the United States as a test-bed (R^2> 0.6), with further goals to apply globally. In an additional step, we also quantify NO_x emission rates from power plants and large cities, by identifying the source of the pollution using the satellite spatial maps and then tracking the plume decay over time. Using these two complementary methods, we better understand the sources of NO_2 pollution and the human exposure to it. These new NO_2 exposure estimates can be used in epidemiological studies to explore the relationship between NO_2 and health outcomes, and in health impact assessments to estimate the health benefits of emission regulations over time.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 2
New Geostatistical Models for Large Scale Air Pollution Exposure
Chairs: Itai Kloog,US & Massimo Stafoggia, Italy

Multi-stage satellite-based machine learning approach to reconstruct $PM_{2.5}$ concentrations across Great Britain

Presenter: Rochelle Schneider dos Santos, Centre on Climate Change and Planetary Health, London School of Hygiene & Tropical Medicine, London, United Kingdom

Authors: R. Schneider dos Santos[1], A. M. Vicedo-Cabrera[2], F. Sera[3], M. Stafoggia[4], K. de Hoogh[5], I. Kloog[6], A. Gasparrini[7];
[1]Centre on Climate Change and Planetary Health, London School of Hygiene & Tropical Medicine, London, UNITED KINGDOM, [2]Institute of Social and Preventive Medicine / Oeschger Center for Climate Change Research, University of Bern, Bern, SWITZERLAND, [3]Department of Public Health, Environments and Society, London School of Hygiene & Tropical Medicine, London, UNITED KINGDOM, [4]Department of Epidemiology, Lazio Regional Health Service, Rome, ITALY, [5]Swiss Tropical and Public Health Institute, Basel, SWITZERLAND, [6]Department of Geography and Environmental Development, Ben-Gurion University of the Negev, Beer Sheva, ISRAEL, [7]Centre for Statistical Methodology / Centre on Climate Change and Planetary Health, London School of Hygiene & Tropical Medicine, London, UNITED KINGDOM.

Background/Aim: Exposure to fine particulate matter ($PM_{2.5}$) is linked to adverse health outcomes. Usually, epidemiological studies rely on $PM_{2.5}$ measurements collected from fixed monitors. However, in many countries such as Great Britain the existing monitoring network provides limited spatio-temporal coverage of $PM_{2.5}$, with scarce data in small towns and rural areas. Data from satellites, climate and atmospheric reanalysis models, chemical transport models, and geospatial features offer additional information that can be used to reconstruct $PM_{2.5}$ concentrations, filling the gaps in the ground monitoring network. The aim of this study is to develop and apply a multi-stage satellite-based machine learning (ML) model to estimate daily $PM_{2.5}$ over a $1km^2$ grid across Great Britain for 2003-2018. Methods: We managed, processed, and synchronised data from several resources with different formats, projections, and spatio-temporal resolutions, collecting a dataset with more than 100 billion rows. We then applied a multi-stage random forest (RF) model to obtain daily modelled $PM_{2.5}$ at $1km^2$. Stage-1 predicts $PM_{2.5}$ concentrations in monitors with PM_{10} only records. Stage-2 imputes satellite aerosol optical depth missing due to cloudiness and bad retrievals. Stage-3 applies the RF algorithm to estimate $PM_{2.5}$ concentrations using a combined dataset from Stage-1, Stage-2, and a list of spatiotemporally synchronised predictors. Stage-4 predicts daily $PM_{2.5}$ using Stage-3 model across the whole Great Britain. Results/Discussion: The RF model performed well in all stages. Stage-1 obtained an R^2=0.91 (Ntree=500/mtry=4). Stage-2 and Stage-3 obtained a mean overall R^2 of 0.93 (Ntree=50/mtry=20) and 0.79 (Ntree=500/mtry=30), respectively. Stage-4 reconstructed approximately 1.5 billion $PM_{2.5}$ values across Great Britain. Conclusion: The modelling tools and data developed in this project provide continuous estimations of $PM_{2.5}$ at surface-level across Great Britain, which can then be linked with existing health databases. This will enable an accurate estimation of health risks and impacts linked to both short- and long-term exposures.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 2
ORAL SESSION 3
Air Pollution and Respiratory Health in Children and Patients
Chairs: Nino Kuenzli,Switzerland & Toyib Olan, Canada

Variation in Clinical Trial Results for Asthma by Environmental and Socioeconomic Exposures

Presenter: Jane Clougherty, Drexel University Dornsife School of Public Health, Philadelphia, United States

Authors: J. E. Clougherty[1], E. J. Kinnee[2], F. Holguin[3];
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Randomized clinical trials (RCTs) are generally considered the gold standard in medical research; by randomizing participants to treatment and control arms, they maximize internal validity and reduce between-group biases. RCTs, however, do not routinely examine variation by environmental and social exposures (e.g., socioeconomic status), which may impact clinical outcomes, treatment response, and study generalizability. To assess whether variation in socioeconomic positon (SEP) and environmental exposures modify treatment response, we have developed and applied Geographic Information Systems (GIS)-based methods to examine three RCTs performed by the NIH AsthmaNet network, which recruited and implemented RCTs using the same protocols across 17 U.S. cities. In preliminary analyses, we have found that: (1) compared to race-specific U.S. averages, AsthmaNet participants disproportionately live in impoverished census tracts. (2) At baseline, traffic density and SEP predicted variation in lung function, in the hypothesized directions. (3) In one longitudinal trial, we found that near-residence roadway density explained greater variation in asthma symptoms than did corticosteroid use, and that children in higher-poverty areas had significantly shorter times to first corticosteroid use. For this trial, we examined effect modification by near-residence roadway traffic and noise exposures, neighborhood violence, and health care access. Preliminary results suggest - only among higher-SES children - significantly greater negative impacts (shorter times to prednisone use) among participants receiving higher inhaled corticosteroid (ICS) doses (220 ug), relative to those receiving lower ICS doses (44 ug).Results suggest that participants in clinical trials may not be representative of U.S. asthmatics, and participants from different SES backgrounds may differentially respond to intensive corticosteroid interventions. Using spatial analysis and GIS to understand the neighborhoods of RCT participants – better accounting for socioeconomic and environmental conditions – may improve the interpretability and applicability of RCT results, by more clearly identifying subpopulations for whom a given intervention may be most effective.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 2
ORAL SESSION 3
Air Pollution and Respiratory Health in Children and Patients
Chairs: Nino Kuenzli,Switzerland & Toyib Olan, Canada

Investigating the associations between exposure to air pollutants and respiratory outcomes in COPD patients: the COPE study.

Presenter: Dimitris Evangelopoulos, King's College London, London, United Kingdom

Authors: D. Evangelopoulos[1], K. Katsouyanni[1], H. Walton[1], L. Chatzidiakou[2], J. K. Quint[3], R. Jones[2], F. J. Kelly[1], E. Samoli[4], B. Barratt[1];
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Background: Previous studies have investigated the effects of air pollution in people with chronic obstructive pulmonary disease (COPD) using either fixed site measurements or a limited number of personal measurements, usually for one pollutant and a short time period. These limitations may introduce bias and underestimate the epidemiological associations due to measurement error. We used detailed information on individuals' exposure to various pollutants measured at fine spatial and temporal scale to identify the true effect estimates.
Methods: 130 patients were followed up for an average period of 128 days during which each patient carried sensors measuring PM_{10} , $PM_{2.5}$, NO_2, NO, CO and O_3 at one-minute resolution, and other environmental factors, such as temperature and noise. Ambient concentrations from the London monitoring network were also utilised for comparison. Each patient recorded daily information on respiratory symptoms and measured their peak expiratory flow (PEF). Exacerbations were defined by a pulmonologist. The exposure-response associations were assessed with mixed-effects models. To quantify exposure misclassification, we compared the differences in the effect estimates when ambient concentrations were used instead of personal exposures.
Results: Gaseous pollutants were associated with a deterioration in patients' health. We observed an increase of 16.4%, 9.4% and 7.6% in the odds of exacerbation for an interquartile range increase in NO_2, NO and CO respectively. Similar results were obtained for cough and sputum. O_3 was found to be associated with PEF and breathlessness. No association was observed between particles and any outcome. When ambient concentrations were used, the previous adverse effects became null or even protective.
Discussion: Our findings suggest that mainly the gaseous pollutants affect COPD patients' health. The lack of association of health outcomes with ambient measurements may indicate that other sources of exposure are more important or that exposure measurement error may lead to serious underestimation of effects.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 2
ORAL SESSION 3
Air Pollution and Respiratory Health in Children and Patients
Chairs: Nino Kuenzli,Switzerland & Toyib Olan, Canada

High traffic pollution predicts rapid decline in lung function among children with cystic fibrosis

Presenter: Emrah Gecili, Cincinnati Children's Hospital Medical Center, Cincinnati, United States

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Background: Environmental exposures and community characteristics (i.e. geomarkers) have been shown to influence pulmonary outcomes; however, the ability for geomarkers to predict rapid lung-function decline among cystic fibrosis (CF) patients has not been studied.
Methods: We applied a longitudinal model to predict rapid lung function decline, defined using forced expiratory volume in 1 second (FEV1) relative to patient and center specific norms, based on registry data for 185 CF patients aged 6-20 years receiving care at Cincinnati Children's Hospital CF Center between 2012 and 2017. Clinical and demographic characteristics (F508del alleles, sex, Medicaid insurance use and pancreatic enzymes) were used as predictors in our initial model. Residential addresses were geocoded and average exposure to elemental carbon attributable to traffic sources (ECAT), a marker of traffic-related air pollution (TRAP), was estimated for the three months prior to each clinical encounter using a previously validated spatiotemporal land-use model. Neighborhood deprivation was derived at the census-tract level using an index comprised of American Community Survey measures related to poverty, education, housing, and access to healthcare. Greenness near the home was derived from the normalized differential vegetation index. We implemented real-time prediction after including geomarkers with the clinical and demographic predictors. Covariates were selected with the likelihood ratio test (LRT). Model fit including/excluding geomarkers was assessed using Akaike information criteria (delta-AIC).
Results: Including geomarkers yielded a significantly better fit and improved prediction of FEV1 compared to a model with only clinical/demographic characteristics (LRT statistic: 45.4, P<0.0001; delta-AIC=27.4). Specifically, an increase of 1 ug/m3 of ECAT was associated with a 1.13% predicted/yr (95% CI: 0.33, 1.93% predicted/yr) more rapid decline.
Conclusion: Exposure to TRAP is an important predictor of pulmonary decline in CF that may be used to enhance clinician assessments of prognosis and enable personalized environmental health interventions.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 2
ORAL SESSION 3
Air Pollution and Respiratory Health in Children and Patients
Chairs: Nino Kuenzli,Switzerland & Toyib Olan, Canada

Air pollution and the development of asthma from birth until young adulthood

Presenter: Ulrike Gehring, Utrecht University, Utrecht, Netherlands

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Background: Air pollution is associated with asthma development in children and adults, but the impact on asthma development during the transition from adolescence to adulthood is unclear. Adult studies lack historical exposures and consequently cannot assess the relevance of exposure during different periods of life. We assessed the relevance of early life and more recent air pollution exposure for asthma development from birth until early adulthood. Methods: We used data of 3,687 participants of the prospective Dutch PIAMA birth cohort and linked asthma incidence until age 20 to estimated concentrations of nitrogen dioxide (NO_2), $PM_{2.5}$ absorbance (“soot”) and particulate matter with a diameter <2.5 µm ($PM_{2.5}$), <10 µm (PM_{10}), and 2.5-10 µm (PM_{coarse}) at the residential address. We assessed overall and age-specific associations with air pollution exposure with discrete time hazard models, adjusting for potential confounders. Results: Overall, we found higher incidence of asthma until age 20 with higher exposure to all pollutants at the birth address [adjusted odds ratio (95% confidence interval) ranging from 1.09 (1.01-1.18) for PM_{10} to 1.20 (1.10-1.32) for NO_2) per interquartile range increase] that were rather persistent with age and similar associations were observed with more recent exposure defined as exposure at the current home address. In two-pollutant models with PM, associations with NO_2 persist. Conclusions: Exposure to air pollution, especially from motorized traffic, early in life may have long-term consequences for asthma development as it is associated with an increased odds of developing asthma through childhood and adolescence into early adulthood.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 2
ORAL SESSION 3
Air Pollution and Respiratory Health in Children and Patients
Chairs: Nino Kuenzli,Switzerland & Toyib Olan, Canada

Health effects of short-term exposure to ultrafine particles around Amsterdam Schiphol airport

Presenter: Nicole Janssen, National Institute for Public Health and the Environment (RIVM), Bilthoven, Netherlands

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Background: Studies have shown elevated concentrations of ultrafine particles (UFP) near airports. Little is known about the health effects of UFP, particularly from aviation. We evaluated the health effects of short-term exposure to UFP around Schiphol Airport, The Netherlands. Methods: We conducted three studies, with different designs: 1. Observational study with 191 schoolchildren in residential areas near Schiphol, including weekly lung function and exhaled NO measurements at school (161 children) and daily lung function and symptom recording at home (all 191 children). 2. Controlled exposure study with 21 healthy adults, including 2-5 repeated 5-hour exposures in a mobile laboratory directly next to Schiphol, with pre and post measurements of lung function, exhaled NO, electrocardiography and blood pressure. 3. Toxicological study with human bronchial epithelial cells (Calu-3), using UFP collected directly next to Schiphol as well as UFP collected from a turbine engine, and assessment of cell viability, cytotoxicity and inflammatory potential. Results: In children, we found statistically significant associations between exposure to UFP and an increase in daily respiratory symptoms and bronchodilator use. These associations were observed for UFP from aviation as well as UFP from road traffic, based on particle size distribution. In the adults study, exposure to UFP from aviation was associated with a decline in lung function (FVC) and a prolongation of the QTc interval (ECG). UFP from road traffic was associated with an increase in systolic blood pressure. In Calu-3 cells, exposure to UFP resulted in cell damage and release of pro-inflammatory markers, with no significant differences in reactivity between the different sources of UFP. Conclusions: Together these studies show that short-term increased exposure to UFP, as occurs around Schiphol, is associated with acute health effects. We found no indications that effects of UFP from aviation are substantially different from those of UFP from road traffic.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 2
ORAL SESSION 3
Air Pollution and Respiratory Health in Children and Patients
Chairs: Nino Kuenzli,Switzerland & Toyib Olan, Canada

Acute effects of air pollution on hospital admissions for asthma COPD and bronchiectasis in Ahvaz Iran

Presenter: Narges Khanjani, Kerman, Kerman, Iran

Authors: H. Raji[1], A. Riahi[1], S. Borsi[1], K. Masoumi[1], N. Khanjani[2], K. Ahmadi Angali[1], G. Goudarzi[1], M. Dastoorpoor[1];
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Acute effects of air pollution on hospital admissions for asthma, COPD and bronchiectasis in Ahvaz, Iran
Abstract
Background and Aim: Although, air pollution is a serious problem in Ahvaz, the association between air pollution and respiratory diseases has not been studied enough in this area. The aim of this study was to determine the relation between short-term exposure to air pollutants and the risk of hospital admissions due to asthma, COPD and bronchiectasis in Ahvaz.
Methods: Hospital admissions data and air pollutants including O_3, NO, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$ were obtained from 2008 to 2018. Adjusted Quasi-Poisson regression with a distributed lag model, controlled for trend, seasonality, weather, weekdays and holidays was used for data analysis.
Results: The results showed a significant increase in hospital admissions for asthma (RR=1.004, 95% CI: 1.002-1.007) and COPD (RR=1.003, 95% CI: 1.001-1.005) associated with $PM_{2.5}$. PM_{10} was associated with increased hospital admissions due to bronchiectasis in both genders (Men: RR=1.003, 95% CI: 1.001-1.006), (Female: RR=1.003, 95% CI: 1.000-1.006). NO_2 was also associated with an increased risk of hospital admissions for asthma (RR=1.040, 95% CI: 1.008-1.074) and COPD (RR=1.049, 95% CI: 1.010-1.090). SO_2 was associated with the risk of hospital admissions of asthma (RR=1.069, 95% CI: 1.017-1.124) and bronchiectasis (RR=1.030, 95% CI: 1.005-1.056). Finally, CO was associated with COPD (RR=1.643, 95% CI: 1.233-2.191) and bronchiectasis (RR=1.542, 95% CI: 1.035-2.298) hospital admissions.
Conclusion: Short-term exposure to air pollutants significantly increases the risk of hospital admissions for asthma, COPD and bronchiectasis in the adult and elderly population.
Keywords: Air pollution; particulate matter; Asthma; COPD; Bronchiectasis

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 4
Exposure and Health Effects of Environmental Noise-A Global View
Chairs: Tamara Schikowski, Germany & Cathryn Tonne, Spain

Road traffic noise, mortality and incidence of cardio-cerebrovascular diseases in Rome

Presenter: Carla Ancona, Lazio Regional Health Service, Local Health Authority Roma 1, Roma, Italy

Authors: L. Bauleo[1], M. Renzi[1], M. Stafoggia[1], P. Michelozzi[1], F. Forastiere[2], C. Ancona[1];
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Background/Aim: Transportation noise is among the most important environmental exposures contributing to the burden of disease in Europe. The aim of the study is to assess whether long-term exposure to road traffic noise is associated with mortality and incidence of coronary and cerebrovascular events in the Rome Longitudinal Study.Methods: All city residents at October 21 2001, aged 30 years and over, followed up until 31 December 2015. Lden (db(A)) and NO2 (μg/m^3) concentrations were estimated at each residential address (Sound Plan 8.1, Lagrangian microscale model). The association between a 10 (db(A)) increase of Lden and non-accidental mortality, incidence of acute coronary events and stroke was assessed using Cox models adjusted for individual variables, including SEP, and NO2 concentrations (HR, CI95%). We also studied the effect of Lden (low ≤48.1 dB(A), medium 48.1-54.4 dB(A), high ≥54.4 db(A)) in three categories of NO2 concentrations (≤34.4 μg/m^3, 34.4-39.9 μg/m^3, ≥39.9 μg/m^3) Results: 1,263,712 residents were enrolled (55% women, mean age (DS) 55 (15.4), 19% low SEP). The average population exposure levels [mean (SD)] were 53.8 (8.1) dB(A) for Lden, and 41.3 (10.1) μg/m^3 for NO_2 (ρ=0.47). For all the outcomes, after adjustment for NO2 we failed to find a clear association with traffic noise. However, at medium and high NO2 exposure levels we found an effect at all the noise levels considered: at Lden >54.4 db(A) we found an HR=1.05 (IC95% 1.03-1.07) for non-accidental mortality, HR=1.07 (IC95% 1.00-1.14) for fatal acute coronary events and HR=1.05 (IC95% 1.00-1.11) for stroke incidence. Conclusion: We found an independent effect of noise exposure especially at medium and high NO2 levels. Policies to reduce the exposure of residents and prevent harmful effects on their health are urgent.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 4
Exposure and Health Effects of Environmental Noise-A Global View
Chairs: Tamara Schikowski, Germany & Cathryn Tonne, Spain

Long-term exposure to road traffic noise and cause-specific mortality: a Danish Nurse Cohort Study

Presenter: Zorana Andersen, University of Copenhagen, Copenhagen, Denmark

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Background. There is growing evidence on the adverse effect of road traffic noise exposure on cardio- and cerebrovascular disease and diabetes morbidity, with limited data on mortality. We investigated whether long-term exposure to road traffic noise was associated with all-cause and cause-specific mortality. Methods. We linked 24,698 female nurses from the Danish Nurse Cohort, who at recruitment in 1993 or 1999 reported information on lifestyle, to the Danish Register of Causes of Death until the end of 2013. Road traffic noise levels in 1970-2013 were estimated by Nord2000 model as the annual mean of a weighted 24h average (L_{den}). We examined the associations between up to 23-year mean exposure to L_{den} and mortality using time-varying Cox regression models, adjusting for individual characteristics and particulate matter with diameter < 2.5 µg/m^3 ($PM_{2.5}$). Results. During the mean follow-up of 17.5 years, 3,779 nurses died in total: 882 from cardiovascular disease (CVD), 277 from stroke, 76 from diabetes, 222 from dementia, 323 from respiratory disease (RD), and 1594from cancer. Compared to a 5-year mean L_{den} < 48 dB, fully adjusted hazard ratios (95% confidence intervals) for all-cause mortality were 1.13 (1.02-1.25) and 1.14 (1.02-1.28) for exposure levels between 48-58 dB and > 58 dB, respectively. Corresponding estimates for CVD mortality were 1.23 (0.99-1.54) and 1.30 (1.02-1.67), for stroke mortality 2.01 (1.27-3.18) and 1.94 (1.17-3.22), for diabetes mortality 1.15 (0.54-2.48) and 1.53 (0.65-3.57), for dementia mortality 1.38 (0.84-2.26) and 1.36 (0.79-2.36), for RD mortality 1.20 (0.82-1.74) and 1.20 (0.79-1.84), and cancer mortality 1.01 (0.87-1.17) and 1.04 (0.88-1.24), respectively. HRs with 23-year mean of L_{den} were enhanced for all-cause and diabetes mortality, but attenuated for CVD, stroke, RD and dementia mortality. Conclusion: Long-term exposure to road traffic noise may increase risk of premature mortality independent of air pollution.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 4
Exposure and Health Effects of Environmental Noise-A Global View
Chairs: Tamara Schikowski, Germany & Cathryn Tonne, Spain

Novel approaches to characterize environmental noise pollution and its sources in rapidly developing cities: Application to the sub-Saharan African city of Accra, Ghana

Presenter: Sierra Clark, Imperial College London, London, United Kingdom

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Background: Cities in sub-Saharan Africa (SSA) are growing at a faster rate than in any other continent. Numerous transport, industrial, and commercial sources of environmental noise pollution may be present, however, little is known about the levels and patterns of noise and its sources in SSA cities. Methods: We deployed an extensive monitoring campaign to characterize the space-time patterns of environmental noise and identify sources in the city of Accra, Ghana. We measured and analyzed sound level data and audio from ~150 locations that were monitored for either 7-days (n=140 locations) or 1-year (n=10 locations) from April 2019 to May 2020. We calculated metrics of environmental noise including A-weighted 24hr, day, and night sound levels ($LAeq_{24hr}$, L_{day}, L_{night}), and an event-based metric called the Intermittency Ratio (IR, % of event-based sound energy). Audio recordings were analyzed for types of sounds (i.e., sources) using a pre-trained neural network.
Results: Most residential areas (95% of site-days) exceeded the national noise guidelines (Day 55; Night 48 dBA). Commercial, business, and industrial areas had the highest median L_{day} (69 dBA [Interquartile range (IQR) 59, 76]) and L_{night} (63 dBA [IQR 58, 67]) and the lowest median percent of event-based sound (46% [IQR 30, 57]), while the inverse was true for peri-urban background areas. The most predominant sources of sound in the city were from road transport, animals, human speech, and outdoor music (present 75%, 24%, 23%, and 12% of the time, respectively), and these sounds varied between location and time with animal sounds occurring most often in background areas at night and road transport sounds in commercial, business, and industrial areas.
Conclusion: Noise levels in Accra are higher than in most high-income country cities and should be prioritized as an environmental health risk in stronger policies and regulation.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 4
Exposure and Health Effects of Environmental Noise-A Global View
Chairs: Tamara Schikowski, Germany & Cathryn Tonne, Spain

Aircraft noise exposure and saliva cortisol in the DEBATS longitudinal study

Presenter: Lise Giorgis-Allemand, Univ Lyon, Univ Eiffel, IFSTTAR, Univ Lyon 1, Umrestte, UMR_T9405, F-69675 Bron, France

Authors: L. Giorgis-Allemand[1], A. Kourieh[1], M. Carlier[2], M. Lefèvre[1], B. Laumon[3], A. S. Evrard[1];
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Introduction
Although aircraft noise is known to impact human health, the biological pathway is still unclear. One of the possible pathway is that aircraft noise exposure may induce a modification of the cortisol circadian rhythm. However, only a few studies have examined the association between this exposure and cortisol levels.
Objectives
This longitudinal study conducted in France aimed to investigate the association between aircraft noise exposure and saliva cortisol levels.
Methods
The DEBATS study included 1,244 participants living near three French major airports. In 2013, 2015 and 2017, these participants responded to a face-to-face questionnaire administered at their home by a trained interviewer and collected two saliva samples: the first one immediately after awakening (when the cortisol level is usually high) and the second one just before going to bed (when the cortisol level is usually the lowest). ELISA kits were used to determine morning and evening cortisol levels in saliva for the 1,115 participants who followed the protocol and did not use any medication that could modify cortisol levels. Outdoor aircraft noise levels were estimated at each home address using noise maps. To estimate the associations between noise levels and cortisol levels (morning, evening, relative daily variation), linear mixed models were used with a subject-specific random intercept and adjusted on potential confounders.
Results
A 10 dB(A) increase in the day-evening-night (L_{den}) level was associated with decreased relative daily variation of cortisol (exp(β)=0.77; 95% confidence interval: 0.70-0.85), higher evening cortisol levels (exp(β)=1.16; 95% CI: 1.08-1.23) and unchanged morning levels (exp(β)=0.95; 95% CI: 0.90-1.00).
Discussion
The results of this study support the hypothesis that aircraft noise exposure was associated with flattened diurnal cortisol rhythm across the day, indicating a possibly disturbed hypothalamus-pituitary-adrenal axis regulation.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 4
Exposure and Health Effects of Environmental Noise-A Global View
Chairs: Tamara Schikowski, Germany & Cathryn Tonne, Spain

Environmental noise exposure and sleeping troubles: A general population-based study in Montreal and Halifax

Presenter: Ying Liu, University of Montreal, Montreal, Canada

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Objectives: To investigate the association between environmental noise exposure and quality of sleep among adults in the metropolitan areas of Montreal and Halifax, Canada. Methods: Self-reported sleeping conditions (frequency of getting sleep troubles) of 5,027 subjects (3,211 from Montreal and 1,816 from Halifax) were retrieved from the 2007-2008 and 2011-2012 Canadian Community Health Survey (CCHS) archive. Noise estimates derived from a machine learning regression approach were assigned to the subjects based on their six-digit postal codes. Mixed-effects logistic regression models were used to calculate odds ratios (OR) and 95% confidence intervals (CI) for the associations between sleep trouble and noise exposure, adjusting for age, sex, work status, and number of children in the household. City was set as the random effect in the regression models. Three sensitivity analyses were conducted by excluding the individuals with physical (i.e., heart disease, hypertension, and diabetes), psychological (i.e., stress, anxiety, and mood disorder), and both kinds of diseases. Results: The adjusted OR (1.00) and 95% CI (0.97-1.02) did not suggest any associations between noise exposure and sleep problems while sleep troubles were more common in females and the number of kids significantly influenced sleeping. Conclusion: We did not see clear links between environmental noise exposure and sleep trouble using the CCHS survey data from Montreal and Halifax.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 4
Exposure and Health Effects of Environmental Noise-A Global View
Chairs: Tamara Schikowski, Germany & Cathryn Tonne, Spain

Long-term exposure to aircraft noise and risk of incident cardiovascular disease in the Women's Health Initiative

Presenter: Daniel Nguyen, Department of Environmental Health, Boston University School of Public Health, Boston, United States

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[1]Department of Environmental Health, Boston University School of Public Health, Boston, MA, [2]Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, [3]Department of Epidemiology, Brown University School of Public Health, Providence, RI, [4]Department of Epidemiology, Boston University School of Public Health, Boston, MA, [5]Volpe National Transportation Systems Center, U.S. Department of Transportation, Cambridge, MA, [6]Departments of Neurology, Epidemiology and Neurosurgery, University of Iowa, Iowa City, IA, [7]Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA.

Background: Aircraft noise is a persistent concern for communities surrounding airports. Studies have reported associations with cardiovascular disease (CVD), but few studies have been longitudinal or assessed multiple airports. Also, to date, no prospective cohort study investigating noise and CVD has been conducted in the United States (U.S.). We evaluated the association between long-term exposure to aircraft noise and incident CVD events among post-menopausal participants in the Women's Health Initiative (WHI), a large ongoing U.S. prospective study. Methods: Day-night average sound levels (DNL) at 1 decibel (dB) intervals down to 45 dB were modeled for 90 U.S. airports from 1995-2015 in 5-year intervals. We used the U.S. Federal Aviation Administration's Aviation Environmental Design Tool and linked to WHI-participant geocoded addresses. Participants were followed from 1993-2010. CVD was defined as first occurrence of coronary heart disease or stroke during follow-up. Using time-varying Cox regression, we estimated hazard ratios (HRs) and 95% confidence intervals (95% CI) for incident CVD comparing exposure to ≥45 dB versus <45 dB and ≥55 dB versus <55 dB while adjusting for participant-level demographic, behavioral and risk factors. Results: Of the 132,499 women free of CVD at baseline, 10,300 developed CVD during follow-up. Median follow-up time was 13.2 (interquartile range: 9.9-14.4) years, and 20.5% were exposed to ≥DNL 45 dB and 3.9% to ≥DNL 55 dB. We observed adjusted HRs (95% CI) of 1.04 (0.98-1.11) at DNL 45 dB and 0.95 (0.83-1.09) at DNL 55 dB. Conclusions: This is among the first U.S.-based studies investigating the longitudinal relationship between aircraft noise exposure and CVD risk using a national cohort. After adjustment, preliminary analyses indicate no consistent associations between aircraft noise exposure and incident CVD among post-menopausal women. Future work will further investigate environmental and contextual factors, explore alternative noise metrics, and analyze CVD-subtypes.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 3
Glyphosate: Regulation, Toxicity, Exposure and Controversy
Chairs: Cynthia Curl, US & Michael Antoniou, UK

Why EPA and IARC Classifications of Glyphosate Oncogenicity Differ

Presenter: Charles Benbrook, Heartland Study, Port Orchard, United States

Authors: C. Benbrook;
Heartland Study, Port Orchard, WA.

In March 2015 IARC classified glyphosate (GLY), and glyphosate-based herbicides (GBHs) as “probable human carcinogens.” The U.S. EPA’s September 2016 “Glyphosate Issue Paper: Evaluation of Carcinogenic Potential” concluded that “The strongest support is for ‘not likely to be carcinogenic to humans’ at doses relevant to human health risk assessment.” This presentation explains why the IARC Working Group and EPA reached such different conclusions. Reasons include: (1) the EPA analysis is based on risks arising from GLY residues in food, while IARC assessed data on all routes of exposure to formulated GBHs, including high-exposure scenarios (e.g., mixer-loaders, applicators using handheld wands); (2) the EPA discounted dozens of tumors in 15 animal bioassays, including several that should have been deemed treatment related had the EPA followed its 2005 Cancer Risk Assessment guidelines; (3) the EPA essentially ignored dozens of positive, formulated GBH genotoxicity assays, including several in vivo studies in humans, whereas IARC placed considerable weight on them in concluding there is “strong mechanistic evidence” linking GBH exposure to cancer; (4) the EPA relied predominantly on animal bioassay and genotoxicity data generated by GBH registrants, whereas IARC placed heavy weight on studies published in peer-reviewed journals; and (5) EPA’s decision to limit its genotoxicity analysis to relatively low dietary exposures to pure GLY. These decisions led the agency to conclude “there is no evidence that glyphosate induces mutations in vivo through the oral route.” This conclusion is largely irrelevant to the evaluation of GBH cancer risk to applicators and others exposed to GBHs via routes other than diet. Had EPA included in its analysis the dozens of positive genotoxicity studies on formulated GBHs, the agency would not have been able to support its judgements regarding the absence of GLY and GBH genotoxicity and cancer risk.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 3
Glyphosate: Regulation, Toxicity, Exposure and Controversy
Chairs: Cynthia Curl, US & Michael Antoniou, UK

Urinary biomonitoring to assess human exposure to glyphosate

Presenter: Cynthia Curl, Boise State University, Boise, United States

Authors: C. Curl, M. Spivak, R. Phinney;
Boise State University, Boise, ID.

Glyphosate, the active ingredient in common weed killers like Roundup, is the single most heavily used agricultural chemical in the world. This increase has been driven, in large part, by the introduction of glyphosate-resistant crops, such as “Roundup Ready” corn and soybeans, and over the past two decades, global use of glyphosate has increased by more than 15-fold. Human exposure to glyphosate and its formulations may occur through dietary, agricultural, residential and occupational pathways, yet current exposure levels in human populations are not well documented. A 2019 review article identified just 19 studies of glyphosate levels in humans, many of which included small sample sizes or looked only at individuals with occupational exposure. We will summarize and present all currently available data on glyphosate exposures in humans with an emphasis on recently published studies. We will also describe preliminary results of a longitudinal biomonitoring study to assess glyphosate exposure among pregnant women. For this longitudinal biomonitoring study, we are recruiting 40 women in their first trimester of pregnancy from the Treasure and Magic Valleys of Idaho. Study participants either live within one mile of a glyphosate-treated agricultural field (n=20) or ten or more miles from a glyphosate-treated field (n=20). Participants are providing weekly urine samples from recruitment until delivery (24 samples per participant; 960 total). In addition, all participants are taking part in a two-week dietary intervention study during which they are receiving one week of a fully organic diet and one week of a fully conventional diet. During this period, we are collecting daily urine samples (14 samples per participant; 560 total). Ultimately, we aim to describe glyphosate exposure levels within this population over time and to attribute this exposure to agricultural and dietary sources.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 3
Glyphosate: Regulation, Toxicity, Exposure and Controversy
Chairs: Cynthia Curl, US & Michael Antoniou, UK

Can glyphosate and commercial glyphosate-based herbicide formulations alter human microbiomes?

Presenter: Michael Antoniou, King's College London, London, United Kingdom

Authors: M. Antoniou, R. Mesnage;
King's College London, London, UNITED KINGDOM.

Glyphosate exerts its herbicidal action by inhibiting 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) of the shikimate pathway, thus blocking aromatic amino acid biosynthesis. Glyphosate may also affect shikimate pathway positive microorganisms and is patented as an antibiotic. We have recently shown that glyphosate and a commercial formulation of glyphosate-based herbicide can indeed inhibit EPSPS and the shikimate pathway in the gut microbiome of rats. However, it is uncertain whether glyphosate exposure could lead to perturbations of human microbiota including those of the gut. We have thus conducted bioinformatics analyses of publicly available datasets for effects of glyphosate on human microbiomes, especially the gut. Data from the Human Microbiome Project for 6 major body sites shows that the shikimate pathway is found in almost all individuals and all locations. Comparison of the abundance of the shikimate pathway in paired metagenomes and metatranscriptomes indicated that in the human gut microbiome most bacteria do not possess a complete shikimate pathway, which is mostly transcriptionally inactive. This suggests that gut bacteria are mostly aromatic amino acid auxotrophs and thus relatively resistant to potential growth inhibition by glyphosate. We also classified E. coli EPSPS homologues as Class I (sensitive to glyphosate) and Class II (resistant to glyphosate). Among 44 subspecies reference genomes, accounting for 72% of the total assigned microbial abundance in 2,144 human faecal metagenomes, 9 subspecies have Class II EPSPS. The study of gut metagenomes also indicated that glyphosate might be degraded by Proteobacteria in the human gut microbiome using the carbon-phosphorus lyase pathway. Overall, there is limited experimental evidence available for the effects of glyphosate on the human microbiomes including the gut. Further investigations using more advanced molecular profiling techniques including transcriptomics and metabolomics are needed to ascertain whether glyphosate and glyphosate-based herbicides can alter the function of microbiomes with consequent health implications.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 3
Glyphosate: Regulation, Toxicity, Exposure and Controversy
Chairs: Cynthia Curl, US & Michael Antoniou, UK

Underneath glyphosate label: possible health hazards from the exposure to co-formulants

Presenter: Robin Mesnage, King's College London, London, United Kingdom

Authors: R. Mesnage;
King's College London, London, UNITED KINGDOM.

Commercial formulations of glyphosate are mixtures of chemicals. Glyphosate is classified as the active ingredient, while some other compounds included in the pesticide mixture are categorized as 'inert'. Active ingredients are tested in a battery of cell assay and rodent bioassays to establish health-based guidance values, such as the chronic reference dose. However, pesticide ingredients considered to be inert are generally exempt from the requirements of tolerances, although they can actually be more toxic than the declared active ingredients. It is widely recognised that glyphosate-based herbicides, such as Roundup, and the inert ingredients in formulated glyphosate-based herbicides, are more toxic than the declared active ingredient, glyphosate. The first generation of polyethoxylated amine (POEA) surfactants in Roundup was markedly more toxic than glyphosate and heightened concerns of risks to human health, especially among heavily-exposed applicators. Although these surfactants are still used in most countries, including in the United States, they have been progressively replaced by other POEA or non-POEA surfactants in the European Union. However, it is not always clear to which extent these surfactants are dealing with lingering concern over surfactant toxicity. This presentation will describe the inert ingredients present in various glyphosate-based formulations. The results of the first comprehensive study evaluating the contribution of a representative member of the new generation of surfactant to glyphosate toxicity will be presented. I will address what is known regarding the contribution of co-formulants to the health effects triggered by use of, and exposure to glyphosate-based herbicides.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 3
Glyphosate: Regulation, Toxicity, Exposure and Controversy
Chairs: Cynthia Curl, US & Michael Antoniou, UK

Epidemiologic Evidence of Glyphosate's Carcinogenic Potential

Presenter: Lianne Sheppard, University of Washington, Seattle, United States

Authors: L. Zhang[1], I. Rana[1], R. M. Shaffer[2], E. Taioli[3], L. Sheppard[2];
[1]University of California Berkeley, Berkeley, CA, [2]University of Washington, Seattle, WA, [3]Icahn School of Medicine at Mount Sinai, New York, NY.

Worldwide use of glyphosate has exploded since it was introduced in 1974. Most official assessments have disagreed with IARC's 2015 conclusion that glyphosate is probably carcinogenic to humans (group 2A). In order to assess as directly as possible whether glyphosate is associated with an increased risk of non-Hodgkin lymphoma (NHL) in humans, we conducted a meta-analysis of the epidemiologic evidence with an a priori focus on high glyphosate exposures. We used six studies, adding the recently published Agricultural Health Study (AHS) results to five older case-control studies. To best address glyphosate's carcinogenic potential, we focused on the workers in each study with the highest exposure by prioritizing in order: (1) highest cumulative exposure and longest lag, (2) highest cumulative exposure; (3) longest exposure duration and longest lag; (4) longest exposure duration; (5) longest latency or lag; and (6) ever-exposure. This quantification varied by study. We estimated the overall meta-relative risk of NHL to be 1.41 (95% confidence interval: 1.13-1.75). Due to our focus on the highest exposed workers, this is a stronger effect than previously reported. We compare and contrast our results with other meta-analyses and describe our concerns with the exposure assessment in the most recent AHS and its potential to bias the inference towards no increased risk. The AHS exposure group we used in our meta-analysis is likely to provide the least biased exposure effect estimate. Our findings support IARC's assessment of glyphosate's carcinogenic potential. This work has received much attention in the popular press and beyond, resulting in accusations of unethical scientific methods, public records requests and subpoenas.

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ABSTRACT E-BOOK

August 24, 2020 / 10:00 - 11:00 / Parallel 5
EMS 2
The Importance of NOT being "Ernest" in Environmental Epidemiology
Chairs: John Nuckols, US & Rena Jones, US

The Importance of NOT being "Ernest" in Environmental Epidemiology

Authors: Tony Fletcher, London School of Hygiene and Tropical Medicine, London, United Kingdom; John Nuckols, Colorado State University, CO, United States

BACKGROUND: In 1894, the famous Irish playwright, Oscar Wilde, penned a profound satirical comedy concerning earnestness, considered then the over-riding value in Western society. It remains so in today's global society. If one is earnest, they pursue their purpose in a steady, sincere, and eager way. The intended lesson from Wilde is well-intentioned rather than well-placed earnestness can very well result in trivializing the intended purpose. The exhortation "Exposure assessment is hard but necessary in environmental epidemiology" has been the mantra for as long as ISEE has existed. We employ Wilde's protagonist, Ernest, as the figurative representation of why so little progress has been made in exposure assessment for environmental epidemiological risk analysis. OBJECTIVE: To contribute productive interdisciplinary dialog on this dilemma, we explore, through debate, why it is such a struggle to remedy. The premise debated is "Epidemiologists are being too 'Ernest' in their pursuit of quantifying exposure in the context of environmental health risk analysis". Our debate addresses a counter premise as well; that is the earnestness for mathematical perfection by environmental scientists and engineers can render this quantification far too complex. METHODS: We will conduct a non-adversarial debate on the following points from the perspectives of two senior academicians in disciplines critical to environmental health risk assessment: epidemiology and environmental science. 1) The key word is "environmental". Is understanding/applying basic science of contaminant fate and transport a "necessary" in "exposure assessment is hard but necessary"? 2) Interdisciplinary communication is foundational to competent collaboration. To what extent does profession-specific vocabulary impede communication? 3) Disease prevention is a key element of applied epidemiology. What are the optimal means for prevention of diseases related to environmental contaminant exposure? What role can regulations play? DESIRED OUTCOME: Take home message - It takes more than being earnest in one's chosen profession to solve a problem requiring multi-discipline expertise.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 5
On the Built and Green Environment
Chairs: Mark Nieuwenhuijsen, Spain & Hector Olvera Alvarez, US

Traffic-related air pollution, road noise, urban green space, and incidence of cardiovascular events: findings from the Ontario Population Health and Environment Cohort (ONPHEC)

Presenter: Li Bai, ICES, Toronto, Canada

Authors: L. Bai[1], P. Hystad[2], S. Weichenthal[3], T. H. Oiamo[4], R. T. Burnett[5], M. Jerrett[6], J. C. Kwong[1], E. Lavigne[5], R. Copes[7], A. Kopp[1], H. Chen[5];
[1]ICES, Toronto, ON, CANADA, [2]Oregon State University, Corvallis, OR, [3]McGill University, Montreal, QC, CANADA, [4]Ryerson University, Toronto, ON, CANADA, [5]Health Canada, Ottawa, ON, CANADA, [6]University of California Los Angeles, Los Angeles, CA, [7]Public Health Ontario, Toronto, ON, CANADA.

Background: Little is known about the interplay among traffic-related air pollutants, noise, urban greenness, and incidence of major cardiovascular events.
Methods: We examined relationships between multiple environmental factors and incidence of acute myocardial infarction (AMI) and congestive heart failure (CHF) in a cohort that comprised 1 million people aged 30+ years, who lived in Toronto, Canada, 2001-2015. We estimated annual concentrations of UFPs and NO_2 using land-use regression models, derived noise levels (as the A-weighted equivalent sound pressure level over the 24-hour period) using propagation modelling, and estimated exposure to green space using satellite-derived Normalized Difference Vegetation Index within 250 meters of participants' residence. We assigned these estimates to participants' annual postal-code addresses during follow-up. Using random-effects Cox proportional hazards models adjusting for individual- and neighborhood-level covariates, we assessed the associations of these factors with AMI and CHF in both single- and multiple-exposure models. We also examined the associations with each factor stratified by the levels of other factors.
Results: During follow-up, there were 37,441 AMI incident cases and 95,138 CHF incident cases. In single exposure models, the associations of AMI and CHF increased monotonically across the quintiles of UFPs, NO_2, and noise, but decreased across the quintiles of greenness. For both AMI and CHF, adjustment for noise and greenness attenuated the impact of UFPs: the HRs per interquartile range increase in UFPs reduced from 1.067 (1.048-1.088) to 1.048 (1.028-1.068) for AMI and from 1.039 (1.026-1.053) to 1.018 (1.004-1.031) for CHF. A similar pattern was seen for the impact of NO_2 on CHF. There were no increased risks of AMI with UFPs and NO_2 in the greenest areas.
Conclusion: Adjustment for greenness and noise exposure had a tangible impact on the associations of UFPs and NO2 with AMI and CHF. The associations with AMI appeared to be modified by greenness.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 5
On the Built and Green Environment
Chairs: Mark Nieuwenhuijsen, Spain & Hector Olvera Alvarez, US

Effects of combined exposure to surrounding green, air pollution and traffic noise with non-accidental and cause-specific mortality in the Dutch national cohort

Presenter: Jochem Klompmaker, National Institute for Public Health and the Environment (RIVM), Bilthoven, Netherlands

Authors: J. O. Klompmaker[1], N. A. Janssen[1], L. D. Bloemsma[1], M. Marra[1], B. Brunekreef[2], E. Lebret[1], U. Gehring[2], G. Hoek[2];
[1]National Institute for Public Health and the Environment (RIVM), Bilthoven, NETHERLANDS, [2]Institute for Risk Assessment Sciences (IRAS), Utrecht University, Utrecht, NETHERLANDS.

Background: In daily life, people are exposed to multiple environmental factors that may affect health. The aim of this study was to evaluate associations of combined long-term residential exposure to surrounding green, air pollution and traffic noise with non-accidental and cause-specific mortality. Methods: We followed approximately 10.5 million adults (aged ≥30 years) living in the Netherlands from 1 January 2013 until 31 December 2018. We used Cox proportional hazard models to evaluate associations of combined exposure to residential surrounding green [including the average Normalized Difference Vegetation Index (NDVI) in buffers of 300m and 1000m], annual average air pollutant concentrations [including particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2)] and traffic noise with non-accidental and cause-specific mortality, adjusting for potential confounders. Results: In single-exposure models, surrounding green was associated with reduced risk of dying from several causes, while air pollution was associated with increased risk of dying from several causes. In two-exposure models, associations of air pollutants with non-accidental and circulatory disease mortality became weak (HR<1.015 per IQR increase), while associations of surrounding green remained. Associations of surrounding green and air pollution with respiratory disease, lung cancer and dementia mortality attenuated but generally remained in two-exposure models. For example, for dementia mortality, the HR of NO_2 attenuated from 1.045 (95% CI: 1.024, 1.067) to 1.028 (95% CI: 1.006, 1.051) per IQR increase and the HR of NDVI 300m attenuated from 0.963 (95% CI: 0.950, 0.977) to 0.974 (95% CI: 0.960, 0.989) per IQR increase in a two-exposure model. Road-traffic noise was only positively associated with lung cancer mortality, also after adjustment for air pollution or surrounding green. Conclusion: Surrounding green (inversely) and air pollution (positively) were associated with non-accidental and cause-specific mortality in the Dutch national cohort. Studies including only one of these correlated exposures may overestimate the associations with mortality.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 5
On the Built and Green Environment
Chairs: Mark Nieuwenhuijsen, Spain & Hector Olvera Alvarez, US

Greenspace exposure and cancer incidence in the Gazel Cohort

Presenter: Emeline Lequy, CRCHUM, Montreal, Canada

Authors: M. Sakhvidi[1], J. Yang[1], M. Zins[2], J. Siemiatycki[3], M. Goldberg[2], P. Dadvand[4], E. Lequy[3], B. Jacquemin[1];
[1]Inserm - Irset, Rennes, FRANCE, [2]Inserm - UMS 011, Villejuif, FRANCE, [3]CRCHUM, Montreal, QC, CANADA, [4]ISGlobal, Barcelona, SPAIN.

Background: Exposure to greenspace has been suggested to be associated with lower cancer incidence; however, the evidence is still very scarce, and controversial. Here, we reported the association between exposure to greenspace at any site and site-specific (breast, bladder, colorectal, prostate, lung and skin) cancer incidence in the French GAZEL cohort.Method: We used 27 years follow-up data for 19,360 out of 20,625 enrolled participants in 1989 and assessed their exposure to greenness using satellite-derived Normalised Difference Vegetation Index (NDVI) within several buffers, and residential proximity to urban greenspaces, agricultural and forest lands using Corine Land Cover data. We used extended Cox model controlled for time-varying personal and area-level variables, with age as time scale and a ten-year lag. We stratified according to urban-rural area of the participants' residence over follow-up.Results: Over the 294,371 person-years of follow-up (mean age at enrolment: 43.7; 27.1% female), we registered 3,689 cases of cancer. We found an increased risk for all-sites cancer with an inter-quartile range (IQR) increase of greenness exposure for all buffers, with a hazard ratio (HR) of 1.08, 95%CI (1.03: 1.13) for the 100m buffer. We also found a positive association of all-sites cancer with each km of decreasing distance to agricultural lands (HR: 1.04; 95% CI: 1.02: 1.07) and to forests (HR:1.03; 95% CI: 1.01: 1.05), but nothing with urban greenspaces. The cancer site-specific analyses showed a negative association between breast cancer and higher greenness within 100m (HR: 0.88; 95% CI: 0.76: 1.02), and no associations between any other site-specific cancers. Stratified analyses on rurality did not show any difference.Conclusion: Our study identified an increased risk of all-site cancer associated with increased greenness and proximity to agricultural lands and forests, whatever the level of rurality. Our findings are less clear for site-specific cancers.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 5
On the Built and Green Environment
Chairs: Mark Nieuwenhuijsen, Spain & Hector Olvera Alvarez, US

Neighborhood Aesthetics as a Correlate of Physical and Mental Health

Presenter: Jill Litt, University of Colorado, Boulder, United States

Authors: J. Litt[1], W. Zijlema[2], M. Triguero-Mas[3], M. Cirach[2], C. Gidlow[4], H. Kruize[5], R. Grazuleviciene[6], M. Nieuwenhuijsen[2];
[1]University of Colorado, Boulder, CO, [2]ISGlobal, Barcelona, SPAIN, [3]ICTA, Barcelona, SPAIN, [4]University of Colorado, Staffordshire University, UNITED KINGDOM, [5]Tillburg University, Tilburg, NETHERLANDS, [6]Vytautas Magnus University, Kaunus, LITHUANIA.

Background/Aim: Evidence of associations between nature and health is mounting. However, there is a need to deconstruct “natural space” to capture quality in addition to and the various ways they impact on health. In this paper, we test associations between a quality-based index of neighborhood aesthetics and satellite-observed measure of greenspace and their relationships to health. Method: Using a population-based sample of 2696 adults in four European cities from the PHENOTYPE study, we examined the association between quality-based index of neighborhood aesthetics (13 items on perceived amount, appeal and satisfaction of nearby green space; α=0.86) and the satellite-generated Normalized Difference Vegetation Index (NDVI) and mental and physical health. General health status was assessed using the Short-Form (SF)-36 question to self-rate health (5-point response scale: excellent to poor). Mental health was assessed using the SF-36 mental health subscale, including five items about the occurrence of symptoms in the past 4 weeks (e.g., nervousness, depression) (6-point response scale: all of the time to none of the time).Results: The results from multi-level analyses adjusted for demographic and socioeconomic factors showed that in the pooled analysis, the neighborhood aesthetics index was associated with better self-rated mental (β=0.32 (0.24, 0.40)) and physical health (odds ratio=1.05 (1.03, 1.08)) while satellite-observed neighborhood greenness was not. These results were consistent across the four cities, even though they differ in aesthetics ratings and green space availability.Conclusions: This research suggests that community planners and health professionals can target interventions that foster positive neighborhood aesthetic experiences as a way to initiate health promotive processes that lead to improved mental and physical health. Satellite-observed greenness may miss important elements of the nearby green environment when assessing association between green space and health. Rather, street-based directly observed data provide a more accurate picture of the street green environment that affects populations.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 5
On the Built and Green Environment
Chairs: Mark Nieuwenhuijsen, Spain & Hector Olvera Alvarez, US

Greenspace, air pollution, neighborhood factors and preeclampsia in California

Presenter: Kari Weber, Stanford University, Stanford, United States

Authors: K. A. Weber[1], W. Yang[1], E. Lyons[1], G. M. Shaw[1], A. M. Padula[2];
[1]Stanford University, Stanford, CA, [2]University of California, San Francisco, San Francisco, CA.

AbstractBackground/Aim: We examined the relationships between greenspace, air pollution, neighborhood factors and preeclampsia. Methods: Data were from birth certificates and hospital discharge records of 77,406 women living in the San Joaquin Valley of California from 2000-2006. Maternal residences were geocoded. Preeclampsia cases were divided into mild, severe, or superimposed on preexisting hypertension. Greenspace was estimated from satellite data using Normalized Difference Vegetation Index (NDVI). Average NDVI was calculated within a 100m and 500m buffer surrounding each woman's residence. Air quality data were assigned from daily 24-hour averages of nitrogen dioxide, particulate matter <10µm (PM10) and <2.5µm (PM2.5), and carbon monoxide for the entire pregnancy. Neighborhood socioeconomic (SES) factors included greater than 20% living below the federal poverty level (high poverty) and median annual income less than $30,000 (low-income) according to 2000 US Census data. NDVI and pollutant levels were divided into quartiles and logistic regression was performed to estimate odds of preeclampsia comparing the highest quartile of each to the lowest. Interaction between greenspace and air pollutants were assessed using a Wald test and further stratified by neighborhood SES. Results: More greenspace within a 500m buffer was inversely associated with superimposed preeclampsia (OR=0.57). High PM2.5 exposure and low SES were associated with all preeclampsia phenotypes. Demographics of women with more greenspace exposure did not differ from the overall population except there were fewer living in high poverty and low-income neighborhoods. We observed modification of the association between greenspace within 500m and severe preeclampsia by high PM10 exposure among all participants and those not in a low-income neighborhoods. Conclusions: Exposure to less greenspace, higher levels of particulate matter, and high poverty/low-income neighborhoods were associated with preeclampsia. There was also effect modification observed between these exposures - further research into combinations of exposures and their etiologic contribution to preeclampsia is warranted.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 5
On the Built and Green Environment
Chairs: Mark Nieuwenhuijsen, Spain & Hector Olvera Alvarez, US

Testing the Savanna Hypothesis: Effect of Desert Landscape on Physiological Stress Recovery

Presenter: Jie Yin, Harvard University, Boston, United States

Authors: J. Yin[1], G. N. Bratman[2], M. Browning[3], J. D. Spengler[1], H. A. Olvera Alvarez[4];
[1]Harvard University, Boston, MA, [2]University of Washington, Seattle, WA, [3]Clemson University, Clemson, SC, [4]Oregon Health & Science University, Portland, OR.

Background: Evidence suggests that green environments are protective of health and wellbeing. Many of these studies evoke prospect-refuge theory that poses that savanna-like landscapes offer opportunities for restorative experiences. However, evidence is still limited on how environments that do not match these criteria, and that instead may offer cues of danger (e.g., desert landscapes) affect health. In this study we quantified the effects of a desert landscape on physiological stress recovery and compared those with the effects of a green environment.
Methods: Between-subjects experiments were conducted in El Paso, TX with 95 healthy adult men using virtual reality. Participants experienced an acute stressor (The Trier Social Stress Test) followed by one of three randomly assigned immersive virtual environments (IVEs: desert, green or control [office]) for 10-min. After the IVE, they then rested for 40-min. Physiological indicators of stress including systolic and diastolic blood pressure (SBP & DBP), pulse, mean arterial pressure (MAP) and salivary cortisol, were repeatedly measured throughout the experiment.
Results: After the IVE, participants exposed to desert and green environments showed larger decreases in pulse rate than participants in the control group. Effects were similar between desert and green conditions. Additionally, participants in the desert condition experienced greater decreases in SBP, DBP and MAP than participants in the green condition. After the first 20 min of rest, participants in both the desert and green conditions showed greater decreases in SBP, DBP, MAP and cortisol than those in the control group.
Conclusions: A desert landscape promoted similar or even greater physiological recovery from an acute stressor than a green landscape. These novel findings suggest that prospect-refuge theory does not adequately explain the protective effects of natural environments, and that exposure to environments such as savannas are by no means the only natural landscapes that may lead to stress recovery.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 6
Early Life Exposures and Cancer Across the Life Course
Chairs: Laura Beane-Freeman,US & Julia Heck, US

Is anogenital distance associated with prostate cancer risk

Presenter: Gemma Castaño-Vinyals, ISGlobal, Barcelona, Spain

Authors: G. Castaño-Vinyals[1], J. Ruiz-Dominguez[2], J. Mendiola[3], L. Cecchini[4], P. Goebell[5], C. Meder[5], C. Cámara[4], M. Costa[4], M. Kogevinas[6];
[1]ISGlobal, Barcelona, SPAIN, [2]Urology Department, Hospital Germans Trias i Pujol, Badalona, SPAIN, [3]Division of Preventive Medicine and Public Health, University of Murcia School of Medicine, IMIB-Arrixaca, Murcia, SPAIN, [4]Urology Deparment, Hospital del Mar, Barcelona, SPAIN, [5]Urologische Klinik, Friedrich-Alexander Universität, Erlangen, GERMANY, [6]CIBERESP, Madrid, SPAIN.

Background. Anogenital distance (AGD) is shorter in females than males and in animal studies AGD has been related to fetal androgens. In children, endocrine disruptors were associated with AGD and in young adults, short distances were associated with low sperm concentration. Fetal exposures may affect the development of prostate cancer. We investigated the relationship between AGD and prostate cancer risk in an international study.Methods. 144 confirmed prostate cancer cases and 121 urological controls with determined low PSA levels were recruited in 3 hospitals in Spain and Germany. AGD from anus to scrotum (AGD-AS) and from anus to upper penis (AGD-AP) were measured and a questionnaire on socio-demographic and lifestyle information was administered. Odds ratios and 95% CI were adjusted for hospital, age and BMI.Results. AGD-AS was 3mm shorter in cases than controls. Decreased ORs were observed for each 5mm increase in AGD-AS, OR=0.94 (0.86-1.02). The OR for the third vs first tertile was 0.66 (0.35-1.25). There were no differences by Gleason (prognosis) score. The association was strongest in obese men (OR=0.86, 0.73-1.02) but the interaction with BMI was not significant (p-value=0.27). There was no association between AGD-AP and prostate cancer risk (OR=0.99, 0.90-1.09). A meta-analysis including the only published study, results in decreased ORs for both AGD-AS (OR=0.94; 0.87-1.02) and AGD-AP (OR=0.94; 0.86-1.03). Conclusions. A longer anogenital distance measured from anus to scrotum that may reflect normal in utero sexual development in men, may be associated with lower prostate cancer risk but results were not entirely consistent.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 6
Early Life Exposures and Cancer Across the Life Course
Chairs: Laura Beane-Freeman,US & Julia Heck, US

Serum polychlorinated biphenyl (PCB) levels and risk of testicular germ cell tumors: a population-based case-control study in Connecticut and Massachusetts

Presenter: Zhiyuan Cheng, Department of Epidemiology, School of Public Health, Brown University, Providence, United States

Authors: Z. Cheng[1], X. Zhang[2], B. Bassig[3], R. Hauser[4], T. Holford[5], E. Zheng[6], D. Shi[1], Y. Zhu[5], S. M. Schwartz[7], C. Chen[7], K. Shi[1], Z. Qian[8], P. Boyle[9], T. Zheng[1];
[1]Department of Epidemiology, School of Public Health, Brown University, Providence, RI, [2]Department of Biostatistics and Bioinformatics, Rollins School of Public Health, Emory University, Atlanta, GA, [3]Division of Cancer Epidemiology and Genetics, National Cancer Institute, NIH, DHHS, Bethesda, MD, [4]Department of Environmental Health, T.H. Chan School of Public Health, Harvard University, Boston, MA, [5]Department of Biostatistics, Yale School of Public Health, Yale University, New Haven, CT, [6]University of Vermont, ProvidenceBurlington, VT, [7]Epidemiology Program, Fred Hutchinson Cancer Research Center, Seattle, WA, [8]Institute for Global Health & Wellbeing College for Public Health & Social Justice, Saint Louis University, St. Louis, MO, [9]International Prevention and Research Institute, International Agency for Research on Cancer (IARC), Lyon, FRANCE.

AbstractBackground: The incidence of testicular germ cell tumors (TGCT) has continuously increased in Western countries over the last few decades. Some epidemiologic studies have reported that serum levels of endocrine disrupting polychlorinated biphenyls (PCBs) may be associated with TGCT risk, but the evidence is inconsistent.
Methods: To evaluate whether serum levels of PCBs are associated with TGCT risk, we conducted a population-based case-control study of 308 TGCT cases and 323 controls, all residents of Connecticut and Massachusetts. Serum levels of 56 PCB congeners were measured using gas chromatography and unconditional logistic regression was used to evaluate associations with TGCT risk for concentrations of total PCBs, groups of PCBs categorized by functional characteristics, and individual PCB congeners.
Results: There was no association between total serum levels of PCBs and risk of TGCT overall (quartile 4 (Q4) vs. quartile 1 (Q1) odds ratio (OR) and 95% confidence interval (C.I.) = 1.0 (0.6-1.9), ρ trend = 0.9). However, strong positive association was observed between total serum levels of Wolff Group 1 (potentially estrogenic) PCBs and risk of overall TGCT (Q4 vs. Q1 OR = 2.5, 95% CI = 1.3-4.7, ρ trend <0.05) as well as seminoma and non-seminoma subtypes. Wolff Group 1 PCB congeners that showed an increased risk of TGCT included: 25, 44, 49, 52, 70, 101, 174, and 201/177.
Conclusion: We found an increased risk of TGCT associated with Wolff Group 1 PCBs and specific PCB congeners. Considering the continuing increase of TGCT, these associations should be replicated in larger studies.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 6
Early Life Exposures and Cancer Across the Life Course
Chairs: Laura Beane-Freeman,US & Julia Heck, US

Maternal occupational benzo(a)pyrene exposure and risk of cancer in children

Presenter: Julia Heck, UCLA, Los Angeles, United States

Authors: J. E. Heck[1], D. He[1], B. Ritz[1], J. Olsen[2], J. Hansen[3];
[1]UCLA, Los Angeles, CA, [2]Aarhus University, Aarhus, DENMARK, [3]Danish Cancer Society Research Center, Copenhagen, DENMARK.

Background/Aim: The International Agency for Research on Cancer has classified benzo(a)pyrene (BaP) as carcinogenic to humans, based on sufficient evidence of carcinogenicity in experimental animals and supportive data on mechanistic pathways in humans. BaP is also a developmental toxicant. Yet, few studies assessed whether parental exposure to BaP is related to an increased risk for childhood cancers. Previous studies reported possible associations between environmental BaP exposure with risk increases in neuroblastoma and acute lymphoblastic leukemia. The aim of our study was to examine the relation between maternal occupational BaP exposure with risk of cancer in offspring.
Methods: In this case-control study of Danish children (8339 cases, 208475 controls), we ascertained cases from the Cancer Registry and controls from the Central Population Register. Jobs during pregnancy were ascertained from the Supplemental Pension Fund, a mandatory supplement to the state pension. BaP exposure was determined via a job-exposure matrix developed for the Danish workforce. We used conditional logistic regression to determine associations with childhood cancer.
Results: Ever occupational exposure to BaP during pregnancy was related to an increase in risk of neuroblastoma (Odds Ratio=1.65, 95% Confidence Interval 1.22, 2.23), while there was no increased risk for ALL (OR=1.02). We did not estimate any compelling risk increase for any other type of cancer, with effect estimates close to the null.
Conclusions: This is the second study to report possible associations between BaP and neuroblastoma. Occupational exposures tend to be higher than ambient environmental exposures likely leading to greater fetal loss, which may in part explain variation in leukemia results compared to other studies.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 6
Early Life Exposures and Cancer Across the Life Course
Chairs: Laura Beane-Freeman,US & Julia Heck, US

Cluster Detection of Cancer Incidence: Analyzing Childhood Residential Location Linked to Later Life Cancer Records

Presenter: Claire Leiser, University of Washington, Seattle, United States

Authors: C. L. Leiser[1], M. Taddie[2], R. Richards-Steed[2], J. Ambrose[2], J. A. VanDerslice[2], K. Henry[3], B. O'Neil[2], K. R. Smith[2], H. A. Hanson[2];
[1]University of Washington, Seattle, WA, [2]University of Utah, Salt Lake City, UT, [3]Temple University, Philadelphia, PA.

BackgroundChildhood environmental exposures are now recognized contributors to cancer later in life. However, direct measurement of environmental contaminants is not feasible using most retrospective datasets and potentially long latency periods exist between exposures and cancer incidence. Investigating the spatiotemporal patterns of cancer clustering is one useful approach to evaluate the importance of childhood environment on adult cancer risk. We assessed spatial clustering of cancer incidence in 1966-2017 based on early life location defined by household Enumeration District (ED) at the 1940 US Census. MethodsA cohort of all individuals born 1930-1939 was selected from the Utah Population Database. Incident cancer cases for 25 cancer types were identified beginning in 1966 from the Utah Cancer Registry or by death records and linked to geocoded population-weighted ED centroids. Follow-up time was measured as years from 1940 to first primary cancer diagnosis, death, or last known residence in Utah. Spatial scan statistic with a purely elliptic scanning window was used to identify spatial clustering of EDs with high rates of cancer assuming the discrete Poisson model. Separate analyses were completed for each cancer type. Our analysis included 92,279 individuals who contributed 4,674,932 person-years representing 826 EDs. ResultsAverage follow-up time was 50.9 years (range 0.58-78 years). Cancer was diagnosed in 21% of individuals on follow-up. The number of individuals in an ED ranged from 11-518 (mean = 111). We detected four clusters of excess risk of breast (Relative Risk [RR]=1.27, p=0.028), leukemia (RR=1.92, p=0.033), lung (RR=1.89, p=0.013), and prostate cancers (RR=1.27, p=0.0089). ConclusionsWhile this study was hypothesis generating and did not test for environmental contaminants directly, we demonstrate that early life location may contribute to later health outcomes. With the growing availability of longitudinal databases that compile records across the lifespan, spatial cluster detection methods offer unique opportunities to improve understanding of chronic disease etiology.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 6
Early Life Exposures and Cancer Across the Life Course
Chairs: Laura Beane-Freeman,US & Julia Heck, US

Prenatal Exposure to Polybrominated Diphenyl Ethers (PBDEs) Flame Retardants and Breast Tissue Composition among Adolescents Girls

Presenter: Sabine Oskar, Columbia University, New York, United States

Authors: S. Oskar, R. Kehm, J. Herbstman, M. Terry;
Columbia University, New York, NY.

Exposure to endocrine-disrupting chemicals including PBDEs during the prenatal period may affect breast development and composition and the risk of developing breast cancer in adulthood. We examined the association between prenatal exposure to PBDEs and breast tissue composition in adolescent girls. We used data from the Columbia's Breast Cancer and the Environment Research Project (BCERP), part of the Columbia Center for Children's Environmental Health birth cohort. Prenatal PBDE concentrations were measured in cord blood from African-American or Dominican neonates, born between 1998 and 2006 (prior to PBDE phase out). After longitudinal follow-up, breast tissue composition was measured using optical spectroscopy (OS) in adolescent girls between 2016 and 2020. OS is a non-invasive device that uses visible and near infrared light to provide a broad compositional view of the breast by capturing variation in the amount of water, lipid, oxy-hemoglobin, deoxy-hemoglobin (HbO2), and collagen, and cellular and connective tissue density. Spectral data was reduced using principal component analysis and principal component (PC) scores were generated for each girl (averaged over both breasts). Associations between lipid-adjusted PBDE concentrations (ln) and PC scores were evaluated using linear regression. The analysis included 94 daughters (ages 12.6 to 19.9 years, median=16.9 years). Five PCs explained 99.9% of the variation in OS data. When examining PBDE as continuous, PC2 scores were lower on average for girls with higher prenatal concentrations of BDE-47 (overall sample geometric mean = 11.82 ng/g lipid; $\beta_{BDE\text{-}47}$ = -0.05, 95% CI:-0.09, -0.005) after adjusting for age and body mass index. Results were consistent when examining PBDEs using median cut-points. PC2 covered 3.8% of the spectral variations and was related to overall lower HbO2 and higher water. Associations were attenuated in fully adjusted models. We found evidence suggesting that prenatal exposure to PBDEs may be associated with breast tissue composition in adolescent girls.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 6
Early Life Exposures and Cancer Across the Life Course
Chairs: Laura Beane-Freeman,US & Julia Heck, US

Untargeted metabolomics profiles of newborn dried blood spots and pediatric acute myeloid leukemia: a pilot study

Presenter: Lauren Petrick, Department of Environmental Medicine and Public Health, Institute of Exposomics Research, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: L. Petrick[1], P. Imani[2], Y. Yano[3], T. Whitehead[4], C. Metayer[4], C. Schiffman[2], S. Dudoit[5], S. Rappaport[6];
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Background: Leukemia is the most common childhood cancer. Compared to acute lymphoblastic leukemia, which makes up 80% of pediatric leukemia cases, acute myeloid leukemia (AML) is rarer and has lower survival rates. The etiology of pediatric AML is largely unknown, but evidence for the requirement of multiple mutations in utero and long latency periods (of up to 15 years) suggests that environmental factors play a role in causing the disease. Untargeted metabolomics of archived newborn dried blood spots (DBS) provides a means for retrospective investigation of in utero exposures as potential causal risk factors for rare pediatric diseases. Using DBS, we discovered untargeted metabolomics profiles at birth, which are associated with subsequent development of AML in childhood.
Methods: Following AML diagnosis, the California Department of Public Health provided archived newborn DBS from 48 pediatric patients and 46 healthy controls matched by sex, ethnicity, and age as part of the California Childhood Leukemia Study (CCLS). Using a single 4.7-mm punch of DBS, untargeted metabolomics profiling was performed with liquid chromatography high-resolution mass spectrometry (LC-HRMS). Metabolomics features associated with AML were identified in analyses stratified by sex.
Results: An ensemble of feature selection methods found 8 predictors of AML in females with fold-changes ranging from 0.84-1.88 and 16 different predictors of AML in males with fold-changes ranging 0.75 to 1.24. Two of the metabolites positively associated with AML in females were putatively annotated as ceramides, a class of metabolites that has been linked with cancer cells.
Conclusions: Untargeted metabolomics of DBS revealed sex-specific predictors of pediatric AML, suggesting different early life biology. Replication with larger numbers of subjects is required to validate the findings.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 7
Environmental Exposures in Children and Adolescents and Brain Health
Chairs: Raanan Raz,Israel & Zeyan Liew, US

Association of Prenatal Acetaminophen Measured in Meconium with Attention-Deficit Hyperactivity Disorder

Presenter: Brennan Baker, Columbia University, New York, United States

Authors: B. H. Baker[1], C. Lugo-Candelas[1], H. Wu[1], H. E. Laue[2], A. Boivin[3], V. Gillet[3], J. Bellenger[3], J. Posner[1], L. Takser[3], A. A. Baccarelli[1];
[1]Columbia University, New York, NY, [2]Dartmouth College, Hanover, NH, [3]University of Sherbrooke, Sherbrooke, QC, CANADA.

Background Multiple studies have shown an association between prenatal acetaminophen exposure and attention-deficit hyperactivity disorder (ADHD), but questions remain due to a paucity of quantifiable dose-response estimates and poor understanding of fetal exposure to acetaminophen and its toxic metabolites. To address this gap, we examined the association between prenatal acetaminophen concentrations measured in meconium and ADHD diagnosis in children aged 6-7 years. Methods Acetaminophen was measured in meconium with ultraperformance liquid chromatography mass spectrometry and ADHD diagnosis was determined at a scheduled cohort follow-up when children were 6-7 years old or from medical records for 345 children in the Gestation and the Environment prospective observational pregnancy cohort in Sherbrooke, Quebec, Canada. We modeled the associations of both binary (detected versus not detected) and continuous meconium acetaminophen with ADHD using logistic regressions. We compared continuous linear and non-linear models with a likelihood ratio test. We employed inverse probability weighting with propensity scores to account for potential confounders, including child sex, familial income, and maternal age, education, pre-pregnancy BMI, smoking during pregnancy, alcohol during pregnancy, and maternal self-reported ADHD. Results Acetaminophen was detected in 199 meconium samples (58%) and ADHD was diagnosed in 33 children (10%). Compared to no acetaminophen, detection of acetaminophen in meconium was associated with more than double the odds of ADHD (odds ratio = 2.44 [1.41, 4.22]). There was a linear dose response relationship: each doubling of exposure increased the odds of ADHD by 10% (OR = 1.10 [1.02, 1.19]). Conclusions and Relevance Together with the multitude of other cohort studies showing adverse neurodevelopment associated with prenatal acetaminophen, this work suggests caution should be used in administering acetaminophen during pregnancy. Research into alternative pain management strategies for pregnant women could be beneficial.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 7
Environmental Exposures in Children and Adolescents and Brain Health
Chairs: Raanan Raz,Israel & Zeyan Liew, US

Prenatal Exposure to Perfluoroalkyl Substances and Dysmorphic Facial Features at age 5

Presenter: Jiajun Luo, Yale School of Public Health, New Haven, United States

Authors: J. Luo[1], J. Xiao[1], C. H. Ramlau-Hansen[2], U. S. Kesmodel[2], J. Olsen[2], Z. Liew[1];
[1]Yale School of Public Health, New Haven, CT, [2]Department of Public Health, Aarhus University, Aarhus, DENMARK.

Background: Perfluoroalkyl substances (PFAS) are widespread persistent pollutants suggested to induce developmental neurotoxicity in animals, but evidence from human studies remains inconclusive. Epidemiological studies have focused on neurobehavioral and psychological evaluations but other measures such as facial features anomalies have never been investigated. Facial dysmorphia is known to accompany impaired development in the central nervous system and part of the diagnosis of the Fetal Alcohol Syndrome. Objective: To investigate the association between prenatal PFAS exposures and facial features measured at age 5. Methods: We analyzed standardized digital facial photographs taken from 670 children enrolled in the Danish National Birth Cohort (DNBC) at age 5 and three facial features (palpebral fissure length (PFL), philtrum groove, and upper lip thickness) using the Facial Photographic Analysis Software. The features were classified as short or normal PFL as binary outcomes, while philtrum (grooved or smooth versus normal) and upper lip (thick or thin versus normal) were classified in three groups. Six types of prenatal PFAS in maternal plasma collected in early pregnancy (median, 8 gestational weeks) were studied. We conducted logistic regression analysis and estimated the odds ratio (OR) and 95% confidence interval (CI) for each facial feature using the normal group as the reference according to $\log_2$-PFAS level (ng/mL), adjusting for potential confounders including maternal alcohol intake, smoking and age. Results: We found that all six types of prenatal PFAS levels were correlated with higher odds for having a short PFL (e.g. OR ranging from 1.38 to 2.23) with the association being the strongest for perfluorodecanoic acid (PFDA, OR: 2.23, 95% CI: 1.21, 4.11). There were no associations between any of the PFAS and philtrum smoothness or upper lip thickness. Conclusion: Maternal pregnancy PFAS serum levels were associated with shorter PFL in the offspring. Our findings are novel and warrant further research.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 7
Environmental Exposures in Children and Adolescents and Brain Health
Chairs: Raanan Raz,Israel & Zeyan Liew, US

Environmental Risk Score of subclinical Psychopathology risk in children

Presenter: Léa Maitre, ISGlobal, Barcelona, Spain

Authors: L. Maitre[1], S. Alemany[1], B. Paniello[1], M. Guxens[1], M. Lopez-Espinosa[2], J. Ibarluzea[3], J. Julvez[1], L. Chatzi[4], R. Gražulevičienė[5], R. Slama[6], C. Thomsen[7], J. Wright[8], M. Vrijheid[1];
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Current knowledge on environmental causation for psychiatric disorders suggests a complex picture with a multitude of social, physical and chemical exposures occurring at different stages of life. Researchers who want to explain or predict mental illness need to jointly study a multitude of environmental exposures, which may be summed up in cumulative poly-environmental scores. As part of the ATHLETE project, we aim to build a predictive poly-environmental score (E-score) of subclinical manifestation of psychopathology (e.g. psychotic, autistic, depressive and anxious symptoms) in 1546 children aged around 8 years drawn from the general population from six European birth cohorts with extensive data on environmental exposures (HELIX cohorts). The E-score will be replicated and tested in an independent population drawn from the INMA-Valencia and Gipuzkoa birth cohorts (Spain) for validation (N=916). We identified 35 environmental factors with meta-analytic evidence of association extracted from umbrella reviews with at least one psychiatric disorder, including schizophrenia, autism, bipolar disorder, major depression and anxiety disorders, that can occur in early in life (up to childhood). Among these, 19 were available in the cohorts including factors related to obstetrics complications, sleep, diet quality, urbanicity and metabolic health. We then tested the association between each of the E-scores (predicting combined and individual psychopathology symptoms) and behavioural symptoms that were assessed using the Child Behaviour Checklist (CBCL) at 6-12 years. The E-score for subclinical psychotic symptoms was positively associated with the CBCL subscale for thought problems using negative binomial regression (1.81 [CI, 0.89; 3.66]). These findings indicate that the E-score approach shows promise to be used in the early detection of psychopathology and inform potential public health policies aimed to prevent mental disorders. Additionally, we will generate polygenic risk scores for main psychiatric disorders in order to examine potential genetic modifying effects of E-scores.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 7
Environmental Exposures in Children and Adolescents and Brain Health
Chairs: Raanan Raz,Israel & Zeyan Liew, US

Prenatal exposure to mixtures of environmental chemicals and adolescent internalizing behaviors in the New Bedford Cohort

Presenter: Lisa Rokoff, Department of Environmental Health, Harvard T.H. Chan School of Public Health; Population Health Sciences, Harvard Graduate School of Arts and Sciences, Boston, United States

Authors: L. B. Rokoff[1], B. A. Coull[2], M. Bosquet Enlow[3], S. A. Korrick[4];
[1]Department of Environmental Health, Harvard T.H. Chan School of Public Health; Population Health Sciences, Harvard Graduate School of Arts and Sciences, Boston, MA, [2]Department of Biostatistics, Harvard T.H. Chan School of Public Health, Boston, MA, [3]Department of Psychiatry, Boston Children's Hospital; Department of Psychiatry, Harvard Medical School, Boston, MA, [4]Channing Division of Network Medicine, Brigham and Women's Hospital, Harvard Medical School; Department of Environmental Health, Harvard T.H. Chan School of Public Health, Boston, MA.

Background/Aim: Exposure to combinations of chemical neurotoxicants has not been well explored as a risk factor for mental health difficulties. We evaluated associations of prenatal exposure to mixtures of organochlorines and metals with adolescent internalizing behaviors.
Methods: Participants were 397 socioeconomically (32% household income <$20,000) and racially (31% non-White) diverse children from a prospective birth cohort recruited at birth (1993-1998) in New Bedford, Massachusetts. Organochlorines [hexachlorobenzene, p,p'-dichlorodiphenyl dichloroethylene, polychlorinated biphenyls] and metals [manganese, lead] were analyzed in cord blood. Internalizing behaviors (anxiety, depression, somatization) at age ~15 years were assessed via teacher, parent, and self-report using the Behavior Assessment System for Children, 2nd Edition (BASC-2). Adjusted for sociodemographic predictors of exposures and internalizing behaviors, multi-chemical linear regression and Bayesian Kernel Machine Regression (BKMR) were used to explore overall and sex-specific associations between prenatal chemical exposures and BASC-2 T-scores [standardized to mean (standard deviation) of 50 (10)].
Results: Chemical concentrations were consistent with background exposure levels [e.g., mean (range) cord blood lead: 1.50 (0-17.45) g/dL]. Although there was some variability in magnitude and precision, across all three reporters, lead was associated with higher anxiety, depression, and somatization behaviors in adolescents of both sexes. For example, in linear regression, a doubling of lead was associated with a 1.6-point higher (95% confidence interval: 0.6, 2.7) parent-reported anxiety T-score. There was suggestive evidence of increased susceptibility to lead among boys for parent-reported behaviors. The direction of associations of organochlorines and manganese with internalizing behaviors varied, depending on the reporter. BKMR analysis supported linear regression results, with no evidence of interactions between chemicals or non-linear associations.
Conclusions: Low-level prenatal lead exposure was consistently associated with adolescent internalizing behaviors. In utero chemical exposures, particularly lead, may contribute to the emergence of anxiety and depression symptoms during this vulnerable developmental stage.
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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 7
Environmental Exposures in Children and Adolescents and Brain Health
Chairs: Raanan Raz,Israel & Zeyan Liew, US

Prenatal exposure to organophosphate pesticides and longitudinally assessed executive function and attention in childhood and early adolescence

Presenter: Sharon Sagiv, University of California, Berkeley, Berkeley, United States

Authors: S. Sagiv, K. Kogut, K. Harley, A. Bradman, N. Morga, B. Eskenazi;
University of California, Berkeley, Berkeley, CA.

Background: Neurobehavioral functions governed by the prefrontal cortex, including executive function and attention, impact children's academic and socioeconomic attainment into adulthood. Pesticide exposures may affect these functions. Objective: To investigate whether prenatal exposure to organophosphate (OP) pesticides is associated with children's executive functioning and attention at ages 7 to 12 years. Methods: We measured dialkyl phosphates (DAPs), metabolites of OP pesticides, in urine samples collected from pregnant women participating in the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS), a population-based cohort study conducted in an agricultural region of California. We assessed executive functioning and attention via maternal report on behavior and standardized assessments of children. We estimated associations of prenatal OP exposure with these outcomes, longitudinally assessed at ages 7, 9, 10.5 and 12 years (n=310 to 341, depending on the time point), adjusting for sociodemographic factors, home learning environment, and maternal receptive language skills and depressive symptoms. Results: Higher prenatal total DAP concentrations (geometric mean (SD) = 130.3 (2.7)) were associated with more parent-reported executive function and attention problems and poorer performance on child assessment measures. For example, a 10-fold increase in prenatal DAP concentrations was associated with a 3.7 point (95% CI 1.8, 5.6) increase in Behavior Rating Inventory of Executive Function Global Executive Composite T-scores and a 3.9 point reduction (95% CI: -6.4, -1.3) in Weschler Intelligence Scales for Children-IV Working Memory scores. Associations were driven primarily by dimethyl phosphates, which are considerably higher than diethyl phosphates in CHAMACOS. In addition, DAP-related associations with parent-reported behavior were stronger in boys than in girls. Discussion: OP pesticide metabolite concentrations during pregnancy were associated with poorer executive functioning and attention at school age and into adolescence. Reducing prenatal exposure to OP pesticides through public health interventions and policy is an important goal.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 7
Environmental Exposures in Children and Adolescents and Brain Health
Chairs: Raanan Raz,Israel & Zeyan Liew, US

Paternal arsenic exposure increases risk of myelomeningocele among offspring in a highly-exposed population

Presenter: Gwen Tindula, Boston Children's Hospital, Boston, United States

Authors: G. Tindula[1], S. K. Mukherjee[2], S. M. Ekramullah[2], D. M. Arman[2], J. Obrycki[1], D. Christiani[3], M. Mazumdar[1];
[1]Boston Children's Hospital, Boston, MA, [2]National Institute of Neurosciences and Hospital (NINS), Dhaka, BANGLADESH, [3]Harvard School of Public Health, Boston, MA.

Background: Neural tube defects, severe birth defects that occur when the neural plate fails to close in early gestation, continue to be a pressing public health concern, despite advances in prevention from folic acid-based strategies. Arsenic, a chemical naturally occurring in soils and drinking water, has been shown to induce neural tube defects in animal models and could contribute to neural tube defects in humans. We investigated the relationship between parental arsenic exposure and risk of myelomeningocele, a common and severe form of neural tube defect, in a case control study in Bangladesh. We also explored the interaction between arsenic levels and maternal serum folate. Methods: We analyzed arsenic in maternal and paternal toenail samples using inductively coupled plasma mass spectrometry. A total of 275 participants (153 cases and 122 controls) were included in the analysis. Results: On average, fathers of cases had higher levels of arsenic in toenails than fathers of controls. Maternal toenail arsenic levels were not significantly related to case status in the main effect model. In the paternal model, a 1-unit increase in the natural logarithm of toenail arsenic was significantly associated with 75% greater odds of being a case (adjusted odds ratios: 1.75) compared to being a control after adjusting for maternal serum folate level, parental age, child age, birth facility, and child sex. Results did not suggest an interaction between paternal arsenic and maternal serum folate. Conclusions: The findings from this study provide novel insight into the role of arsenic in neural tube defect risk in humans and add to the growing body of literature of the influence of paternal environmental factors on child health outcomes.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 8
High Resolution Air Pollution Exposure Assessment: New Developments for Measurement, Modeling & Health Studies
Chairs: Joshua Apte, US & Ellison Carter, US

Mobile-monitoring of Black Carbon and Ultrafine particles in Bangalore, India

Presenter: Meenakshi Kushwaha, ILK Labs, Bangalore, India

Authors: M. Kushwaha[1], A. Upadhya[1], P. Agrawal[1], E. Savio[1], J. Gingrich[2], V. Sreekanth[3], J. Asundi[3], J. D. Marshall[4], J. S. Apte[2];
[1]ILK Labs, Bangalore, INDIA, [2]University of Texas, Austin, TX, [3]CSTEP, Bangalore, INDIA, [4]University of Washington, Seattle, WA.

INTRODUCTION--Mobile monitoring can effectively capture spatial patterns in on-road exposure. Here, we report measured on-road concentrations of black carbon and ultrafine particles in urban and peri-urban Bangalore, India.
METHODS--Our mobile platform, a CNG car, was equipped with an aethalometer for black carbon (BC) and a condensation particle counter for ultrafine particles (UFP). We sampled on roadways in four parts of Bangalore: a central business district, a residential urban neighborhood, a peri-urban neighborhood, and along an urban-rural transect; in total, we collected ~400 h (~5000 km) of on-road data. Our study design involved oversampling each road segment (n=25 repeated samples per road). We then quantify, via subsequent subsampling, the data requirements for robustly estimating time-integrated concentrations. We computed average concentration for each 30m road segment and computed mean and median concentrations for each region.
RESULTS--Mean on-road concentrations were highest in the central business district (BC: 50 µg/m3; UFP: 145,000 cm-3), intermediate in the urban residential neighborhood (32 µg/m3; 87,000 cm-3), and lowest in the peri-urban neighborhood (29 µg/m3; 30,000 cm-3). Median values are 2% - 38% less than mean. The urban-rural transect reveals analogous spatial patterns: average concentrations decline when going from downtown to the peri-urban area; spatial gradients are larger for UFP than BC. Subsampling analyses reveal how the robustness of estimated mean concentrations varies with number of observations and the timing of those observations, and how that relationship varies in space.
CONCLUSION--Average on-road concentrations decline from downtown to the peri-urban area; spatial gradients are larger for UFP than BC. Our subsampling analyses inform how many visits are needed to obtain robust estimates of long-term average concentrations, as well as how that result varies in space and time.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 8
High Resolution Air Pollution Exposure Assessment: New Developments for Measurement, Modeling & Health Studies
Chairs: Joshua Apte, US & Ellison Carter, US

Land-Use Regression Variable Selection with Spatiotemporal Dependent Errors and Large Sample Size: A National and Daily Ground-Level NO_2 Model

Presenter: Kyle Messier, National Toxicology Program/ National Institute of Environmental Health Sciences, Morrisville, United States

Authors: K. P. Messier[1], M. Katzfuss[2];
[1]National Toxicology Program/ National Institute of Environmental Health Sciences, Morrisville, NC, [2]Texas A&M University, College Station, TX.

Nitrogen dioxide (NO_2) is a primary constituent of traffic-related air pollution and has well established harmful environmental and human health impacts. Knowledge of the spatiotemporal distribution of NO_2 is critical for assessing exposure and subsequent risk assessment. A common approach for assessing exposure to outdoor air pollution is linear regression involving spatially referenced covariates, known as land-use regression (LUR). While LURs have undoubtedly been useful for many exposure and risk assessment studies, the typical assumption of independent errors is usually violated because the spatial dependence in the response cannot be captured fully by the covariates, resulting in biased covariate estimates and decreased sensitivity and specificity in the model-selection process. Here, we develop an approach for simultaneous variable selection and estimation of LUR models with spatiotemporal correlated errors that is feasible with large sample sizes. We employ a general-Vecchia approximation, which is highly accurate and guarantees linear complexity with respect to the sample size. We demonstrate this new approach with spatiotemporal random field simulations and with the case study of daily ground-level NO_2 in the United States. The simulations show that our approach results in consistently better prediction as measured by the cross-validation mean squared error (MSE) compared to the competing methods. Additionally, the model selection false positive and negative rates are lower across most simulation scenarios. For NO_2, our approach has at least a 10 percent improvement in prediction MSE over all of the competing methods and results in significantly more sparse models. US-wide, daily NO_2 predictions and R-code are freely available for use.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 8
High Resolution Air Pollution Exposure Assessment: New Developments for Measurement, Modeling & Health Studies
Chairs: Joshua Apte, US & Ellison Carter, US

Using Google Street View Imagery in Land Use Regression to Predict Street Level Particulate Air Pollution

Presenter: Meng Qi, Virginia Tech, Blacksburg, United States

Authors: M. Qi, T. Lu, S. Hankey;
Virginia Tech, Blacksburg, VA.

Background/aim: Land-use regression (LUR) is frequently applied to estimate spatial patterns of air pollution, which is necessary for exposure assessment and epidemiological studies. Traditional LUR typically relies on data that is jurisdiction-specific or has lower spatial resolution. In this study, we investigate use of a promising new set of variables for LUR - features extracted from Google Street View (GSV) imagery - and compare GSV-only LUR to traditional LUR.
Methods: We build models on previously collected mobile monitoring data in Blacksburg, VA (Particle Number [PN] and Black Carbon [BC]). We collected ~14,000 GSV images around the mobile monitoring routes. Images included 2 categories: (1) images within 50 meters of measurements to capture central features and (2) images aggregated within 8 buffers (250-2,000m) to capture background features. A deep learning model was used to classify features (e.g., vegetation, buildings, cars, water). The percentage of features within each image was used in stepwise linear regression to develop GSV-only LUR models.
Results: We found that the GSV-only models had comparable performance to traditional LUR. Adjusted R^2 (10-fold CV R^2) was 0.76 (0.65) for PN and 0.69 (0.58) for BC, which were 5.6% (-5.8%) higher for PN and 4.5% (3.6%) higher for BC than traditional LUR models. Furthermore, adjusted R^2 for PN (BC) models that used only central features were 0.45 (0.41) suggesting that street-level images at the measurement location can describe a significant amount of variability for these pollutants. Collectively, our findings suggest that GSV imagery is a promising data source for predicting street-level patterns of air pollution.
Conclusions: Our results suggest that GSV imagery may be an effective data source for LUR. GSV offers potentially two major advantages: (1) finer spatial (i.e., street-level) resolution and (2) the ability to apply consistent data collection and processing protocols across large geographies and political boundaries.

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ABSTRACT E-BOOK

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ORAL SESSION 8
High Resolution Air Pollution Exposure Assessment: New Developments for Measurement, Modeling & Health Studies
Chairs: Joshua Apte, US & Ellison Carter, US

Reducing Exposure Measurement Error Using Disease Risk Scores

Presenter: David Richardson, UNC Chapel Hill, Chapel Hill, United States

Authors: D. B. Richardson;
UNC Chapel Hill, Chapel Hill, NC.

Suppose that an investigator wants to estimate an association between a continuous exposure variable and an outcome, adjusting for a set of confounders. If the exposure variable suffers classical measurement error, in which the measured exposures are distributed with independent error around the true exposure, then an estimate of the covariate-adjusted exposure-outcome association may be attenuated. We propose an approach to estimate a marginal exposure-outcome association that is standardized for covariates using a disease risk score in the setting of classical exposure measurement error. First, we show that the proposed marginal estimate of the exposure-outcome association will suffer less bias due to classical measurement error than the covariate-conditional estimate of association when the covariates are predictors of exposure. Second, we show that if an exposure validation study is available with which to assess exposure measurement error then the proposed marginal estimate of the exposure-outcome association can be corrected for measurement error more efficiently than the covariate-conditional estimate of association. We illustrate these points using simulations.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 8
High Resolution Air Pollution Exposure Assessment: New Developments for Measurement, Modeling & Health Studies
Chairs: Joshua Apte, US & Ellison Carter, US

Assessing the distribution of air pollution health risks within cities: a neighborhood-scale analysis leveraging high resolution datasets in the Bay Area, California.

Presenter: Veronica Southerland, George Washington University, Washington, United States

Authors: V. Southerland[1], S. Anenberg[2], M. Harris[3], A. Roy[4], J. Apte[5], P. Hystad[6], M. Beyers[7], J. Schwartz[8]; [1]George Washington University, Washington, DC, [2]George Washington University, Washinton, DC, [3]Environmental Defense Fund, San Francisco, CA, [4]Environmental Defense Fund, Washington, DC, [5]University of Texas at Austin, Austin, TX, [6]Oregon State University, Corvallis, OR, [7]Alameda County Public Health Department, Oakland, CA, [8]Harvard T.H. Chan School of Public Health, Boston, MA.

Background: Air pollution-attributable disease burdens are typically reported at country, state, or county levels, masking potential smaller scale geographic heterogeneity driven by non-uniform pollution levels and disease rates. Estimating the variation in air pollution health impacts within cities is now possible with high resolution pollutant concentrations derived from satellite remote sensing, modeling, and mobile monitoring. Objectives: We quantify neighborhood-level variation in air pollution health risks, using highly spatially resolved pollutant and disease rate datasets available for the Bay Area, California. Methods: We estimate mortality and morbidity attributable to nitrogen dioxide (NO_2), black carbon (BC), and fine particulate matter ($PM_{2.5}$) in the Bay Area using epidemiologically derived health impact functions. We compare geographic distributions of pollution-attributable risk estimates using pollutant concentrations from different sources: (1) mobile monitoring of NO_2 and BC, covering roadways over a one-year period; and (2) models predicting annual NO_2, BC and $PM_{2.5}$ concentrations from land use variables and satellite observations, with full spatial coverage. We also compare the application of county versus census block group (CBG) level disease rates. Results: Across Bay Area counties, estimated pollution-attributable mortality rates (attributable deaths per 100,000 people) ranged by a factor 15, 13 and 8 for NO_2, BC and $PM_{2.5}$ (NO_2 range=40-570, median=219; BC range=3-40, median=13; $PM_{2.5}$ range=60-470, median=305). Applying concentrations from mobile monitoring and land use regression datasets resulted in similar spatial patterns of estimated NO_2-attributable mortality rates, though the mobile monitoring concentrations yielded more spatial heterogeneity. Using CBG disease rates revealed spatial heterogeneity in estimated NO_2 and $PM_{2.5}$-attributable mortality rates that is masked when using county-level disease rates. Discussion: Estimated air pollutant attributable health burdens vary considerably between neighborhoods in the Bay Area, driven by spatial heterogeneity in both concentrations and disease rates. Future research should test the generalizability of these findings for other cities.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 5
SYMPOSIUM 4
Novel Methods for Studying the Epidemiology of Exposure to Mixtures: NIEHS' 2019 PRIME Program
Chairs: Marianthi-Anna Kioumourtzoglou, US & Bonnie Joubert, US

Non-linear effects of environmental and social exposures and interactions on early childhood academic achievement

Presenter: Mercedes A. Bravo, RTI International, Durham, United States

Authors: M. A. Bravo[1], D. Kowal[2], M. Leong[2], K. Ensor[2], M. Miranda[2];
[1]RTI International, Durham, NC, [2]Rice University, Houston, TX.

Non-linear effects of environmental and social exposures and interactions on early childhood academic achievement
Introduction. Previous research has shown that environmental and social exposures are associated with academic achievement. However, the interactions between environmental mixtures and social conditions, and the scales of the associations with academic achievement remain unclear. In our study we seek to: 1.Examine childhood co-exposures to environmental and social conditions; and2.Capture the non-linear effects of environmental and social exposures (and interactions) that occur across the life course on academic achievement, as measured by end of grade (EOG) test scores.
Methods. We use North Carolina birth records from the year 2000, linked to data on lead, education, neighborhood deprivation index (NDI), residential isolation (RI), air quality ($PM_{2.5}$), and temperature. We use EOG standardized test scores in reading and mathematics for 4th grade as a proxy for academic achievement. We apply a generalized additive model (GAM) to measure the scales of associations, as well as interactions, between environmental and social exposures and educational outcomes.
Results: Main effects: environmental exposure in trimesters 2 and 3, social conditions, birthweight percentile for gestational age, blood lead level, mother's race/ethnicity group, and NDI are significant predictors of educational outcomes. Interactions between RI/NDI and environmental exposures, as well as blood lead level and RI, are also significant predictors. We also find non-linear effects of environmental exposures in trimesters 2 and 3 on educational outcomes, with higher pollution levels predicting worse test scores.
Conclusion. Childhood blood lead level, RI, and NDI are associated with academic achievement both individually and interactively. Also, we find clear evidence of non-linear effects of environmental and social exposures (and interactions) on educational outcomes, which has implications for how multiple exposures should be modeled in future research.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 5
SYMPOSIUM 4
Novel Methods for Studying the Epidemiology of Exposure to Mixtures: NIEHS' 2019 PRIME Program
Chairs: Marianthi-Anna Kioumourtzoglou, US & Bonnie Joubert, US

Consideration of Regulatory Guidelines in the Analysis of Mixtures of Environmental Chemicals and Nutrients

Presenter: Chris Gennings, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: C. Gennings;
Icahn School of Medicine at Mount Sinai, New York, NY.

We introduce a new class of models that include the regulatory concept of "acceptable concentration range" (ACR). These models complement current risk assessment methods by estimating regulatory guideline values using human biomonitoring data. We illustrate the strategy using prenatal concentrations from 11 environmental chemicals and two health outcomes. We determine that the published guideline values are orders of magnitude higher than those estimated using human data. The results suggest that chemical-by-chemical approaches underestimate risk by a factor that range from 1 to 100 for different chemicals. Further, we have developed a personalized nutrition index that measures the nutrient quality (i.e., "nutritiousness") of a specified daily diet and is calculated based on quantification of dozens of macro- and micronutrients that are specific to an individual's nutritional needs (as defined by published recommended guidelines for individual nutrient target ranges) by incorporating dietary restrictions, subject characteristics, activity level, and health behaviors. We illustrate the use of the nutrition index based on food frequency questionnaire nutrient estimates, adjusted for total calories, in evaluating the potential mitigating effect of good nutrition on environmental toxins and in evaluating dietary sources of toxic chemicals. (We gratefully acknowledge support from NIEHS: #R01ES028811)

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 5
SYMPOSIUM 4
Novel Methods for Studying the Epidemiology of Exposure to Mixtures: NIEHS' 2019 PRIME Program
Chairs: Marianthi-Anna Kioumourtzoglou, US & Bonnie Joubert, US

Development and Testing of Response Surface Methods for Investigating the Epidemiology of Exposures to Mixtures

Presenter: Thomas F Webster, Boston University School of Public Health, Boston, United States

Authors: T. F. Webster[1], B. Claus Henn[1], R. Hauser[2], M. Weisskopf[2], B. Coull[2];
[1]Boston University School of Public Health, Boston, MA, [2]Harvard T.H. Chan School of Public Health, Boston, MA.

We are extending Bayesian kernel machine regression (bkmr) to examine health outcomes as a function of a multi-dimensional space of exposures, adding capabilities needed by environmental epidemiologists such as mediation, multiple imputation and the ability to analyze large data sets. Borrowing ideas from toxicology, we are developing an approach related to bkmr that constructs exposure summary scores and tests when they are appropriate, an important goal for mixtures epidemiology. We are testing bkmr and other other mixtures methods and comparing results using both synthetic data and real world data sets, including the Environment And Reproductive Health (EARTH) Study.A second focus of our project is the application of causal models to mixtures epidemiology, including the construction of synthetic data sets and interpretation of results. We have extended our earlier analysis of co-exposure amplification bias to methods in addition to regular linear regression. Special care in causal methods must be used when constructing synthetic data sets with increasing correlation between exposures.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 5
SYMPOSIUM 4
Novel Methods for Studying the Epidemiology of Exposure to Mixtures: NIEHS' 2019 PRIME Program
Chairs: Marianthi-Anna Kioumourtzoglou, US & Bonnie Joubert, US

Bayesian Joint Modeling of Chemical Structure and Dose Response Curves

Presenter: Kelly R Moran, Duke University, Durham, United States

Authors: K. R. Moran, D. Dunson, A. H. Herring;
Duke University, Durham, NC.

Today there are approximately 85,000 chemicals regulated under the Toxic Substances Control Act, with around 2,000 new chemicals introduced each year. It is impossible to screen all of these chemicals for potential toxic effects either via full organism in vivo studies or in vitro high-throughput screening (HTS) programs. Toxicologists face the challenge of choosing which chemicals to screen, and predicting the toxicity of as-yet-unscreened chemicals. Our goal is to describe how variation in chemical structure relates to variation in toxicological response to enable in silico toxicity characterization designed to meet both of these challenges. With our Bayesian partially Supervised Sparse and Smooth Factor Analysis (BS3FA) model, we learn a distance between chemicals targeted to toxicity, rather than one based on molecular structure alone. Our model also enables the prediction of chemical dose-response profiles based on chemical structure (that is, without in vivo or in vitro testing) by taking advantage of a large database of chemicals that have already been tested for toxicity in HTS programs. We show superior simulation performance in distance learning and modest to large gains in predictive ability compared to existing methods. Results from the high-throughput screening data application elucidate the relationship between chemical structure and a toxicity-relevant high-throughput assay. An R package for BS3FA is available online at https://github.com/kelrenmor/bs3fa.

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ABSTRACT E-BOOK

August 24, 2020 / 12:00 - 13:30 / Parallel 5
SYMPOSIUM 4
Novel Methods for Studying the Epidemiology of Exposure to Mixtures: NIEHS' 2019 PRIME Program
Chairs: Marianthi-Anna Kioumourtzoglou, US & Bonnie Joubert, US

Selecting Key Agents from Environmental Mixtures: A Method for High-Dimensional Feature Selection in Presence of Strong Collinearity

Presenter: Sanjib Basu, University of Illinois at Chicago, Chicago, United States

Authors: S. Basu, J. Jang, H. Chen, M. Turyk;
University of Illinois at Chicago, Chicago, IL.

Understanding health risks from environment mixtures is of growing scientific interest and presents unique methodological challenges. Individuals are exposed simultaneously to a multitude of pollutants that potentially interact and present health risk. Each pollutant may have a weak individual effect that contributes to the overall heath effect of the mixture. Further, the pollutant measurements are often extremely correlated at levels that are generally not seen in other areas of science. Regularized variable selection methods such as LASSO are popular for statistical variable selection. We, however, find that these methods may not perform well in presence of such strong collinearity. To address these challenges, we have developed a method that can effectively identify a set of influential mixture components and make improved predictions of the health risk. This method is based on iterative correlation screening, cluster detection and selection. The proposed method improves prediction accuracy compared with other selection methods such as LASSO, Elastic Net, and others when variables are correlated in a variety of high-dimensional settings, and is applicable to both dichotomous and continuous health outcomes. The performance of this method has been evaluated through an extensive set of simulation studies and in real-world data applications. We applied the method to the investigation of the impact of persistent organic pollutants on endocrine and metabolic health outcomes in the National Health and Nutrition Examination Survey and the Great Lakes Fish Consumer Cohort.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 1
SYMPOSIUM 5
Quasi-experimental Designs to Study Effects of Extreme Weather Events on Population Health in a Changing Climate
Chairs: Tarik Benmarhnia, US & Joan Casey,US

Applying synthetic control methods for multiple treatments to study the health impacts of extreme weather events

Presenter: Paige Sheridan, University of California San Diego, La Jolla, United States

Authors: T. Benmarhnia;
University of California, San Diego, San Diego, CA.

Title: Applying synthetic control methods for multiple treatments to study the health impacts of extreme weather events
Extreme weather events such as wildfires, heat waves or flooding are expected to increase in frequency and intensity in our changing climate. In this context, it is particularly important to precisely and accurately quantify the causal effects of such events to inform adaptation strategies and identify vulnerable populations and territories. Quasi-experimental designs (QED) that capitalize on natural experiments can be particularly robust to obtain valid causal estimates under specific identification assumptions. Especially, QED could be useful and flexible to disentangle the effects of extreme weather events from underlying secular changes affecting the health outcomes or other time fixed unmeasured confounders. In the recent years, many methodological developments regarding QED have been proposed in other settings highlighting their flexibility and good performance regarding bias and precision. For example, synthetic control methods (SCM) constitute a recent family of methods that have been used to estimate the effect of various policy changes or intervention on health outcomes. In the recent years, many developments allowed the consideration of multiple treatments and/or heterogeneity in the expected outcome across space and population subgroups. Such recent SCM developments can be very useful to understand how extreme weather events impact population health across space and time especially when the nature of such events and population susceptibility changes across time. In this introduction of the symposium, we will first present recent developments in SCM and how they could be applied to various extreme weather events such as wildfires or heat waves. We will then present an extension of the SCM and focus on an empirical example related to the impacts of the wildfires on the risk of respiratory hospital admissions in California.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 1
SYMPOSIUM 5
Quasi-experimental Designs to Study Effects of Extreme Weather Events on Population Health in a Changing Climate
Chairs: Tarik Benmarhnia, US & Joan Casey,US

Applying synthetic control methods for multiple treatments to study the health impacts of extreme weather events

Presenter: Tarik Benmarhnia, University of California, San Diego, San Diego, United States

Authors: T. Benmarhnia;
University of California, San Diego, San Diego, CA.

Title: Applying synthetic control methods for multiple treatments to study the health impacts of extreme weather events
Extreme weather events such as wildfires, heat waves or flooding are expected to increase in frequency and intensity in our changing climate. In this context, it is particularly important to precisely and accurately quantify the causal effects of such events to inform adaptation strategies and identify vulnerable populations and territories. Quasi-experimental designs (QED) that capitalize on natural experiments can be particularly robust to obtain valid causal estimates under specific identification assumptions. Especially, QED could be useful and flexible to disentangle the effects of extreme weather events from underlying secular changes affecting the health outcomes or other time fixed unmeasured confounders. In the recent years, many methodological developments regarding QED have been proposed in other settings highlighting their flexibility and good performance regarding bias and precision. For example, synthetic control methods (SCM) constitute a recent family of methods that have been used to estimate the effect of various policy changes or intervention on health outcomes. In the recent years, many developments allowed the consideration of multiple treatments and/or heterogeneity in the expected outcome across space and population subgroups. Such recent SCM developments can be very useful to understand how extreme weather events impact population health across space and time especially when the nature of such events and population susceptibility changes across time. In this introduction of the symposium, we will first present recent developments in SCM and how they could be applied to various extreme weather events such as wildfires or heat waves. We will then present an extension of the SCM and focus on an empirical example related to the impacts of the wildfires on the risk of respiratory hospital admissions in California.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 1
SYMPOSIUM 5
Quasi-experimental Designs to Study Effects of Extreme Weather Events on Population Health in a Changing Climate
Chairs: Tarik Benmarhnia, US & Joan Casey,US

Exploring the association between drought and health: examples with mortality and psychosocial stress in farmers

Presenter: Jesse D Berman, University of Minnesota School of Public Health, Minneapolis, United States

Authors: J. D. Berman;
University of Minnesota School of Public Health, Minneapolis, MN.

Drought conditions are considered to be one of the most far reaching natural disasters and a leading cause for climate related mortality. Yet, there is limited research examining the drought and health relationship. This absence is partly attributed to the complexity of quantifying drought, which is slow to develop with a potential long latency and heterogeneity across space and time. As a natural event, drought cannot be explored through the perspective of a randomized trial; however, it can be evaluated through the lens of observational health data. One alternative approach is to use quasi-experimental designs to evaluate how an exogenous event, specifically a drought, impacts populations over time. Among the most vulnerable subgroups to drought exposures are agricultural populations. Close economic ties to the land, reliance on surface water, and reduced access to care can make agricultural populations increasingly vulnerable. Previous research has linked drought conditions to increased psychosocial stress and suicide. However, the quantitative evidence for droughts effect on mental health is still limited and shows uncertainty. In addition, almost no research on drought and mental health exists for U.S. populations. In this talk, we will explore the association between drought and health outcomes through the quasi-experimental approach of interrupted time-series. We will discuss how to estimate the association between drought and mortality using a temporally robust daily data set across a 14-year period. In a second example, we will discuss the challenges of evaluating drought and health using more temporally limited data. In this example, we explore psychosocial stress and drought conditions among a cohort of 518 Midwestern farmers using 3.5 years of repeated surveys for occupational stress. Our goal is to present the importance of drought and health research, and explore methodology to evaluate this complex environmental exposure.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 1
SYMPOSIUM 5
Quasi-experimental Designs to Study Effects of Extreme Weather Events on Population Health in a Changing Climate
Chairs: Tarik Benmarhnia, US & Joan Casey,US

Methods for making causal inferences from natural experiments

Presenter: Elizabeth L Ogburn, Johns Hopkins School of Public Health, Baltimore, United States

Authors: E. L. Ogburn;
Johns Hopkins School of Public Health, Baltimore, MD.

Extreme weather events often act as natural experiments, effectively randomizing the communities that experience them to an exposure condition. By choosing an appropriate control group, e.g. nearby communities outside of the path of the extreme event or the same community in the time period leading up to the event, we may be able to make causal inferences about the effects of the extreme weather events. In this talk I will describe identification and estimation strategies for natural experiments, focusing on each strategy's assumptions, limitations and common biases. These strategies include regression discontinuity designs, difference-in-differences analyses, instrumental variables analyses, and case-crossover designs.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 1
SYMPOSIUM 5
Quasi-experimental Designs to Study Effects of Extreme Weather Events on Population Health in a Changing Climate
Chairs: Tarik Benmarhnia, US & Joan Casey,US

The 2019 Getty Fire and healthcare visits among vulnerable older adults in Southern California

Presenter: Joan Casey, Columbia University Mailman School of Public Health, New York, United States

Authors: J. A. Casey[1], S. Y. Tarof[2], M. Kioumourtzoglou[1], T. Benmarhnia[3], E. Mayeda[4], J. Manly[5], D. Hernandez[1], A. Baccarelli[1], F. Dominici[6];
[1]Columbia University Mailman School of Public Health, New York, NY, [2]Kaiser Permanente Southern California, Pasadena, CA, [3]University of California, San Diego, San Diego, CA, [4]University of California, Los Angeles, Los Angeles, NY, [5]Columbia University School of Medicine, New York, NY, [6]Harvard T.H. Chan School of Public Health, Boston, MA.

Introduction: Prior wildfire studies have relied on hospital claims data to evaluate associations between wildfire-related particulate matter ($PM_{2.5}$) and acute cardiovascular and respiratory outcomes, but have not assessed dementia-related visits. Here, we focus on the 2019 Getty Fire in Southern California and evaluate both wildfire-related $PM_{2.5}$ and evacuation-related exposures and acute and chronic healthcare visits among Kaiser Permanente Southern California (KPSC) members who rely on at-home electricity-dependent medical equipment (DME) or that had a prior dementia diagnosis.
Methods: We estimated $PM_{2.5}$ exposures in a two-stage approach: we first estimated total $PM_{2.5}$ levels and we subsequently used NOAA's Hazard Mapping System to identify ZIP codes exposed to wildfire smoke plumes. We use the smoke plume information combined with multiple imputation to estimate daily wildfire $PM_{2.5}$ and non-wildfire $PM_{2.5}$ levels. Areas required to evacuate or under evacuation watch were identified from local media sources and linked to patient address. We used case-crossover and difference-in-differences designs to estimate associations between wildfire exposures and acute healthcare utilization among two vulnerable KPSC populations.
Results: The Getty Fire ignited on October 28, 2019, burned until November 5, 2019, resulted in daily-average $PM_{2.5}$ levels >25g/m^3, and caused 25,000 people to evacuate. While overall KPSC visits decreased during the Getty Fire (-9%), dementia patients living in ZIP codes 20-km from the Getty boundary had a 20% increase in overall, as well as in dementia-related visits, compared to ZIP codes located >20-km away during the same period. Among patients with a prior dementia diagnosis, we found outpatient and ED visits declined by 10% among those living in ZIP codes with mandatory evacuation compared to ZIP codes located >20-km away.
Discussion: These findings highlight the need to consider longer relevant time periods and evacuation exposures, which may limit access to healthcare altogether.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 9
Prenatal Exposure to PFAS, Pregnancy Complications and Birth Outcomes
Chairs: Lida Chatzi, US & Scott Maichael Bartell,US

Association of perfluoroalkyl substances with gestational hypertension and preeclampsia in the MIREC study

Presenter: Michael Borghese, Health Canada, Ottawa, Canada

Authors: M. M. Borghese[1], M. Walker[2], M. E. Helewa[3], W. D. Fraser[4], T. E. Arbuckle[1];
[1]Health Canada, Ottawa, ON, CANADA, [2]The Ottawa Hospital, Ottawa, ON, CANADA, [3]University of Manitoba, Winnipeg, MB, CANADA, [4]University of Sherbrooke, Sherbrooke, QC, CANADA.

Background: We examined relationships between perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorohexane sulfonate (PFHxS) and the development of gestational hypertension or preeclampsia in the MIREC Canadian pregnancy cohort. We also explored the potential for fetal sex-stratified effects.Methods: PFOA, PFOS, and PFHxS were analyzed in first trimester maternal plasma samples. Blood pressure and diagnostic information for gestational hypertension and preeclampsia were assessed during each trimester. Logistic regression was used to derive adjusted odds ratios (OR) for associations between PFAS concentrations (per doubling of concentration and by tertile) and gestational hypertension or preeclampsia. Linear mixed models were used to examine associations with changes in blood pressure throughout pregnancy.Results: Of 1739 participants, 90% were normotensive throughout pregnancy, 7% developed gestational hypertension, and 3% developed preeclampsia. In the full sample, neither PFOA nor PFOS were associated with gestational hypertension or preeclampsia. However, each doubling of PFHxS plasma concentration was associated with developing preeclampsia (OR = 1.32; 95%CI: 1.03, 1.70). In addition, participants in the highest PFHxS tertile (1.4 - 40.0 µg/L) had higher odds of developing preeclampsia relative to those in the lowest tertile (OR = 3.06; 95%CI: 1.27, 7.39). In stratified analyses, this effect was only apparent among women carrying a female fetus (OR = 4.90; 95%CI: 1.02, 22.3). However, among women carrying a male fetus, both PFOS and PFHxS were associated with gestational hypertension, but not preeclampsia. Higher concentrations of all three PFAS were associated with increases in diastolic blood pressure, while PFOA and PFHxS were associated with increases in systolic blood pressure.Conclusions: Higher levels of PFHxS were associated with the development of preeclampsia, but not gestational hypertension. Neither PFOA nor PFOS were associated with either outcome. However, we show, for the first time, that fetal sex may modify these associations, a finding which warrants replication and further study.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 9
Prenatal Exposure to PFAS, Pregnancy Complications and Birth Outcomes
Chairs: Lida Chatzi, US & Scott Maichael Bartell,US

Associations between prenatal maternal exposure to per- and polyfluoroalkyl substances (PFAS) and polybrominated diphenyl ethers (PBDEs) with birth outcomes among pregnant women in San Francisco

Presenter: Elizabeth Hom Thepaksorn, University of California, San Francisco, San Francisco, United States

Authors: E. K. Hom Thepaksorn[1], S. Eick[1], M. Izano[1], L. Cushing[2], Y. Wang[3], S. Crispo Smith[3], S. Gao[3], J. Park[3], A. Padula[1], E. DeMicco[1], L. Valeri[4], T. Woodruff[1], R. Morello-Frosch[5];
[1]University of California, San Francisco, San Francisco, CA, [2]San Francisco State University, San Francisco, CA, [3]Department of Toxic Substances Control, California Environmental Protection Agency, Berkeley, CA, [4]Columbia University, New York, NY, [5]University of California, Berkeley, Berkeley, CA.

Background: Perfluoroalkyl substances (PFAS) and polybrominated diphenyl ethers (PBDEs) are used in consumer products for their water repellent and flame retardant properties, respectively. Both PFAS and PBDEs have been found to travel from the placenta to the fetus. There is concern about their potential harm to the developing fetus.
Methods: We examined the association between prenatal exposure to 12 PFAS and 19 PBDEs, measured in maternal serum during the 2nd trimester of pregnancy, with low birth weight (LBW; <2500 grams) and preterm birth (PTB; gestational age <37 weeks) among women in the San Francisco Bay Area between 2014 and 2018. In our analysis, we included 5 PFAS and 2 PBDE congeners with >80% of samples above the minimum detection limit.
Results: Adjusted logistic regression models showed a slightly elevated risk of LBW associated with increasing concentrations of PFNA (odds ratio [OR]= 1.56, 95% confidence interval [CI]= 0.85, 2.77, N=474), PFOS (OR=1.03, 95% CI= 0.59, 1.74, N=476), PFOA (OR=1.62, 95% CI= 0.87, 2.96, N=476), Me-PFOSA-AcOH (OR=1.05, 95% CI= 0.59, 1.77, N=475), PFHxS (OR=1.24, 95% CI= 0.70, 2.11, N=476). We also observed a slightly increased risk of PTB associated with higher concentrations of PFNA (OR=1.32, 95% CI= 0.78, 2.17, N=479), PFOA (OR=1.54, 95% CI= 0.89, 2.63, N=481), and Me-PFOSA-AcOH (OR=1.10, 95% CI= 0.71, 1.67, N=480).
Conclusions: Our findings suggest that increased maternal serum PFAS concentrations may be associated with LBW and PTB. There was no evidence of an association between maternal serum concentrations of PBDEs and LBW or PTB.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 9
Prenatal Exposure to PFAS, Pregnancy Complications and Birth Outcomes
Chairs: Lida Chatzi, US & Scott Maichael Bartell,US

Association between prenatal exposure to PFAS and fetal sex hormones: Are the short-chain PFAS safer?

Presenter: Min Nian, Ministry of Education-Shanghai Key Laboratory of Children's Environmental Health, Xinhua Hospital, Shanghai Jiao Tong University of Medicine, Shanghai, China

Authors: M. Nian, K. Luo, R. Aimuzi, X. Huo, F. Luo, J. Zhang;
Ministry of Education-Shanghai Key Laboratory of Children's Environmental Health, Xinhua Hospital, Shanghai Jiao Tong University of Medicine, Shanghai, CHINA.

Background: Experimental evidence suggested that per- and polyfluoroalkyl substances (PFAS) may affect the production of reproductive and sex steroid hormones. However, epidemiologic evidence regarding the effects of in utero exposure to PFAS, particularly to short-chained PFAS, on sex hormones in fetus are scarce and inconsistent. Objective: This study aimed to assess the relationship between maternal PFAS exposure and reproductive and sex steroid hormones in the fetal umbilical cord blood. Methods: A total of 752 pregnant women who were recruited in the Shanghai Birth Cohort Study between 2013 and 2016 were selected. We quantified 9 PFAS in early pregnancy (median gestational age at 12 weeks) in maternal blood using HPLC-MS/MS. Dehydroepiandrosterone sulfate (DHEA-S), sex hormone-binding globulin (SHBG), luteinizing hormone (LH), follicle-stimulating hormone (FSH) and testosterone (T) were measured in the cord blood using chemiluminescence kits. Both PFAS concentrations and hormones were ln-transformed due to their right skewed distribution. Multiple linear regression was used to evaluate the associations between PFAS and hormones indicators. Results: One ln- unit increase in maternal perfluorobutane sulfonate (PFBS) was related to decreased FSH [-0.093 (95% CI: -0.170, -0.016)] and LH [-0.099 (95% CI: -0.199, -0.001)], and increased SHBG [0.040 (95% CI: 0.007, 0.074)] in cord blood. These associations were larger in girls but non-significant in boys. In girls, FSH (-0.126, 95% CI: -0.244, -0.009), LH (-0.147, 95% CI: -0.301, 0.008) and SHBG (0.062, 95% CI: 0.003, 0.122). No association was found for other 8 PFAS. Conclusions: Prenatal exposure to PFBS was associated with the interruption of fetal reproductive and sex hormone homeostasis in this prospective cohort. These significant associations were limited to girls. Our findings suggested that reproductive toxicity of short-chain PFAS may not be neglected.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 9
Prenatal Exposure to PFAS, Pregnancy Complications and Birth Outcomes
Chairs: Lida Chatzi, US & Scott Maichael Bartell,US

Endocrine Disrupting Chemical Mixtures Alter Maternal Thyroid Hormones - A Potential Pathway for Altered Fetal Programming?

Presenter: Eva Tanner, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: E. M. Tanner[1], C. Gennings[1], A. Derakshan[2], T. I. Korevaar[2], C. Bornehag[3];
[1]Icahn School of Medicine at Mount Sinai, New York, NY, [2]Erasmus MC, Rotterdam, NETHERLANDS, [3]Karlstad University, Karlstad, SWEDEN.

Background: During early pregnancy the fetus wholly depends on maternal thyroid hormone (TH) for normal growth and development. Even sub-clinical changes can elicit adverse pregnancy and child-health outcomes. Individually, numerous endocrine disrupting chemicals (EDCs) have been linked to altered TH levels, but the combined effect of multiple EDCs remains understudied. Aim: To evaluate the cross-sectional association between 26 suspected or confirmed EDCs measured in urine and blood on maternal TH status during the first trimester of pregnancy. Methods: Within the Swedish Environmental Longitudinal, Mother and child, Asthma and allergy (SELMA) study, we assessed EDCs in relation to thyroid function markers, including thyroxine and free and total triiodothyronine (fT3, tT3), among 1240 pregnant women (median 10 weeks gestation) using Weighted Quantile Sum (WQS) regression. We tested bi-directional constraints, adjusting for maternal age, ethnicity, education, parity, smoking, gestational age, thyroglobulin and thyroid-peroxidase antibodies, and urinary creatinine. Based on prior literature, we assessed interactions by gestational age. Results: The EDC mixture was related to lower fT3 levels (WQS=-0.21 95%CI=-0.29, -0.13); the largest chemical weights included total polychlorinated biphenyls (PCBs) (25%), trans-nonachlor (17%), and dichlorodiphenyltrichloroethane (DDT) (10%). The EDC mixture was related to altered fT3, with different chemicals eliciting positive and negative effects. The negatively constrained estimate (WQS=-0.12 95%CI=-0.19, -0.04) was driven by PCBs (17%), DDT (13%), and perfluorooctane sulfonate (PFOS) (13%), whereas the positively constrained estimate (WQS=0.08 95%CI=0.01, 0.15) was driven by 2-4-methyl-7-oxyooctyl-oxycarbonyl-cyclohexane-carboxylic-acid (MOiNCH) (13%), 2-hydroxyphenanthrene (12%), and monoethyl and monobutyl phthalates (MEP, MBP) (11%, 11%). With a negative constraint, there was a significant interaction between the EDC mixture and gestational age for fT3 (WQSxAge=-0.03 95%CI=-0.01, -0.05). Conclusions: During pregnancy, mixtures of persistent chlorinated and perfluoroalkyl compounds were related to lower tT3 and fT3, whereas short-lived pollutants (plasticizers, polycyclic aromatic hydrocarbon) were related to higher fT3. Detected associations may depend on gestational age.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 9
Prenatal Exposure to PFAS, Pregnancy Complications and Birth Outcomes
Chairs: Lida Chatzi, US & Scott Maichael Bartell,US

Per- and Polyfluoroalkyl Substances in Drinking Water and Birthweight in the US: A County-level Study

Presenter: Yachen Zhu, University of California, Irvine, Irvine, United States

Authors: Y. Zhu, S. Bartell;
University of California, Irvine, Irvine, CA.

Background: Per- and polyfluoroalkyl substances (PFAS) are ubiquitous in the serum of general US population, and were detected in public water systems serving approximately 16.5 million US residents during 2013-2015. Low birthweight was associated with PFAS exposures in previous studies. Objective: To examine PFAS detections in public water supplies and birthweight in the US during 2013-2015. Methods: Birthweights for singleton births during 2013-2015 were obtained from CDC WONDER, multiple stratified by county, maternal age, race, education, smoking status, and parity. PFAS water concentrations were obtained from EPA UCMR3 database and aggregated by county. Multiple regression, weighted by group size or inverse variance, was used to produce estimates equivalent to those that would be obtained from individual-level data on birthweight and confounders. Three imputation methods were used to account for PFAS concentrations below the minimum reporting levels. Results: Adjusting for confounders and co-exposures, and using inverse-variance weights, we found an average change in birthweight of 19.9 g (95% CI: 16.2, 23.6), -32.9 g (95% CI: -35.8, -30.0), -8.0 g (95% CI: -11.4, -4.6), and -5.0 g (95% CI: -8.8, -1.2) per 10% increase in the detection of PFOA, PFOS, PFHpA, and PFHxS in public water by county, respectively. We found an average change in birthweight of -1.0 g (95% CI: -1.2, -0.8) per ng/L increase in the sum of PFOA, PFOS, PFHpA, and PFHxS concentrations in public water. Conclusions: The association between PFAS and birthweight varied by PFAS chemical in this study. Overall, we found a negative association between the total of four PFAS in public water and birthweight. Conclusions are tempered by inherent limitations of the two public-use datasets.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 3
ORAL SESSION 10
Health Impacts of Hurricanes in the Atlantic Basin
Chairs: Gregg Wellenius,US & Brooke Anderson, US

Coastal storms, hurricanes and multiple hospitalization outcomes in the United States

Presenter: Robbie Parks, The Earth Institute, Columbia University, New York, United States

Authors: R. M. Parks[1], G. B. Anderson[2], F. Dominici[3], M. A. Kioumourtzoglou[4];
[1]The Earth Institute, Columbia University, New York, NY, [2]Colorado State University, Fort Collins, CO, [3]Harvard T.H. Chan School of Public Health, Boston, MA, [4]Columbia University Mailman School of Public Health, New York, NY.

In the United States, coastal storms and hurricanes have a devastating impact on the economy, environment and human health. Previous assessments of health effects have largely focused on single deleterious and well-known events. These studies have examined associations with particular outcomes, such as physical injuries, parasitic and infectious disease, as well as adverse mental health. Less research has been conducted on the national impact of storms and hurricanes on a comprehensive set of adverse health outcomes. In the present study, we used data of over 120 million hospitalizations in the eastern United States from the dynamic Medicare cohort with a comprehensive record of exposures from storms and hurricanes over 16 years (1999-2014). We used conditional quasi-Poisson models to examine how storm events—defined as days with a sustained maximum wind speed of greater than 38 mph—affect hospitalizations from a set of mutually exclusive, clinically meaningful cardiorespiratory disease categories. We found that each storm event is associated with an increase in rates of hospitalization with a lag of one day from several key disease groups. Rate ratios for these disease groups included 1.10 (95%CI: 1.06-1.15) for congestive heart failure, 1.08 (95%CI: 1.01-1.14) for acute myocardial infarction, 1.06 (95%CI: 1.00-1.11) for pneumonia, 1.60 (95%CI: 1.52-1.68) for chronic obstructive pulmonary disease and bronchiectasis, and 1.27 (95%CI: 1.17-1.37) for respiratory failure. We will also present how rate ratios vary by lag time, age group, sex, and socioeconomic status, as well as how various storm events differently impact hospitalizations. Our findings demonstrate the need for targeted interventions and additional preparedness for key causes of hospitalization during storms and hurricanes, especially as these episodes are likely to increase in strength with global climate change.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 3
ORAL SESSION 10
Health Impacts of Hurricanes in the Atlantic Basin
Chairs: Gregg Wellenius,US & Brooke Anderson, US

Hurricane Flooding and Gastrointestinal Illness in North Carolina

Presenter: Arbor Quist, University of North Carolina at Chapel Hill, Chapel Hill, United States

Authors: A. J. Quist, M. D. Fliss, D. B. Richardson, P. L. Delamater, L. S. Engel;
University of North Carolina at Chapel Hill, Chapel Hill, NC.

Background: Hurricanes often flood homes, sewers, and drinking water systems, which can spread pathogens. Contact with pathogen-contaminated water can result in diarrhea, vomiting, nausea, or other gastrointestinal distress, known collectively as acute gastrointestinal illness (AGI). Hurricane Florence was a Category 4 hurricane that hit North Carolina (NC) in September 2018, causing extensive flooding. We investigated hurricane flooding in relation to AGI to inform future disaster planning. Methods: We obtained flood inundation data from the NC Department of Public Safety and calculated the percent of area flooded in each NC zip code after Hurricane Florence (among flooded zip codes: mean=16%, range=0.0006-100%). Zip codes that flooded ≥30% (N=104) were compared to those with no flooding. We used NC's syndromic surveillance system to calculate rates of AGI emergency department (ED) visits. We calculated rate ratios by comparing the AGI rates in flooded areas during the 3 weeks after Florence's landfall to the rates in these same zip codes during the 3 weeks before Florence. We compared these to the rate ratio in unflooded areas. We stratified by age and race to identify demographic patterns. Results: We observed a 19% increase in AGI ED visits in zip codes with ≥30% flooding during the 3 weeks after Florence compared to the 3 weeks before Florence (RR=1.19, 95% CI: 1.04, 1.36). During this same period, AGI rates in zip codes without flooding increased only 3% (RR=1.03, 95% CI: 0.99, 1.08). In areas that flooded ≥30%, the increase in AGI rate was highest for children ages 5-17 (RR=2.00, 1.09, 3.82) and American Indians (RR=1.92, 95% CI: 1.20, 3.16). Conclusions: Hurricane Florence flooding was associated with an increase in AGI rates, especially among American Indians, who have often been pushed to less desirable, flood-prone land, and NC children.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 3
ORAL SESSION 10
Health Impacts of Hurricanes in the Atlantic Basin
Chairs: Gregg Wellenius,US & Brooke Anderson, US

Evidence of association between flooding during and following Hurricane Harvey and reported illness

Presenter: Balaji Ramesh, Virginia Polytechnic Institute and State University, BLACKSBURG, United States

Authors: Balaji Ramesh1, Benjamin F Zaitchik2, Lauren Deanes2, Korine N Kolivras1, Samarth Swarup3, Julia M Gohlke1 1Virginia Polytechnic Institute and State University, 2Johns Hopkins University, 3University of Virginia

Background: The Centers for Disease Control and Prevention Social Vulnerability Index (CDC-SVI) has been used to identify census tracts that may be particularly vulnerable during and following disasters. Earth observations captured during or immediately after flooding may be useful in determining exposure risk. This study examines the association between self-reported illness, flooding extent, and the CDC-SVI in the greater Houston area during and following Hurricane Harvey. Methods: Data on reported illnesses were derived from the Hurricane Harvey Registry (now known as the Texas Flood Registry), a project that collects health, location, and exposure information from people affected by major storms. Survey responses from 14981 respondents, aggregated over 961 census tracts were included in the present analysis (https://doi.org/10.25612/837.EZX989NOXG51). Census tracts were categorized into no/minimally flooded or flooded areas using Dartmouth Flood Observatory remotely sensed flooding, captured at a resolution of 100m. Poisson regression models were used to characterize the association between proportion of respondents that reported illness in each tract, with flooding and CDC-SVI of the tract. Results: On average, respondents whose homes or neighborhood was flooded were 1.77 times (CI: 1.32-2.38 for home flooded and CI:1.27-2.45 for neighborhood flooded) more likely to report illness than those whose homes or neighborhood weren't flooded. Reported illness by respondents are also positively associated with remotely sensed flooding at the census tract level, with reported illness increasing by 12% (95% CI:2.8%-22%) on average in flooded versus no/minimally flooded tracts. The proportion of respondents that reported illness increased in the most socially vulnerable census tracts (third and fourth quartile) compared to the least (first quartile) by 20% (95% CI:5.7%-36%) and 81% (95% CI:59%-104%), respectively. Conclusions: Earth observations along with the CDC-SVI may be useful for identifying populations with increased health risks during flooding events.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 3
ORAL SESSION 10
Health Impacts of Hurricanes in the Atlantic Basin
Chairs: Gregg Wellenius,US & Brooke Anderson, US

Tropical Cyclone and Risk of Preterm Birth: A Retrospective Analysis of 20 Million Births across 378 US Counties

Presenter: Shengzhi Sun, Boston University, Boston, United States

Authors: S. Sun[1], K. Weinberger[2], M. Yan[3], G. Anderson[4], G. Wellenius[1];
[1]Boston University, Boston, MA, [2]University of British Columbia, Vancouver, BC, CANADA, [3]Peking University, Beijing, CHINA, [4]Colorado State University, Fort Collins, CO.

BackgroundThe public health impact of tropical cyclones (TCs) is expected to increase due to the continued growth of coastal populations and the increasing severity of these events. We aimed to estimate the association between prenatal exposure to TC and risk of preterm birth (PTB) in the eastern United States (US).MethodsWe included data on 19,529,748 spontaneous singleton births from 1989 to 2002 across 378 US counties. In each county, we classified days as exposed to a TC when TC-associated peak sustained winds at the county's population-weighted center were >17.2 m/s (gale-force winds or greater). We used distributed lag log-linear mixed-effects models to estimate the relative risk (RR) and absolute risk difference (ARD) for TC exposure by comparing PTBs occurring in TC-periods (from 2 days before to 30 days after) to matched non-TC periods. We conducted secondary analyses using different exposure metrics and thresholds.Results During the study period, there were 1,981,797 (10.1%) PTBs and 58 TCs that affected at least one studied US county. The risk of PTB was positively associated with TC exposure defined as peak sustained wind speed >17.2 m/s [RR: 1.01 (95% CI: 0.99, 1.03); ARD: 9 (95% CI: -7, 25) per 10,000 pregnancies], distance to storm track <60km [RR: 1.02 (95% CI: 1.01, 1.04); ARD: 23 (95% CI: 9, 38) per 10,000 pregnancies], and cumulative rainfall >100mm [RR: 1.04 (95% CI: 1.02, 1.06); ARD: 36 (95% CI: 16, 56) per 10,000 pregnancies]. Results were comparable when considering other wind, distance, or rain thresholds. The association was more pronounced among early PTBs and mothers living in more socially vulnerable counties but did not vary across strata of other hypothesized risk factors.ConclusionsPrenatal exposure to TC was associated with a higher risk of PTB. Our findings provide initial evidence that severe storms may trigger PTB.
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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 3
ORAL SESSION 10
Health Impacts of Hurricanes in the Atlantic Basin
Chairs: Gregg Wellenius,US & Brooke Anderson, US

Impact of Hurricane Maria on prenatal environmental exposures and mental health in Puerto Rico

Presenter: Deborah Watkins, University of Michigan School of Public Health, Ann Arbor, United States

Authors: D. Watkins[1], H. Torres Zayas[2], C. Vélez Vega[2], Z. Rosario[2], M. Welton[3], L. Agosto[2], Z. Feric[4], A. Alshawabkeh[4], J. Cordero[3], J. Meeker[1];
[1]University of Michigan School of Public Health, Ann Arbor, MI, [2]University of Puerto Rico, San Juan, PR, [3]University of Georgia, Athens, GA, [4]Northeastern University, Boston, MA.

Hurricane Maria struck Puerto Rico in September 2017, and previous research suggests that pregnant women who experience a natural disaster are at higher risk of adverse birth outcomes. However, it is unknown whether this is due to stress, hazardous exposures, or other factors. Puerto Rico already has one of the highest preterm birth rates in the US, so identifying vulnerable populations and modifiable risk factors in preparation for future disasters is critical. Here we characterize prenatal environmental exposures and mental health pre- and post-hurricane within the ongoing Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) birth cohort. We hypothesized that participants had higher exposures after Maria to polycyclic aromatic hydrocarbons (PAHs) due to extensive gas-powered generator use, increased phthalate exposure due to increased consumption of processed and packaged foods, and increased metals exposure due to increased water contamination. However, urinary concentrations of several PAHs decreased after the storm, suggesting that PAH exposure among this population is primarily from other sources (e.g. diet). Urinary cadmium, cobalt, and nickel levels increased after Maria, but concentrations of other metals decreased, possibly due to decreased tap water ingestion post-hurricane. Biomarker concentrations of phthalates commonly used in food packaging were higher among participants post-hurricane, while phthalates commonly used in personal care products were lower, suggesting that participants did not have regular access to fresh foods and water during hurricane recovery. We also hypothesized that experiencing Hurricane Maria could lead to increased reports of stress and depression, but we only observed this among women with the highest income (higher perceived stress) and highest education (higher depressive symptoms). Identification of specific hurricane-related experiences related to changes in exposure and mental health is ongoing. Ultimately, the goal of this work is to identify interventions that will minimize the impact of future natural disasters on adverse birth outcomes.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 4
SYMPOSIUM 6
From the University Door to the Congress Floor: How We Translate Science into Policy
Chairs: Joan Casey,US & Marianthi-Anna Kioumourtzoglou, US

Translating Scientific Findings on Environment and Health for Relevance to Decision Making

Presenter: Tracey J Woodruff, UCSF, San Francisco, United States

Authors: T. J. Woodruff;
UCSF, San Francisco, CA.

There is extensive scientific work and publications on exposures to industrial chemicals and pollution and their relationship to adverse health outcomes across the population. However, much of this data and findings are locked in scientific journals, scientific meetings and/or obscured by scientific jargon despite the relevance and importance of the findings to informing decisions that affect the public's health. Multiple audiences outside the scientific community need access to valuable scientific information including: community groups who want to understand exposures that affect their community and how to intervene on their behalf and policy makers who need to understand scientific findings for informing policy interventions to prevent harmful chemical exposures. This talk will draw upon extensive and deep expertise on identifying key scientific data that is relevant to the concerns of the public and policy makers and how to translate this information for effective evidence based decision making at the individual, community and policy level. Key examples discussed will be illustrating environmental chemical exposures and the importance of vulnerable populations, how to present scientific information in a credible and rigorous fashion and partnering with community and clinical community for effective engagement on environmental health issues. The talk will also highlight the relevance of scientific findings to current chemical policy work that is ongoing within the federal government in relation to the Toxics Substances Control Act.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 4
SYMPOSIUM 6
From the University Door to the Congress Floor: How We Translate Science into Policy
Chairs: Joan Casey,US & Marianthi-Anna Kioumourtzoglou, US

Making the most impactful science: incorporating policy-relevance into science throughout the scientific process

Presenter: Michelle L. Bell, Yale Univerity, New Haven, CT, United States

Authors: M. L. Bell, D. Esty;
Yale Univerity, New Haven, CT, CT.

Interaction between environmental health science and policy has moved from separate spheres to higher levels of communication with scientists sharing results with policy makers. However, much of this interaction is one-way and at the tail end of the scientific process, with the generation of easy to understand policy briefs on scientific evidence after analysis is complete. While useful to inform decision making, this process misses the opportunity to design scientific studies with multi-directional interaction between policy makers and scientists, so that research can be directed to be most informative to policy. Here we present examples from the U.S. Environmental Protection Agency funded Solutions to Energy AiR Climate and Health (SEARCH) Center's Policy and Decision-Making Unit. This Center includes interaction between scientists and policy makers at all stages of the scientific process to best enhance the direct applicability of scientific evidence to improve public health.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 4
SYMPOSIUM 6
From the University Door to the Congress Floor: How We Translate Science into Policy
Chairs: Joan Casey,US & Marianthi-Anna Kioumourtzoglou, US

Translating Science into Policy: the US Congress Perspective

Presenter: Priyanka Hooghan, Subcommittee on Environment
Committee on Science, Space, and Technology, Washington, United States

Authors: T. Woodruff;
UCSF, San Francisco, CA.

This presentation will discuss how scientists can conduct, translate, and communicate their science to be most impactful for policymakers. Specifically, it will emphasize what policymakers seek in science and scientific reports when they (1) develop policies and laws, and (2) oversee policy implementation. We will provide basic information on what differentiates a scientific manuscript from a policy brief and how scientists can most effectively communicate their results to best inform policy briefs.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 4
SYMPOSIUM 6
From the University Door to the Congress Floor: How We Translate Science into Policy
Chairs: Joan Casey,US & Marianthi-Anna Kioumourtzoglou, US

Community-based campaigns to advance from science to policy

Presenter: Peggy Shepard, New York, United States

Community-based campaigns are an effective tool to translate environmental health research to policy. Campaigns that are evidence-based can influence media, policymakers and provide credibility for community residents and advocates who can tell their story founded on their experience, community expertise and knowledge, and sound research. Organizing residents most affected by an environmental exposure to speak for themselves is compelling to elected officials and policymakers who often need mobilized communities to build the political will to assert their agency against experienced, well paid lobbyists. It is an important means of securing policies and practice that improves the environmental health of all especially the most vulnerable populations. Translation of research to policy is an important role for community partners engaged in community-academic partnerships. That role ensures that the research does not remain in peer-reviewed journals but is put into practice and policy. Methods include community organizing; training of residents to understand the data and to articulate their experience; strong interaction and collaboration between academics, community partners, advocates and community residents; and briefings for elected officials, policymakers, and media. Decades of community-academic partnership in Harlem and the South Bronx has yielded positive legislation and practice change on toxics, air pollutants, pesticides, and carbon reduction. Community-based campaigns can be effective and transformative with strong advocacy and organizing, and with academics who understand the value of their research being translated and guided -- by the people most affected-- into outcomes that improve health and knowledge at the grassroots and at the city, state and federal levels.

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ABSTRACT E-BOOK

August 24, 2020 / 15:00 - 16:30 / Parallel 4
SYMPOSIUM 6
From the University Door to the Congress Floor: How We Translate Science into Policy
Chairs: Joan Casey,US & Marianthi-Anna Kioumourtzoglou, US

Shepherding science into the decision-making process: case studies in food production and public health

Presenter: Keeve Nachman, Johns Hopkins Bloomberg School of Public Health, Baltimore, United States

Authors:

In an era of unprecedented attacks on the use of scientific evidence in public policy, there is an increasing urgency for academic researchers to play an active role in the translation of scientific evidence in support of public health decision-making. The role of researchers can take a variety of different forms, and any chance of success in these endeavors demands a nuanced understanding of the context in which the decisions are being made, familiarity with the players involved in the process, resilience, and tenacity. I will describe experiences translating my own research (alongside evidence generated by others) to support legislative and regulatory policies at the state and federal levels in the context of industrial food animal production. Lessons learned from both successful and failed efforts will be shared.

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ABSTRACT E-BOOK

August 24, 2020 / 18:30 - 20:00 / Parallel 1
ORAL SESSION 11
Emerging Environmental Threats in Asia and the Pacific
Chairs: Alistair Woodward,New Zealand & Junwei Xu, Canada

The effect of displacement on the association between landslides and mental wellbeing in Indonesia

Presenter: Kate Burrows, Yale University, New Haven, United States

Authors: K. Burrows[1], D. Pelupessy[2], M. L. Bell[1];
[1]Yale University, New Haven, CT, [2]University of Indonesia, Depok, INDONESIA.

Residential moves (displacement) due to natural disasters and environmental events may significantly impact mental health. Despite growing risk from climate change, health impacts of environmental-mobility remain understudied. We investigated the effects of landslide-displacement on mental wellbeing in Banjarnegara, Indonesia. Landslides are common in this area and many villages and farms are settled on steep slopes. This makes the population extremely vulnerable to landslide-displacement. In the quantitative phase of this mixed-methods study, we surveyed 420 individuals who experienced landslides over the past 5 years, and compared mental wellbeing between those who were displaced and those who were not displaced. We used mixed-effect generalized linear regressions to assess the effect of displacement on standard mental health outcomes (post-traumatic stress disorder, generalized anxiety disorder, and depression) as well as a set of “community-based definitions” of mental wellbeing that were identified during the first (qualitative) phase of this project (not presented here). These community-based definitions included feelings of safety, optimism, sense of economic stability, religiosity, and closeness with family and community. Preliminary results indicate a protective effect of displacement, which was higher when considering community-based definitions of mental wellbeing compared to standard mental health metrics. Those who were displaced were 3.97 (95% confidence interval [CI]: 1.89, 8.33) times more likely to report increases in economic stability after the landslide, 2.61 (95% CI: 1.12, 6.07) times more likely to report increased optimism about the future, and 4.45 (95% CI: 2.18, 9.06) times more likely to report feeling safer compared to those who did not relocate. These findings indicate that we should not only be attentive to the needs of those displaced by natural disasters, but also consider those who are left behind. Further, this work supports the need for community-based participatory research to fully capture the health impacts of environmental mobility.

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ABSTRACT E-BOOK

August 24, 2020 / 18:30 - 20:00 / Parallel 1
ORAL SESSION 11
Emerging Environmental Threats in Asia and the Pacific
Chairs: Alistair Woodward,New Zealand & Junwei Xu, Canada

Effects of the Sumatran forest fires (haze) on cognitive function in Indonesian children

Presenter: Geoff Morgan, University of Sydney, Sydney, Australia

Authors: B. Jalaludin[1], F. Garden[1], A. Chrzanowska[1], B. Haryanto[2], C. Cowie[1], F. Lestari[2], G. Morgan[3], S. Mazumdar[1], K. Metcalf[1], G. Marks[3];
[1]University of New South Wales, Sydney, AUSTRALIA, [2]Universitas Indonesia, Jakarta, INDONESIA, [3]University of Sydney, Sydney, AUSTRALIA.

Background: Smoke from the seasonal forest fires that occur on the Indonesian islands of Sumatra and Kalimantan (often referred to as 'haze' in South-East Asia) can reach hazardous levels for extended periods of time. This poses severe health risks to tens of millions of people. We aimed to determine if living in a haze affected province is associated with cognitive function in Indonesian children. Methods: We used data from the Indonesian Family and Life Survey (IFLS) that assessed cognitive function by the Ravens Colored Progressive Matrices (RCPM). Spatially resolved levels of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) throughout Indonesia were downloaded from the Atmospheric Composition Analysis Group. We used multilevel mixed linear regression models to estimate associations between haze and annual mean PM2.5 concentrations and cognitive function. Results: There were no differences in RCPM scores for children living in haze provinces compared to children living in non-haze provinces in adjusted models (mean difference=-1.16%, 95%CI=-2.53%, 0.21%) in each survey wave. For children who completed cognitive tests in two successive survey waves, scores on the second RCPM were lower for children who had lived in a haze province all their lives compared to those children who had lived in a non-haze province all their lives (β=-1.50%; 95%CI:-2.94%, -0.07%). Conclusions: Living in a haze province for a prolonged period of time negatively impacted childhood cognitive scores after adjusting for individual factors. These findings may also be relevant for (mainly) women and young children exposed to high levels of household air pollution.

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ABSTRACT E-BOOK

August 24, 2020 / 18:30 - 20:00 / Parallel 1
ORAL SESSION 11
Emerging Environmental Threats in Asia and the Pacific
Chairs: Alistair Woodward,New Zealand & Junwei Xu, Canada

Exposure to ambient particulate matter during pregnancy: Associations with birth weight in Thailand

Presenter: Will Mueller, Institute of Occupational Medicine, Edinburgh, United Kingdom

Authors: W. Mueller[1], M. Loh[1], S. Vardoulakis[2], H. J. Johnston[3], S. Steinle[1], N. Precha[4], W. Kliengchuay[5], K. Tantrakarnapa[5], J. W. Cherrie[1];
[1]Institute of Occupational Medicine, Edinburgh, UNITED KINGDOM, [2]Australian National University, Canberra, AUSTRALIA, [3]Heriot Watt University, Edinburgh, UNITED KINGDOM, [4]Walailak University, Nakhon Si Thammarat, THAILAND, [5]Mahidol University, Bangkok, THAILAND.

Background/Aim: Studies show birth weight (BW) is adversely associated with exposure to ambient particulate matter (PM) during pregnancy. Most research originates from high-income countries. The objective of this study was to quantify associations between BW and exposure to PM during pregnancy in Thailand. Methods: We obtained available hourly ambient air pollutant data (PM_{10} , Ozone [O_3], and Nitrogen Dioxide [NO_2]) from the government-operated network of ground monitors and individual birth weight data in Thailand during 2015-2018. We performed an ecological analysis to evaluate the association between mean trimester (T) exposure to PM_{10} with BW and low BW (<2,500 g), adjusting for gestation age, sex, number of previous pregnancies, mother's age, heat index, season, year, and NO_2 and O_3. We examined potential effect modification of PM_{10} exposure by sex and province.
Results: There were 83,931 eligible births during the study period with a mean pregnancy PM_{10} exposure of 39.7 μg/m^3 (SD = 7.7). In the continuous BW analysis, the entire pregnancy exposure to PM_{10} was associated with reduced BW only after adjustment for NO_2 (-6.76 g [95% CI = -12.49 to -1.04] per 10 μg/m^3 increment. In contrast with these findings, a reduced adjusted Odds Ratio (aOR) of LBW was associated with PM_{10} exposure in T1 (aOR = 0.953 [95% CI = 0.917 to 0.990]) and T2 (aOR = 0.942 [95% CI = 0.905 to 0.981]). Although some associations reached statistical significance, there was no consistent interaction observed by sex or province.
Conclusions: We found weak evidence that average PM_{10} levels during the whole pregnancy were associated with small reductions in BW, but also found exposure in T1 and T2 had a lowered risk of LBW. These findings call for additional research of air pollution and BW in low and middle income countries with improved exposure estimates.

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ABSTRACT E-BOOK

August 24, 2020 / 18:30 - 20:00 / Parallel 1
ORAL SESSION 11
Emerging Environmental Threats in Asia and the Pacific
Chairs: Alistair Woodward,New Zealand & Junwei Xu, Canada

Intra-country climate variability and geographical distribution of diarrhoea among children under five in Bangladesh

Presenter: Rezanur Rahaman, The University of Adelaide, Adelaide, SA, Australia

Authors: M. R. Rahaman[1], A. Milazzo[1], H. Marshall[1], S. M. Satter[2], M. Rahman[2], P. Bi[1];
[1]The University of Adelaide, Adelaide, SA, AUSTRALIA, [2]International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, BANGLADESH.

Background
Associations between climate and childhood diarrhoea are likely, particularly in the face of climate change. We estimated the effects of climate conditions on hospitalizations due to childhood diarrhoea across three Bangladeshi regions to assist develop regional prevention strategies.
Methods
Fortnightly hospital admissions (July/2012-June/2017) for diarrhoea (≥3 loose stool in a day, and symptoms lasting ≤7 days) in children under five years of age and fortnightly recordings for average maximum temperature, relative humidity and rainfall for 3 regions (i.e., Mymensingh-R1, Rajshahi-R2 and Sylhet-R3) were modelled using a Poisson regression model with distributed lag linear terms. Flexible spline functions were used to adjust models for season and trend. Lagged (delayed) effects of maximum temperature were estimated over 0-4 fortnights.
Results
Higher temperature was associated with fewer diarrhoea hospitalizations across the 3 regions (IRR 0.90-0.92, 95% CI [0.87-0.89] - [0.93-0.95]). When seasonality and long-term trends were adjusted, estimates moved towards the null. Adding relative humidity to the model did not change the effect estimates. There is evidence of an association between diarrhoea hospitalizations and maximum temperature at different fortnightly lags. When lag effects were adjusted for each other using distributed lag models, a negative association at lag 2 (IRR 0.70, 95% CI 0.55-0.90) was reported in R1.
Conclusions
Our results varied from previous studies in that higher temperature is associated with increased diarrhoea hospitalizations in Bangladesh. In addition, results underscore that the relationship between maximum temperature and diarrhoea hospitalizations could be confounded by season and long-term trends. Although the unadjusted lagged effects varied between regions in terms of directions, higher temperatures could cause fewer diarrhoea hospitalizations in Mymensingh for as long as a month. Our findings inform policymakers that climate change may have variable effects in different regions, hence childhood diarrhoea prevention strategies could merit region specific considerations over generic guidelines.

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ABSTRACT E-BOOK

August 24, 2020 / 18:30 - 20:00 / Parallel 1
ORAL SESSION 11
Emerging Environmental Threats in Asia and the Pacific
Chairs: Alistair Woodward,New Zealand & Junwei Xu, Canada

Dengue in Queensland, Australia

Presenter: Rokeya Akter, Queensland University of Technology, Brisbane, Australia

Authors: R. Akter, W. Hu, M. Gatton, H. Bambrick, S. Tong;
Queensland University of Technology, Brisbane, AUSTRALIA.

BackgroundDengue is a wide-spread mosquito-borne disease globally with a likelihood of becoming endemic in tropical Queensland, Australia. The aim of this study was to analyse the spatial variation of dengue notifications in relation to climate variability and socio-ecological factors in the tropical climate zone of Queensland, Australia.
Methods Data on the number of dengue cases and climate variables including minimum temperature, maximum temperature and rainfall for the period of 1st January 2010 to 31st December 2015 were obtained for each statistical local area (SLA) from Queensland Health and Australian Bureau of Meteorology, respectively. Socio-ecological data including estimated resident population, percentage of Indigenous population, housing structure (specifically terrace house), socio-economic index and land use types for each SLA were obtained from Australian Bureau of Statistics, and Australian Bureau of Agricultural and Resource Economics and Sciences, respectively. To quantify the relationship between dengue, climate and socio-ecological factors, multivariate Poisson regression models in a Bayesian framework were developed with a conditional autoregressive prior structure. Posterior parameters were estimated using Bayesian Markov Chain Monte Carlo simulation with Gibbs sampling.
Results In the tropical climate zone of Queensland, the estimated number of dengue cases was predicted to increase by 85% [95% Credible Interval (CrI): 25%, 186%] and 7% (95% CrI: 0.1%, 14%) for a 1-mm increase in annual rainfall and 1% increase in the proportion of terrace houses, respectively. The estimated spatial variation (structured random effects) was small compared to the remaining unstructured variation, suggesting that the inclusion of covariates resulted in no residual spatial autocorrelation in dengue data.
ConclusionsClimate and socio-ecological factors explained much of the heterogeneity of dengue transmission dynamics in the tropical climate zone of Queensland. Results will help to focus mosquito control activities in the most needed areas and will help in designing effective local dengue control programs.

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ABSTRACT E-BOOK

August 24, 2020 / 18:30 - 20:00 / Parallel 1
ORAL SESSION 11
Emerging Environmental Threats in Asia and the Pacific
Chairs: Alistair Woodward,New Zealand & Junwei Xu, Canada

Smoke-related health impacts of an unprecedented 2019/2020 forest fire season in Victoria, Australia

Presenter: Martine Dennekamp, Environment Protection Authority, Melbourne, Australia

Authors: M. Dennekamp[1], K. Martin[2], S. Coutts[1], J. Choi[1], A. Hinwood[1], A. Bone[2], D. Csutoros[2], V. Lynch[2], V. Mulvenna[2], F. Johnston[3];
[1]Environment Protection Authority, Melbourne, AUSTRALIA, [2]Department of Health and Human Services, Melbourne, AUSTRALIA, [3]University of Tasmania, Hobart, AUSTRALIA.

Background Victoria is a state in south-eastern Australia with a population of 6.6 million people. The 21st of November 2019 was the start of an unprecedented forest fire season during which 1.5 million hectares were burnt in Victoria. The fires were preceded by record fire danger weather in Australia and smoke affected large populations for a longer duration and with higher concentrations than previous fire seasons. As this was a recent event, detailed analysis of the wide-ranging health impacts are ongoing. Methods EPA Victoria commenced monitoring fine particles on 25th November 2019. A total of 32 air monitors measuring $PM_{2.5}$ were deployed across the state. Preliminary data on emergency department presentations from the Victorian Emergency Minimum Dataset were provided by the Victorian Department of Health and Human Services. Results Air pollution from the forest fires was worst in the eastern half of the State. The 24-hour air quality standard for $PM_{2.5}$ (25 µg/m^3) was exceeded for 50 days in the East Gippsland region. The maximum 24 hour average $PM_{2.5}$ was 3,253 µg/m^3 and was recorded in the town of Bright in the north east. The 1hr peak at Bright was 6,956 µg/m^3. Initial descriptive analyses of Victorian emergency department data clearly demonstrate an increase in respiratory-related emergency department presentations during this period. For example, in January 2020 Victorian emergency departments reported over 1,500 additional respiratory-related presentations compared to the same period the previous year. More detailed analyses investigating the association between forest fire smoke exposure and health effects using hospital admissions, Ambulance Victoria call-outs and calls to Nurse-on-Call are in progress. Conclusions Preliminary analyses have revealed major increases in respiratory-related emergency department presentations during an unprecedented 2019/2020 forest fire season in Victoria, Australia. Results of further analysis will be presented at the conference.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 1
KEYNOTE SESSION 2

Epidemiology for One Health: Applying New Tools to Inform the Control of Infectious Diseases at the Interface Between Humans, Animals and the Environment

Keynote Speaker: Nigel French, Massey University, New Zealand, Palmerston North, New Zealand

A One Health approach recognises the close connection between the health of people, animals and our shared environment. The emergence of Covid-19 and other globally important zoonoses, combined with pressing issues such as the rise of antimicrobial resistance and the impacts of climate change, have raised awareness of the need to work across disciplines, under a One Health framework. Understanding transmission pathways between animal and human hosts helps to guide policy and decision making – both in the face of outbreaks, and for reducing the burden associated with sporadic disease. Many tools and approaches have been developed in recent years, including molecular approaches and models that consider pathogen genetics, evolution and transmission between hosts. This presentation will outline recent advances in genomics and evolutionary modelling that have made a significant contribution to public health through the control of foodborne and environmental pathogens. The methods will be illustrated using examples from New Zealand, including determining the multiple sources of 'sporadic' campylobacteriosis, the emergence of an antimicrobial resistant strain of foodborne Campylobacter jejuni, and the use of genome sequencing to identify the source of a massive outbreak of campylobacteriosis associated with drinking water.

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School Closure for COVID-19 Control

Keynote Speaker: Gabriel Leung, University of Hong Kong, Li Ka Shing Faculty of Medicine, Hong Kong, Hong Kong

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Meteorological Determinants of Influenza and SARS-CoV-2 Survival and Transmission

Keynote Speaker: Jeffrey Shaman, Columbia University, International Research Institute for Climate and Society/Earth Institute, Environmental Health Scie, New York, United States, NY

Many pathogens, as part of their naturallifecycle, experienceperiods of time in either the ambient environment or poikilothermic vector intermediaries. During these periods, pathogen survival and transmissionmay bemodulated by physical environmental conditions.For influenza, considerable evidence indicates that atmospheric absolute humidity conditions alter virusviability and transmissibility once expelled from an infected host. The mechanisms underpinning this association remain underdetermined; however, thiseffect of humidity appears to explain the seasonality of influenzain temperate regions, as well as the timing of outbreaks during pandemic events.Here I discuss current understanding of this association withrespect to influenza and implications for the current SARS-CoV-2 pandemic.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 12
Indoor/Built Environment and Health
Chairs: Kenichi Azuma, Japan & Charlie Roscoe, US

Residential greenness and cardiovascular disease incidence, readmission, and mortality

Presenter: Hong Chen, Tongji University, Ottawa, Canada

Authors: H. Chen[1], R. T. Burnett[1], L. Bai[2], J. C. Kwong[2], D. Crouse[3], E. Lavigne[1], M. S. Goldberg[4], R. Copes[5], T. Benmarhnia[6], S. Ilango[6], A. van Donkelaar[7], R. Martin[8], P. Hystad[9];
[1]Health Canada, Ottawa, ON, CANADA, [2]ICES, Toronto, ON, CANADA, [3]Health Effects Institute, Boston, MA, [4]McGill University, Montreal, QC, CANADA, [5]Public Health Ontario, Toronto, ON, CANADA, [6]University of California, San Diego, La Jolla, CA, [7]Dalhousie University, Halifax, NS, CANADA, [8]Washington University, St. Louis, MO, [9]Oregon State University, Corvallis, OR.

Background: Living in greener areas of cities was linked to increased physical activity levels, improved mental wellbeing, and lowered harmful environmental exposures, all of which may influence health. However, whether living near urban green spaces may modify the risks of cardiovascular disease incidence, progression, and premature mortality is unclear. We aimed to examine the associations between residential green spaces and the incidence of acute myocardial infarction (AMI) and heart failure (HF), post-AMI and HF hospital readmissions, and mortality. Methods: We simultaneously followed four large population-based cohorts in Ontario, Canada, including the entire adult population, adults free of AMI and HF, and survivors of AMI or HF from 2000 to 2014. We estimated residential exposure to green spaces using the satellite-derived observations and ascertained health outcomes using validated disease registries. We estimated the associations using spatial random-effects Cox proportional hazards models. We conducted various sensitivity analyses including further adjusting for property values and performing exploratory mediation analysis. Results: Each interquartile range increase in residential greenness was associated with a 7% (95% confidence interval [CI]: 4%-9%) decrease in incident AMI and a 6% (95% CI: 4%-7%) decrease in incident HF. Residential greenness was linked to a ~10% decrease in cardiovascular mortality in both adults free of AMI and HF and the entire adult population. These associations remained consistent in sensitivity analyses and were accentuated among younger adults. Additionally, ~53% of the protective association between greenness and cardiovascular mortality was found to be mediated through its effect on AMI and HF. Conversely, living near green spaces was not associated with any delay in readmission or mortality among AMI and HF patients. Conclusions: Living in urban areas with more green spaces was associated with improved cardiovascular health in people free of AMI and HF, but not among individuals already developed these conditions.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 12
Indoor/Built Environment and Health
Chairs: Kenichi Azuma, Japan & Charlie Roscoe, US

Household Air Pollution (HAP) and Esophageal Squamous Cell Carcinoma: findings from a case-control study in Western Kenya

Presenter: Iva Cukic, University of Liverpool, Liverpool, United Kingdom

Authors: I. Cukic[1], D. Menya[2], E. Puzzolo[1], V. Mccormack[3], D. Pople[1];
[1]University of Liverpool, Liverpool, UNITED KINGDOM, [2]Moi Univeristy, Eldoret, KENYA, [3]IARC, Lyon, FRANCE.

Background/Aim. Esophageal Cancer (EC) is the most common cancer in Kenya with age standardised rates of 17.6 per 100,000 in both sexes, compared to 5.9 worldwide. Traditional risk factors (e.g. smoking and alcohol) are less prevalent in women. Exposure to HAP from solid fuel combustion may be part of the aetiology in this part of the population. Here, we test this hypothesis using data from a large case control study of EC conducted in Eldoret, Kenya.
Methods. A total of 430 cases and 440 age- and sex- frequency matched controls were recruited between 2014 and 2018 from Moi Teaching and Referral hospital. Risk factor profiles were collected (including on fuel use, and exposure to HAP from cooking and heating) along with biospecimens (urinary polycyclic aromatic hydrocarbons (PAHs)).
Results. Fire wood was the most prevalent fuel (n=393; 91.8% in cases and n=360; 82.4% in controls). A higher proportion of cases reported sleeping by the fire all year as a child (n=27; 6.3%) than controls (n=15; 3.4%). Use of firewood as the main cooking fuel was associated with an almost 2-fold increased risk of EC (OR=1.89, 95% CI 1.16-3.28). Sleeping by the fire all year as a child was associated with more than a doubling in risk of EC (OR=2.21, 95% CI=1.01-5.08). Levels of urinary PAHs were higher in healthy women (mean =2.78; sd=5.53) than men (1.67; sd=3.76) (p=0.02) and also in those who report being the main cook in the household (mean=3.43; sd=7.49) than those who did not (mean = 1.84; sd= 3.77) although not significantly (p=0.09).
Conclusions. These results are indicative that HAP from biomass use for cooking and heating is potentially associated in the aetiology of EC. Given their higher exposure due to traditional domestic duties, the HAP-associated risk might be greater in women.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 12
Indoor/Built Environment and Health
Chairs: Kenichi Azuma, Japan & Charlie Roscoe, US

Household Air Pollution Exposure and Childhood Blood Pressure: Evidence from GRAPHS

Presenter: Seyram Kaali, Kintampo Health Research Centre, Kintampo, Ghana

Authors: S. Kaali[1], D. Jack[2], R. Dwommoh[1], Q. Yang[2], M. Mujtaba[1], S. Chillrud[3], O. Agyei[1], P. L. Kinney[4], K. P. Asante[1], A. Lee[5];
[1]Kintampo Health Research Centre, Kintampo, GHANA, [2]Columbia University Mailman School of Public Health, New York City, NY, [3]LDEO of Columbia University, New York City, NY, [4]Boston University School of Public Health, Boston, MA, [5]Icahn School of Medicine at Sinai, New York City, NY.

Background Household air pollution (HAP) exposure results in ~2.8 million premature deaths annually, largely due to cardiovascular disease. The effects of early life HAP exposure, or a clean cookstove intervention, on child blood pressure (BP), are unknown.
MethodsThe Ghana Randomized Air Pollution and Heath Study (GRAPHS) randomized pregnant, non-smoking women to one of two cookstove interventions (liquefied petroleum gas, LPG, or improved biomass cookstove) or control, through the index child's first birthday. Personal HAP exposures [fine particulate matter (PM2.5) and carbon monoxide (CO)] were repeatedly measured prenatally and through child age 4 years. At child age four and five years, we measured resting systolic BP (SBP) and diastolic BP (DBP) (Dinamap Pro 100) per protocol in N=631 children. We employed generalized estimating equations to examine associations between early life CO and $PM_{2.5}$ and SBP and DBP, following adjustment for maternal age, child sex, BMI, ethnicity and second-hand tobacco smoke exposure. We then employed multivariable linear regression to determine associations between cookstove intervention arm and SBP and DBP. Sex-specific effects were explored.
ResultsMedian $PM_{2.5}$ and CO exposures were 67.5µg/m^3 (IQR=42.3-103.6) and 0.87ppm (IQR=0.49-1.41) respectively. Higher early life $PM_{2.5}$ and CO exposures were independently associated with higher SBP [($PM_{2.5}$: 0.24mmHg (0.12-0.35)] per 10µg/m^3 increase in $PM_{2.5}$; CO: 0.59 mmHg (95% CI 0.07-1.12) per 1ppm increase in CO]. Children born to mothers randomized to the LPG arm had lower SBP (-1.62mmHg, 95% CI -3.34, 0.09, p=0.06) and lower DBP (-1.63mmHg, 95% CI -3.13, -0.12, p=0.03), compared to control. Girls were more responsive to the LPG intervention (Girls SBP: -2.73mmHg, 95% CI -5.12, -0.34 vs Boys: SBP: -0.36mmHg, 95% CI -2.85, 2.13).
Conclusion Early life HAP exposure is associated with increased SBP in early childhood and a clean-fuel cookstove intervention may ameliorate this effect, particularly amongst girls.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 12
Indoor/Built Environment and Health
Chairs: Kenichi Azuma, Japan & Charlie Roscoe, US

Living near greener spaces is associated with lower risk of diabetes-related mortality in Brussels, Belgium: a 13-year mortality follow-up study

Presenter: Lucia Rodriguez Loureiro, Vrije Universiteit Brussel, Brussels, Belgium

Authors: L. Rodriguez Loureiro[1], L. Casas[2], M. Bauwelinck[1], C. Noël[1], S. Gadeyne[1];
[1]Vrije Universiteit Brussel, Brussels, BELGIUM, [2]KU Leuven, Leuven, BELGIUM.

Background/Aim: Living in greener areas has been related to a lower risk of diabetes disease, but few studies have explored its association with diabetes-related mortality. This study examined the relationship between objective and subjective indicators of residential urban green spaces (UGS) and diabetes-related mortality in Brussels.Methods: We used data from the 2001 Belgian census linked to migration and mortality register data during 2001-2014. We included objective indicators of UGS within 300m buffers from the residential address (surrounding greenness -NDVI-; surrounding green spaces -Urban Atlas-) and an area-level subjective indicator of perceived neighbourhood greenness. We considered the full causal chain of events leading to death, i.e. we included deaths from diabetes as both the original cause of death and as any cause of death (immediate, intermediate, original or additional). Cox proportional hazards models were conducted to obtain hazard ratios (HR) for diabetes-related mortality. Models were adjusted for age, gender, migrant background, education, housing tenure, $PM_{2.5}$, night noise levels and area-level socioeconomic status (percentage of unemployed). Effect modification by gender, education and migrant background was assessed.Results: We included 734,806 individuals aged 16-80 in 2001. We observed 1,318 (1.5%) deaths from diabetes as the original cause and 5,268 (6.1%) deaths from diabetes as any cause. IQR increases of both surrounding and perceived neighbourhood greenness were inversely associated with diabetes-related mortality. Associations were stronger for diabetes as the original cause of death (e.g. with surrounding greenness: aHR:0.83, 95%CI:0.74-0.93). No associations were found for surrounding green spaces after adjusting by area-level SES. We observed a significant interaction between perceived neighbourhood greenness and gender with diabetes-related mortality: beneficial associations were stronger among women (for diabetes as original cause of death: aHR:0.80, 95%CI:0.69-0.94).Conclusions: Our findings suggest that living near UGS in Brussels might reduce diabetes-related mortality risk. The perception of neighbourhood greenness might be crucial among women.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Long-term exposure to air pollution and heart failure: a systematic review and meta-analyses

Presenter: Zorana Jovanovic Andersen, University of Copenhagen, Copenhagen, Denmark

Authors: K. S. Nielsen, Z. J. Andersen, J. Cramer, H. Amini, Y. Lim;
University of Copenhagen, Copenhagen, DENMARK.

Background: Long-term exposure to air pollution has been linked to coronary cardiovascular disease andcerebrovascular disease mor, yet litearture on heart failure (HF) is rather new and limited. We performed asystematic review and meta-analysis to investigate the association between long-term exposure to airpollution and HF.Methods: We performed an extensive literature search in PubMed, Embase and Web of Science untilSeptember 23, 2019. We identified 1,627 unique studies referring to air pollution and heart failure, fromwhich 10 were included in the meta-analyses. We applied random-effects models to combine risk estimatesof association between air pollutants and HF incidence, and estimated between studies heterogeneity. Weassessed publication bias through plots and the Egger's test.Results: We identified 10 studies investigating associations between long-term exposure to air pollutionand HF published between 2013 and 2019. All 10 studies were cohort studies, two from UK, one from theNetherlands, one from Denmark, one from Sweden, three from Canada, one from US, and one from SouthKorea. The pooled hazard ratio (HR) for association between long-term exposure to PM2.5 and HF incidencefor 1 μg/m^3 increase was 1.04 (95% Confidence Interval (CI): 1.02-1.06), based on 9 studies; for PM10 pooledHR was 1.02 (1.00-1.04) per 1 μg/m^3 increase, based on 3 studies; for NO2 pooled HR was 1.20 (1.09-1.32)per 20 μg/m^3 based on six studies, and for O3 pooled HR was 0.97 (0.89-1.05) per 10 μg/m^3 increase, basedon 4 studies. There are 2 studies on ultrafine particles, with pooled HR of 1.29 (0.77-2.17) per 10,000particles/m^3. There was high heterogeneity between study-specific results for most of the analyses,attributed to different populations under study. There was little evidence of publication bias.Conclusions: We found evidence for an association between long-term exposure to air pollution and risk ofHF.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Estimating exposure to drinking water quality on a national level - Danish Design Drinking Water Epidemiology

Presenter: Jörg Schullehner, Department of Public Health, Aarhus University, Aarhus, Denmark

Authors: J. Schullehner[1], B. Hansen[2], D. D. Voutchkova[2], K. Wodschow[3], A. K. Ersbøll[3], R. R. Jones[4], M. H. Ward[4], V. Coffman[5], L. Stayner[5], S. M. Kristiansen[6], P. J. Clemmensen[1], N. H. Ebdrup[7], C. H. Ramlau-Hansen[1], M. Thygesen[8], S. Dalsgaard[8], C. B. Pedersen[9], T. Sigsgaard[9];
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Denmark has long been considered a model country for conducting epidemiological studies, because the entire population can be evaluated as a cohort due to comprehensive health and administrative registers. We present a nationwide exposure model for drinking water quality linked to longitudinal residential locations and health outcomes. Using our approach, we can now link drinking water exposure variables to the entire Danish population. The model was first introduced in 2014 and has since been updated so that today we can estimate drinking water quality for every resident of Denmark during the past 40 years and has been applied in numerous epidemiological studies on a range of outcomes, from mental health to cancer. Drinking water samples have been analyzed by certified laboratories and registered in a centralized national monitoring database, covering both public supplies and private wells for several decades. In this presentation, we focus on the details for the exposure modelling: linking approx. 9 million drinking water quality samples in space and time to individuals using a geographical information system (GIS). We digitized more than 3500 modern and historical water supply areas and linked them to monitoring data from more than 4500 public waterworks. Users of the more than 60,000 private wells generally have significantly lower water quality than users of public supplies. It was therefore crucial to identify private well users, which we did by proximity analyses.
We will present examples that highlight how a detailed spatial and longitudinal exposure assessment can be critical in epidemiological studies of drinking water quality, e.g. compound-specific exposure patterns or closures of waterworks. We will also give an overview of completed and ongoing epidemiological studies based on this exposure model and discuss opportunities for future studies.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Effectiveness of air pollution intervention and health impacts in low and middle income countries-A scoping review

Presenter: Suganthi Jaganathan, Centre for Chronic Disease Control, NEW DELHI, India

Authors: S. Jaganathan[1], P. Prabhakaran[2], S. Mandal[1], K. Singh[2], P. Ljungman[3], D. Prabhakaran[1];
[1]Centre for Chronic Disease Control, NEW DELHI, INDIA, [2]Public Health Foundation of India, NEW DELHI, INDIA, [3]Kaolinska Institute, Stockholm, SWEDEN.

Background Ambient air pollution is associated with a large burden of disease in low- and middle-income countries (LMICs). To date, no systematic review has assessed the effectiveness of personal interventions aiming to reduce ambient air pollution and its health impact. Objectives To assess the effectiveness of personal interventions to reduce ambient air pollution and associated health outcomes. Methodology We searched electronic database, PubMed as on 28th February 2020. We included studies that evaluated interventions to reduce ambient air pollution from personal protection (air purifiers and face masks/respirators), and effect on cardio-metabolic diseases and outcomes. We restricted the studies to low and middle income countries. Results Our search yielded 466 studies and for this review we included 11 main studies assessing 8 unique interventions. Six unique interventions using air purifiers and two unique interventions using facemasks were included for this review. All the included studies were from China. The interventions were implemented in urban or community settings in cities like Beijing, Shanghai and Hunan Province. All the included studies were randomised double-blind crossover trials, except for one study which was a pre-post intervention study. The intervention period ranged from 2 hours to 5 weeks. Health outcomes studied ranged from blood pressure, pulse pressure, arterial pressure, vasoconstrictive biomarkers, endothelial dysfunction and insulin resistance. All the included studies were with minimum to no risk of bias. The included studies indicated that the studied health outcomes like heart rate variability (-1-3%), blood pressure (0.39-3.0 mmHg), pulse pressure (-3.3%), and insulin resistance improved with the intervention along with improving the air quality and reducing the personal exposure to air pollution by 34.8 to 72.4%. Conclusion Overall, the evidence suggests that the assessed interventions improve the indoor air quality and the studied health outcomes.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Mother-level random effect in the association between $PM_{2.5}$ and low birth weight: A population-based pregnancy cohort in Israel

Presenter: Wiessam Abu Ahmad, Hebrew University–Hadassah, Jerusalem, Israel

Authors: W. Abu Ahmad[1], R. Nirel[2], I. Kloog[3], R. Golan[3], M. Negev[4], G. Koren[5], H. Levine[6];
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Background/Aim: A growing body of literature reports associations between exposure to particulate matter with diameter ≤2.5 μm ($PM_{2.5}$) during pregnancy and term low birth weight (TLBW). Although many studies accounted for clustering due to maternal region of residence, clustering due to inclusion of siblings in the cohort has not been sufficiently explored. We assessed the association between $PM_{2.5}$ and TLBW in a cohort with high prevalence of siblings by using multilevel models accounting for geographical- and mother-level correlations. Methods: In Israel, we used Maccabi health services data to establish a population-based cohort of 437,370 singleton births reaching 24-42 weeks' gestation and birth weight of 500-5,000 g (2004- 2016). Daily $PM_{2.5}$ predictions from a satellite-based spatiotemporal model were linked to the date of birth and maternal residence. We generated mean $PM_{2.5}$ values for the entire pregnancy and for each trimester of pregnancy. Associations between exposure and TLBW were modeled by using logistic regression model with random effects for locality of residence, administrative census area and mother.Results: Based on intra-class correlation coefficient (ICC) values and a comparison of the likelihood between models, the 2-level model clustered to the mother-level was the best one. A 10-μg/m^3 increase in $PM_{2.5}$ over the entire pregnancy was associated with TLBW when entering sequentially random effects of locality of residence, administrative census area and mother [Odds ratio, 95% confidence interval) = (1.13, 0.99-1.28), (1.13, 1.01-1.27), (1.16, 1.01-1.34) respectively]. The association accentuated to (1.22, 1.08-1.39) in the model with mother-level only. Estimates for TLBW for every 10-μg/m^3 increase in the mean first, second, and third trimester $PM_{2.5}$ were (1.02, 0.92 -1.12), (1.09, 0.99-1.21), and (1.17, 1.05-1.30), respectively.Conclusions: Consideration of mother-level variability in a region with high fertility rates provides new insights on the size of associations between TLBW and $PM_{2.5}$.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Different effects on anemia of short-term indoor air purifier intervention in housewives: KoCHENS-MOM study

Presenter: Youngrin Kwag, Ewha Women University, Seoul, Korea, Republic of

Authors: y. Kwag, E. Ha;
Ewha Women University, Seoul, KOREA, REPUBLIC OF.

Background Housewives are involved in daily household chores such as cleaning and laundry, thus making them exposed directly to indoor particulate matter (PM) exposure. Indoor PM exposure is a potential factor that increases systemic inflammation and affects hematopoietic action. This study aims to investigate the association between indoor PM and indicators of anemia (Hemoglobin, Mean Cell Volume; MCV, Mean Corpuscular Hemoglobin; MCH, Mean Morpuscular Hemoglobin Concentration; MCHC, Erythrocyte Sedimentation Rate; ESR) during air purifier intervention in housewives. Methods We recruited a total of 300 housewives in Seoul and Ulsan, Republic of Korea. Among them, we analyzed the data of 40 housewives who were subjected to the Air cleaner arbitration. Indoor exposure level of PM2.5 and PM10 of each housewife was analyzed as the adjusted value of the sensor measurement. We also investigated the indicator of anemia such as hemoglobin, MCV, MCH, MCHC and ESR before and after the installation of air purifier for one month. Statistical analysis was performed by multiple generalized linear model (GLM). Results The difference in indoor PM exposure levels by air purifier was related in all anemia indicators (Hemoglobin, MCV, MCH, MCHC and ESR). The decrease in the level of indoor PM2.5 level was associated with a decrease in MCHC (β: -1.39, P = 0.05) and ESR (β : -0.08, P = 0.04). The decrease in level of indoor PM10 level was associated with a decrease in MCVH (β: -2.60, P = 0.05) and ESR (β: -0.16, P = 0.04). Conclusion Our results suggest, that the intervention of indoor air purifier decreases PM exposure and affects the anemia indicators. In addition, we will analyze the effects of the air purifier for about three months. In conclusion, anemia and inflammation can be improved by managing indoor PM exposure

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Concurrence of heatwaves and extreme ozone episodes and impact on health and well-being

Presenter: Kenza KHOMSI, Morocco Weather Service, Casablanca, Morocco

Authors: K. KHOMSI[1], H. Najmi[1], Z. Souhaili[2];
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Climate change and air pollution are universal related problems and their combined monitoring, at national, regional and local scales, is a worldwide primary public concern. Industrial and traffic activities emit various pollutants that are harmful to health, among which we count ozone (O3) which concentrations may be accentuated under the influence of sunny days. Ozone in the air we breathe can cause respiratory diseases and can trigger a variety of health problems including chest pain, coughing, throat irritation, and airway inflammation. It can also reduce lung function and harm lung tissue. People most at risk include people with asthma, children, older adults, and people who are active outdoors. Temperature is the first meteorological factor to be directly involved in leading to ozone extreme events. In Morocco, the cities of Casablanca and Marrakech are metropolises whose rate of urbanization and population density are the highest in the country, they concentrate many large industrial units and a large vehicle fleet generating pollution. Urban and atmospheric conditions in both cities make them vulnerable to climate change extremes and air pollution episodes that may directly affect population health and wellbeing. In the context of global climate change, more frequent and/or persistent heatwaves and extreme ozone episodes are likely to occur during the next decades and a key question is about the concurrence of these extremes and their joint effect on human health. In this work, using surface temperature and ozone observations during extended summers (April-September), between 2009 and 2016, in Casablanca and Marrakech, we evaluate the thermal comfort and air quality health indexes related to concurrent heatwaves and ozone episodes in order to assess their impact on health and wellbeing. We show that the extremes in temperature and ozone cluster together in many cases and cause the two indexes to worsen.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 3
PECHA KUCHA SESSION 1
Chairs: George Downward, Netherlands & Ulrike Gehring, Netherlands

Human uptake of phthalates from indoor home dust in the SELMA study

Presenter: Anna-Sofia Preece, Department of Health Sciences, Karlstad University, Karlstad, Sweden

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[1]Department of Health Sciences, Karlstad University, Karlstad, SWEDEN, [2]Division of Occupational and Environmental Medicine, Lund University, Lund, SWEDEN.

Background/aim: Phthalates are widely used in consumer products from which they can leach or evaporate, causing every day exposure linked to adverse health effects in humans. However, current knowledge of contributions of different uptake routes to total uptake is incomplete. This study aims to investigate associations between phthalate levels in home indoor dust and biomarkers of phthalate uptake in pregnant women, and model uptake contributions.
Methods: Levels of five phthalates in settled bedroom dust from above floor level and corresponding metabolites in urine from 455 Swedish pregnant women were analyzed using GC-MS/MS to estimate uptake from home indoor environment using adapted steady-state models. Gas and airborne particle phase concentrations were extrapolated from dust assuming steady-state partitioning. Three indoor uptake routes were included in estimations: dust ingestion, airborne particle/gas inhalation, and dermal gas contact.
Results: Dust levels of di-ethyl phthalate (DEP), di-butyl phthalate (DBP) and butyl-benzyl phthalate (BBzP) significantly ($p<0.001$) correlates with corresponding urine metabolites (R^2=0.23, 0.14 and 0.37 respectively), with no such trend for di-ethyl-hexyl phthalate (DEHP). Indoor exposure at home (13h/day) make a meaningful contribution (%) to total daily uptake of DEP (median 11%) and DBP (median 27%), with dermal gas uptake being dominant. The home indoor contributions to total uptake of less volatile BBzP and DEHP were minor (medians 1-2%), although they dominate uptake from the dust ingestion route. For women with PVC bedroom flooring, the relative contribution of home indoor exposure nearly doubled for uptake of BBzP and DEHP (96% increase each).
Conclusion: Our results suggest that home indoor exposure contribute to phthalate uptake in pregnant women, in particular for more volatile compounds. Also, although small compared to total uptake, PVC flooring can increase indoor contribution to uptake of BBzP and DEHP. Our results suggest that reducing indoor exposure will reduce phthalate uptake in pregnant women.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 7
Recent Advances and Future Collaboration in the Birth Cohort Consortium of Asia
Chairs: Jun Zhang,China & Reiko Kishi, Japan

Association between Per- and Polyfluoroalkyl Substances (PFAS) and Semen Quality in Men of Reproductive Age in China

Presenter: Kai Luo, Ministry of Education-Shanghai Key Laboratory of Children's Environmental Health Xinhua Hospital
Shanghai Jiao-Tong University School of Medicine, Shanghai, China

Authors: K. LUO[1], X. Liu[2], R. Aimuzi[1], Y. Wang[1], M. Nian[1], J. Ao[1], D. Chen[2], J. Zhang[1];
[1]Xinhua Hospital Shanghai Jiao Tong University School of Medicine, Shanghai, CHINA, [2]School of Environment, Guangzhou Key Laboratory of Environmental Exposure and Health, and Guangdong Key Laboratory of Environmental Pollution and Health, Jinan University, Guangzhou, CHINA.

Abstract Background/Aim: The relation between per- and polyfluoroalkyl substances (PFAS) and semen quality is evolving, but current epidemiologic results remain equivocal. We examined the associations between PFAS and semen quality among men of reproductive age.Methods: Included were 654 men who came for preconception care in the preconception cohort of the Shanghai Birth Cohort. Seven general semen parameters were assessed, along with the measurement of 31 targeted PFAS and PFOS (Perfluoro-1-octanesulfonate)/ Perfluoro-n-octanoic acid (PFOA) isomers in serum. PFAS were ln-transformed to improve their normality. Box-Cox transformation was used to improve normality of semen indexes. Multiple linear regression and sparse partial least square (SPLS) regression, a multi-pollutant model, were used for association analyses. All analyses were limited to the PFAS detected in > 50% of serum samples.Results:After adjusting for age, body mass index, family annual income, smoking status, alcohol consumption and abstinence time, the SPLS analyses suggested that perfluoro-n-decanoic acid (PFDA), perfluoro-n-undecanoic acid (PFUDA) were consistently inversely associated with semen concentration [beta= -0.07(95% confidence interval: -0.13,-0.01) and-0.07 (-0.14,-0.01) for each standard unit increase in PFDA and PFUDA, respectively], progressive motile rate (-0.61 (-1.02,-0.25) and -0.66 (-1.04,-0.34) for PFDA and PFUDA, respectively) or semen motile index [-0.76 (-1.33,-0.32) for PFUDA]. Consistent inverse associations of perfluoro-n-nonanoic acid (PFNA) with progressive motile rate, average velocity and semen motile index were also observed in SPLS analyses. In addition, perfluoro-n-heptanoic acid (PFHpA) was significantly inversely associated with semen motile rate and progressive motile rate. Other PFAS congeners showed less associations with semen quality. In general, the direction of associations in SPLS analyses was consistent with that in multiple linear regression. Conclusions:Our results suggested that exposure to certain PFAS congeners were inversely associated with general semen quality among men of reproductive age. These associations were robust to the adjustment of multi-collinearity among PFAS congeners.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 7
Recent Advances and Future Collaboration in the Birth Cohort Consortium of Asia
Chairs: Jun Zhang,China & Reiko Kishi, Japan

PFAS and BPA exposures in utero and their alteration of DNA methylation at birth: the Hokkaido Study in collaboration with Taiwan cohorts

Presenter: Atsuko Araki, Hokkaido University Center for Environmental and Health Sciences, Sapporo, Japan

Authors: Chihiro Miyashita Hokkaido University
Ryu Miura Hokkaido University
Shu-Li, Julie Wang National Health Research Institutes
Mei-Lien Chen National Yang Ming University
Reiko Kishi Hokkaido University

Epigenetics is the study of heritable changes in gene expression that do not involve changes to the DNA sequence, and DNA methylation is one of the epigenetic modifications. Technologies make it possible to determine epigenome-wide DNA methylation (EWAS). Recent studies focus the environmental chemical exposures in utero and the DNA methylation levels at birth. Characterization of epigenetic changes may provide valuable insight into the mechanism by which our health is influenced by the environment and biomarkers of exposure. To minimize the influence of false positive results, application of a priori analysis in one study with validation to examine replication in another study is ideal to confirm the findings. In the Hokkaido Study on Environment and Children's Health, Sapporo cohort, 514 pairs of pregnant women and their children were enrolled. Exposures to PFOS, PFOA, and bisphenol A (BPA) in maternal/cord blood were measured to determine in utero exposure. We assessed DNA methylation in cord blood samples and examined the associations between methylation and these exposure levels. We have collaborated with Taiwan Cohorts to conduct replication analysis. For PFOS and PFOA, we found that four differentially methylated positions (DMPs). Among the top five DMRs ranked by the lowest P-values that were associated with exposure to PFOS and PFOA, in addition to ZFP57, DMRs in the CYP2E1, SMAD3, SLC17A9, GFPT2, DUSP22, and TCERG1L genes showed the same direction of effect in the replication cohort. For BPA, we observed that a large portion of BPA-associated differentially methylated CpGs with hypomethylated among female infants (98%), and hypermethylated (88%) among males. Genes annotated to FDR-corrected CpGs clustered into an interconnected genetic network among males, whereas the female-specific genes were significantly enriched for gene ontology terms related to cell adhesion. Our epigenome-wide analysis of cord blood DNA methylation implies potential sex-specific epigenome responses to BPA exposure.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 7
Recent Advances and Future Collaboration in the Birth Cohort Consortium of Asia
Chairs: Jun Zhang,China & Reiko Kishi, Japan

In-utero and childhood chemical exposome in Birth Cohort Consortium of Asia

Presenter: Mei Huei Chen, National Health Research Institute, Miaoli County, Taiwan

Authors: Mei-Huei Chen, National Health Research Institute, Miaoli, Taiwan
Ching-Chun Lin, National Taiwan University College of Public Health, Taipei, Taiwan
Meng-Shan Tsai, National Taiwan University College of Public Health, Taipei, Taiwan
Pau-Chung Chen, National Taiwan University College of Public Health, Taipei, Taiwan

The concept of exposome, which refers to measures that reflect all exposure events of an individual during a lifetime and how those exposures relate to disease, has opened a new approach toward children' environmental health. This study aims to characterize concentrations of numbers of environmental pollutants in pregnant women from Asia and their children, based on chemical analysis of biological samples.
We use the information from Birth Cohort Consortium of Asia (BiCCA) and focus on China, Japan, Korea and Taiwan. Biomarkers or metabolites of exposure to 28 environmental pollutants include heavy metals (as arsenic, cadmium, lead, manganese and mercury), perfluoroalkyl substances (PFASs) and Phthalates were measured in biological samples from mothers during pregnancy, children at birth or postnatal followup.
The detection rates of exposure biomarkers were high for phthalate metabolites, but ranged widely for PFASs. The concentrations were different between cohorts for all compounds, except for cadmium.
However, the biological samples used for heavy metal measurements vary depending on blood, serum or urine, and some difficulties will be encountered when directly comparing. For PFASs, Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonate (PFOS) were the most common detectable chemicals, while the concentrations gradually decreased from maternal blood during pregnancy, cord blood to childhood blood. In addition, the composition of PFASs shows a region-specific pattern, and new alternative chemicals, such as Perfluorobutane sulfonic acid (PFBS), have been found in recently collected biological samples. Mono-n-butyl phthalat (MnBP), Mono-benzyl phthalate (MBzP) and Mono-2-ethylhexyl phthalate (MEHP) were commonly detectable phthalates, their concentrations were highest around preschool age.
Here we provide the unique description of environmental pollutants including composition pattern, concentration distribution, regional differences and time trend among pregnant women and their children in Asia. It is crucial for further investigation on childrens' health impact in consideration with exposome and international comparison.
Keywords:
Exposome, Birth cohort consortium of Asia, Metals, Perfluoroalkyl Substances, Phthalates

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 7
Recent Advances and Future Collaboration in the Birth Cohort Consortium of Asia
Chairs: Jun Zhang,China & Reiko Kishi, Japan

The mediation role of insulin-like growth factor 1 in the relationship between prenatal PFBS exposure and adiposity in pre-school girls

Presenter: Qian Chen, Shanghai Jiao Tong University School of Medicine, Shanghai, China

Authors: Q. Chen, Y. Zhao, W. Lu, J. Wu, F. Ouyang, L. Huang, J. Zhang;
Shanghai Jiao Tong University School of Medicine, Shanghai, CHINA.

Background: Perfluorobutane sulfonate (PFBS), one of the commonly used short-chain per- and polyfluoroalkyl substances (PFAS), has a positive association with adiposity in pre-school girls. However, the exact mechanism of this association remains unknown.Objective: We aimed to investigate whether and the extent to which insulin-like growth factor 1 (IGF1) mediates the association between prenatal exposure to PFBS and female childhood adiposity at 5 years of age.Methods: We conducted a prospective birth cohort study involving 556 pairs of pregnant women-girls from 2012 to 2017 in Shanghai. Fetal umbilical cord blood was collected at birth.
A total of 178 girls completed the adiposity measurements using a bioelectrical impedance analysis method. IGF1 and IGFBP3 were measured at 5 years of age, and cord plasma PFAS were tested using LC-MS/MS. Multivariable linear models after adjustment for potential confounders were used to evaluate the associations between PFAS and childhood adiposity. A mediation analysis was used to evaluate the percentage eliminated by IGF1 in the relationship between PFBS exposure and body components at 5 years of age.Results: The median concentration of PFBS in the cord plasma was 0.05 ng/mL. Multivariable linear regression found that PFBS had a significant positive association with waist circumference, fat mass, body fat percentage and waist to height ratio. PFBS also had a significant positive association with IGF1 and IGF1/IGFBP3. Meanwhile, there was a significant positive association between IGF1 and body components. After the mediation analysis, the proportions of the association eliminated by IGF1 was 52.4% for BMI, 35.2% for fat mass, 27.9% for body fat percentage, and 28.4% for waist circumference, respectively. Conclusions: Our findings suggest that IGF1 may play a substantial role in the association between PFBS exposure and adiposity in pre-school girls. These findings provide us a better understanding of the toxicity of PFBS.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 7
Recent Advances and Future Collaboration in the Birth Cohort Consortium of Asia
Chairs: Jun Zhang,China & Reiko Kishi, Japan

Prenatal exposure to air pollutants and childhood atopic dermatitis and allergic rhinitis by adoptions of machine learning methods

Presenter: Shu Li Wang, National Institute of Environmental Health Sciences, National Health Research Institutes,, Miaoli County, Taiwan

Authors: Yu Huang, National Chiao Tung University, Hsinchu, Taiwan
Hui-Ju Wen, National Health Research Institutes, Miaoli, Taiwan
Shin-Fen Tsai, National Health Research Institutes, Miaoli, Taiwan
Yue Leon Guo, National Taiwan University College of Public Health, Taipei, Taiwan
Vincent S. Tseng, National Chiao Tung University, Hsinchu, Taiwan
Julie Shu-Li Wang, National Health Research Institutes, Miaoli, Taiwan

Prevalence of allergic diseases has been increasing and early prevention is important. We aimed to investigate the predictive ability of a spectrum of data mining methods to predict childhood atopic dermatitis (AD) and allergic rhinitis (AR) using longitudinal birth cohort data.
We studied 14-year follow-up of infants born to pregnant women who had undergone maternal examinations at nine selected maternity hospitals across Taiwan during 2000-2005. The subjects were interviewed using structured questionnaires to record data on basic demographics, socioeconomic status, lifestyle, medical history, and 24-hr dietary recall. Hourly concentrations of air pollutants within one year before childbirth were obtained from 76 national air quality monitoring stations in Taiwan. We utilized weighted K-nearest neighbor method (k = 3) to infer the personalized air pollution exposure. Machine learning methods were performed on the heterogeneous attribute set to predict children allergic diseases.
A total of 1,439 mother-infant pairs were recruited in this study. The prevalence of AD and AR in children up to 14 years of age was 6.8% and 15.9%, respectively. Overall, tree-based models achieved higher sensitivity and specificity than other methods, with areas under receiver operating characteristic curve of 83% for AD and 84% for AR, respectively. Our findings confirm that prenatal air quality is an importance factor to affect the predictive ability. Moreover, different air quality indices predicted better in combination than in separate.
Combining heterogeneous attributes including environment exposures, demographic information and allergens is the key to a better prediction of children allergies for general population. Prenatal exposure to NO2 and its concatenation changes with time were significant predictors for AD and AR till adolescent.
Keywords:
Air pollution, Birth cohort, Allergic diseases, Machine learning, Prediction

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

Estimating quantitative exposure-response relationships for fine particulate matter and maternal, child and adult respiratory outcomes: Experience from the rural -urban TAPHE cohort in Tamil Nadu, India

Presenter: Kalpana Balakrishnan, Sri Ramachandra Institute for Higher Education and Research, Chennai, India

Authors: K. Balakrishnan[1], T. Gurusamy[1], S. Sambandam[1], S. Ghosh[2], K. Mukhopadhyay[1], N. Puttaswamy[1];
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BackgroundAir pollution in the household and ambient environment ranks among the leading risk factors contributing to the national burden of disease in India. We describe results from the Tamil Nadu Air Pollution and Health Effects (TAPHE) study that provided some of the first estimates of quantitative exposure-response relationships for air pollution and health in integrated rural-urban cohorts in India. MethodsWe followed 1121 pregnant women, 948 (index) children and 1060 adults recruited from 110 villages (rural) and 10 municipal (urban) zones, to establish quantitative exposure -response relationships between fine particulate matter ($PM_{2.5}$)exposures and birth weight, prevalence of acute respiratory infections (ARI) prevalence of chronic respiratory symptoms and lung function respectively. ResultsAfter adjusting for relevant co-variates, a 10µg/m^3 change in $PM_{2.5}$ exposures was associated with a (i) 4 gm (95% CI: 1.38 gm,7.18gm) decrease in birth weight (ii) 0.3% (95%CI: 0.02%-0.69%) increase in the longitudinal prevalence of ARI among children <2 years of age and (iii) 10% (OR=1.10; 95% CI: 1.048, 1.153) increase in prevalence of respiratory symptoms, a lower FVC [17ml (95% CI:28ml, 5.9ml)] and a lower FEV1[15ml (95% CI:24ml, 4.9ml)] among adults. Mixed models that provided longer-term estimates of exposure consistently increased the effect size estimates for all outcomes. ConclusionTAPHE methods and results have contributed to numerous follow up efforts across multiple states that are currently expanding the base of quantitative exposure-response response information for ambient and household air pollution. The study also provided important inputs for the household air pollution intervention (HAPIN) trial, one of the first multi-country randomized control trials involving the provision of liquefied petroleum gas (LPG) among pregnant women in biomass using rural households. The trial currently underway in India, Guatemala, Peru and Rwanda is expected to provide major inputs for air quality actions across multiple low and middle income countries.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

Particle exposures and health effects in peri-urban South India: findings from the CHAI Project

Presenter: Cathryn Tonne, Barcelona Institute for Global Health, Barcelona, Spain

Authors: C. Tonne[1], O. Ranzani[1], M. Sanchez[1], C. Milà[1], K. Balakrishnan[2], S. Sambandam[2], S. Kinra[3], J. Marshall[4];
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We provide an overview of findings from the Cardiovascular health effects of air pollution in Telangana, India (CHAI) project, a recent effort to investigate health effects of household and ambient particle exposure in a cross-sectional cohort study. We developed a local land use regression model to estimate particle exposure for all households within 28 villages outside the city of Hyderabad using data from a measurement campaign. Mean measured $PM_{2.5}$ was 34 (sd 3.2) $\mu g/m^3$ and black carbon (BC) was 2.7 (sd 0.5) $\mu g/m^3$. Approximately 60% of households reported using biomass as the primary cooking fuel. To integrate across multiple relevant sources of particle exposure in the population, we developed a model of average personal exposure based on personal exposure measurements (n=610, 24 h avg) and participants' self-reported usual activities and behaviours. Personal exposure to $PM_{2.5}$ and BC was predicted for all participants in the cohort (n=6000). Personal exposure measurements were not correlated (Rspearman < 0.2) with annual ambient concentration at residence modeled by land-use regression. Predictors of personal exposure in women included cooking activities and household socioeconomic position, while in men predictors were smoking and occupation. We provide an overview of results from epidemiological analyses to estimate the independent effects of ambient particles and primary cooking fuel on carotid intima media thickness, blood pressure, and blood glucose levels. We also present results regarding the association between predicted personal exposure and vascular function measures over a wide exposure range (e.g. mean $PM_{2.5}$ 51 µg/m3 (IQR=9.4) for men, 61 µg/m3 (IQR=12.9) for women). We discuss lessons learned regarding investigating ambient air pollution in settings with high exposure to household air pollution and challenges using more personalized exposures in epidemiological analysis and how findings from CHAI fit within the broader context of air pollution health effects studies in Indian populations.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

ATMOSPHERIC POLLUTION AND HUMAN HEALTH (APHH): INDO-UK PROGRAM FOR INDIAN MEGA CITY

Presenter: GUFRAN BEIG, INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE, India

Authors: G. BEIG[1], R. K. SOKHI[2], V. SINGH[3], A. Partners[4];
[1]INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE, INDIA, [2]University of Hertfordshire, Hertfordshire, UNITED KINGDOM, [3]National Atmospheric Research Laboratory, GADANKI, INDIA, [4]MoES-NERC Partners, India-UK, INDIA.

Majority of mega cities in India are reeling under air quality crisis in terms of health impacts and compliance with regulatory standards, particularly, the WHO guidelines which are usually more stringent. Atmospheric Pollution and Human Health in an Indian Megacity (APHH) is a research programme jointly launched by the Ministry of Earth Sciences (MoES, India), Department of Biotechnology (DBT, India), Natural Environment Research Council (NERC, UK), Medical Research Council (MRC, UK), and Newton-Bhabha Fund. This programme, which has been organised into four interrelated themes, will support research on the sources and emissions of urban air pollution in New Delhi, India, the processes underlying and impacting on these, and how air pollution then impacts on health. Existing and new findings will be combined to understand the cost-effectiveness of potential interventions and thus identify appropriate solutions for the benefit of the economy and population. These APHH themes are highly interrelated and, therefore, there is considerable benefit in the projects working together and integrating activities. The present paper will focus on new results emerging from 4 SAFAR cities of India to contrast the scientific challenges which are not only driven by different emission contributions but also by differences in the prevailing meteorology, orography and air quality management capacity. The major air quality issue in Urban India is largely PM2.5. The ultra high-resolution emission inventory for some India mega cities (400m resolution) and its implication in terms of improving forecasting capability and policy framing will be disused. SAFAR-WRF-Chem model results will be focussed on extreme pollution events whose intensity and longevity has increased in recent time and likely to be related to climate change and erratic weather.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

Air Pollution in Urban Slums: Summary of research work in Bengaluru, India

Presenter: Prafulla Shriyan, Public Health Foundation of India, Indian Institute of Public Health, Bangaluru, India

Authors: M. Thakur, P. Shriyan, G. Babu;
Indian Institute of Public Health Bengaluru Campus, Bangalore, INDIA.

Air Pollution in Urban Slums: Summary of research work in Bengaluru, India
MeghaThakur[1], Prafulla Shriyan[1], Giridhara R Babu[1]
[1]Indian Institute of Public Health Hyderabad- Bengaluru Campus
AbstractBackground: Air pollution is a leading cause of morbidity, especially in low and middle-income countries (LMICs). In India, 2 million premature deaths are attributed to exposure to ambient and indoor air pollution annually. People residing in slums are particularly vulnerable to these health and environmental risks. We aimed to assess the association between low birth weight (LBW) and exposure to particulate matter (PM) and carbon monoxide (CO) during pregnancy. Also, we aimed to reduce the levels of indoor air pollution (IAP) and improve the respiratory health of women and children by introducing an improved cookstove.Methods: APPLE, a prospective cohort study of 516 pregnant women aged 18-45 years, was conducted in two big slums in Bangalore. Information was collected on socio-demographic and obstetric history. Exposures to $PM_{2.5}$, PM_{10} , and CO during pregnancy was measured using low-cost monitors. Another study, EXHALE, was conducted in slums among households using firewood for cooking. Information from women was collected on socio-demographics, cooking habits, respiratory and eye symptoms, and headache using a pre-structured questionnaire. Spirometry was performed to assess the lung function. Results: Our preliminary findings from APPLE did not find any association between LBW and exposure to PM2.5, PM10 and CO during pregnancy after adjusting for potential confounders. Data for EXHALE are still being entered, results will be shared later.Conclusion: Although cleaner fuels are available, some groups continue using solid fuels because of financial constraints, absence of infrastructure, and lack of awareness. Some two billion people in LMICs are expected to remain dependent on biomass fuel over the next 25 years. More research is needed in understanding the cooking dynamics in urban slums.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

Air pollution and implications of health research for policy-making byNational Centre for Disease Control, India

Presenter: Aakash Shrivastava, National Centre for Disease Control, New Delhi, India

Authors: A. Shrivastava;
National Centre for Disease Control, New Delhi, INDIA.

Air pollution is a major risk factor for ill health in India. In India, 1·24 million deaths in 2017 were attributable to air pollution. The National Programme on Climate Change and Human Health (NPCCHH) of the Health Ministry, formed in 2019, and the National Centre for Disease Control (NCDC), the nodal technical agency for it, are working on strategies related to air pollution and health issues. Under NPCCHH, following areas are being addressed: Firstly, initiation of surveillance of respiratory illnesses at sentinel hospitals and analysis in context of changing air quality indices (AQI). This surveillance is run in Delhi since 2017 and has helped understanding pattern of emergency visits in relation to changing pattern of AQI. Now another 11 States, 42 hospitals in 35 cities have started this surveillance. NPCCHH targets to establish it in hospitals of all polluted cities. States are being supported to develop Heath Adaptation Plans which would detail their health sector preparedness plans to be undertaken for protecting against health impact of air pollution. Meanwhile NCDC issues advisories to states about necessary activities to be implemented. NCDC is working on increasing awareness among general and vulnerable population. Health message templates have been created and disseminated using social messaging platforms, and also are shared with states for translation in local languages and dissemination. Awareness drives are organized on various occasions. Another area being addressed is capacity building of medical professionals in topics related to air pollution. One of the challenges is about having evidence on intervention measures that protect human health. NCDC has identified some areas for research and requested research institutions to develop and fund proposals on them so as to help Health Ministry with making informed policy decisions.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

Associations between air pollution and built environment on insulin resistance and HbA1c in the PURSE-HIS Cohort.

Presenter: Kevin James Lane, Boston University School of Public Health, Boston, United States

Authors: K. J. Lane[1], S. Thanikachalam[2], M. Thanikachalam[3];
[1]Boston University School of Public Health, Boston, MA, [2]Sri Ramachandra Medical College, Chennai, INDIA, [3]Tufts University School of Medicine, Boston, MA.

Background: India is undergoing rapid urbanization with simultaneous increases in air pollution exposures and cardio-metabolic health. Here we assess associations between fine particulate matter ($PM_{2.5}$) two measures of the built environment and insulin resistance (IR) and hemoglobin A1c (HbA1c) in the Population study of Urban, Rural, Semi-urban Endovascular disease and Holistic Intervention Study (PURSE-HIS) in Tamil Nadu, India. Methods: We performed cross-sectional analysis of 6246 randomly selected participants without diabetes (mean age 42 years; 58% women). IR was assessed by homeostasis model assessment of IR (HOMA-IR); HbA1c was assessed by high-performance liquid chromatography. We used estimates developed for Global Burden of Disease to assign annual average exposure to $PM_{2.5}$. Exposure to the built environment were assigned using satellites: MODIS derived normalized difference vegetation index (NDVI), a measure of vegetation health and greenness; and DMPS-OLS derived nighttime lights (NTL). Multivariable regression models were used to assess associations between built environment measures and IR and HbA1c, adjusting for age, BMI, cook fuel type, energy intake, physical activity, sex, smoking, and socioeconomic status. Results: Residing in areas with higher PM2.5, NTL and lower greenness were associated with elevated HOMA-IR, and HbA1c. An interquartile range change in $PM_{2.5}$ (IQR = 3.0 $\mu g/m^3$) was associated with a 0.29 mg/dl (95%CI: 0.22, 0.37) increase in HOMA-IR. Built environment measures of greenness (IQR = 0.18) was associated with a -0.17 mg/dl (95%CI: -0.24, -0.09) decrease in HOMA-IR and a -0.21% (95%CI: -0.31%, -0.12%) change in HbA1c. An IQR change in NTL (IQR = 0.08) was associated with a decrease in HOMA-IR but was not significant for HbA1c. Conclusions: $PM_{2.5}$ and NTL were associated with increased HOMA-IR, while increased exposure to greenness decreased HOMA-IR and HbA1c suggesting potential pathways by which factors rapid urbanization could be associated with increased prevalence of diabetes in India.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

CHAIR-consortium: A collaboration for air pollution research across India

Presenter: Siddhartha Mandal, Centre For Chronic Disease Control, Gurgaon, India

Authors: K. J. Lane[1], S. Thanikachalam[2], M. Thanikachalam[3];
[1]Boston University School of Public Health, Boston, MA, [2]Sri Ramachandra Medical College, Chennai, INDIA, [3]Tufts University School of Medicine, Boston, MA.

Ambient air pollution levels in India are among the highest in the world and contribute to climate change and poor health. Despite extreme levels of air pollution and increased frequency and intensity of heat waves in India, current Indian public policy to reduce emissions has been inadequate and lacked a coordinated and sustained effort. Planned coal power plants will additionally contribute to both more CO2 and air pollution emissions. Moreover, lack of monitoring in rural areas has contributed to a belief that air pollution is only an urban problem. To address this we have developed an exposure assessment methodology employing machine-learning methods and multiple data sources including monitoring data, satellite data, meteorology and land-use data to make reliable high resolution predictions of particulate matter <2.5 µm in diameter (PM2.5) and temperature in areas with sparse monitoring. We will develop a nation-wide exposure model for daily ambient PM2.5 and ambient temperature from 2008-2020 at a spatial resolution of 1 km x 1 km and locally at 200 m x 200 m in India. Our aim is to link our national estimates of PM2.5 and temperature to health data to quantify the associations between PM2.5 and ambient temperature, independently and jointly on major public health endpoints. Our specific intention is to make the exposure model an open resource to accelerate environmental epidemiology and build capacity around the many existing health studies in India to which the exposure model can be applied. We will develop an online interactive environmental database and a strategy for stakeholder communication to significantly facilitate decision-making and increase public awareness and engagement. Successful fulfillment of our aims in India will significantly contribute to sustainable development benefitting not only the very large Indian population but also the global community.

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ABSTRACT E-BOOK

August 25, 2020 / 08:00 - 09:30 / Parallel 5
SYMPOSIUM 12
The State of Air Pollution Health Effects Research in India
Chair: Dorairaj Prabhakaran, India & Joel Schwartz, US & Poornima Prabhakaran, India

CHAIR-consortium: A collaboration for air pollution research across India

Presenter: Petter L S Ljungman, Karolinska Institute, Stockholm, Sweden

Authors: P. L. Ljungman[1], S. Mandal[2], I. Kloog[3], M. Dahlquist[1], A. Nori-Sarma[4], K. J. Lane[5], G. A. Wellenius[5], M. Rosenqvist[1], P. Arokiasamy[6], G. K. Walia[2], S. Jaganathan[7], A. Rajiva[7], J. Schwartz[8], D. Prabhakaran[7], P. Prabhakaran[2];
[1]Karolinska Institute, Stockholm, SWEDEN, [2]Public Health Foundation of India, Delhi, INDIA, [3]Ben-Gurion University of the Negev, Beer-Sheva, ISRAEL, [4]Brown University, Providence, MA, [5]Boston University, Boston, MA, [6]International Institute for Population Sciences, Mumbai, INDIA, [7]Centre for Chronic Disease Control, Delhi, INDIA, [8]Harvard T H Chand School of Public Health, Boston, MA.

Ambient air pollution levels in India are among the highest in the world and contribute to climate change and poor health. Despite extreme levels of air pollution and increased frequency and intensity of heat waves in India, current Indian public policy to reduce emissions has been inadequate and lacked a coordinated and sustained effort. Planned coal power plants will additionally contribute to both more CO2 and air pollution emissions. Moreover, lack of monitoring in rural areas has contributed to a belief that air pollution is only an urban problem. To address this we have developed an exposure assessment methodology employing machine-learning methods and multiple data sources including monitoring data, satellite data, meteorology and land-use data to make reliable high resolution predictions of particulate matter <2.5 µm in diameter (PM2.5) and temperature in areas with sparse monitoring. We will develop a nation-wide exposure model for daily ambient PM2.5 and ambient temperature from 2008-2020 at a spatial resolution of 1 km x 1 km and locally at 200 m x 200 m in India. Our aim is to link our national estimates of PM2.5 and temperature to health data to quantify the associations between PM2.5 and ambient temperature, independently and jointly on major public health endpoints. Our specific intention is to make the exposure model an open resource to accelerate environmental epidemiology and build capacity around the many existing health studies in India to which the exposure model can be applied. We will develop an online interactive environmental database and a strategy for stakeholder communication to significantly facilitate decision-making and increase public awareness and engagement. Successful fulfillment of our aims in India will significantly contribute to sustainable development benefitting not only the very large Indian population but also the global community.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 13
Microbiome and the Environment
Chairs: Merete Åse Eggesbø,Norway & Nina Iszatt, Norway

Influence of urban greenspace on the early-life gut microbiome

Presenter: Anneclaire De Roos, Drexel University, Philadelphia, United States

Authors: A. J. De Roos[1], S. L. Hoops[2], L. H. Schinasi[1], N. Frager[3], S. Melly[1], K. M. Puopolo[3], S. Mukhopadhyay[3], D. Knights[2], J. S. Gerber[3];
[1]Drexel University, Philadelphia, PA, [2]University of Minnesota, Minneapolis, MN, [3]Children's Hospital of Philadelphia, Philadelphia, PA.

Background. Emerging evidence suggests that early life exposure to trees and other vegetation (i.e., 'greenspace') may prevent development of allergies. A proposed biologic mechanism posits that human contact with natural environments affects the diversity of human commensal microbiota, thus promoting development of immunity. We conducted a pilot study to test the relationship of greenspace exposure in early life with gut microbiome diversity.
Methods. We linked neighborhood environmental and sociodemographic measures from Drexel's Urban Health Collaborative repository with data from a longitudinal birth cohort of children assembled from Children's Hospital of Philadelphia, by census tract of the child's residence at birth. Our pilot study included microbiome profiling of stool samples from 71 infants (born 2016-2018), from birth through 1-year of age. Overall greenness was derived from satellite imagery as the median normalized difference vegetation index (NDVI) in the summer months of 2016. We also assessed coverage of the census tract area by tree canopy and by grasses/shrubs, derived from the National Land Cover Database (2011) for the entire study region and from high-resolution landcover data for the City of Philadelphia (2008).
Results. Greenspace of residential census tracts was associated with the change in gut microbial composition from age 1-12 months. In addition, cross-sectional associations were seen at age 1-month in Philadelphia. There was no association of greenspace with beta diversity at other ages (3, 6, or 12 months), nor with alpha diversity measures (species richness). The association of greenspace variables with the change in microbial composition from 1-12 months could not be linked to shifts in any particular microbial taxa.
Conclusions. Our results suggest an influence of urban greenspace on development of the gut microbiome in early life. Given the potential to modify vegetation around homes in ways that may benefit health, robust investigation is warranted.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 13
Microbiome and the Environment
Chairs: Merete Åse Eggesbø,Norway & Nina Iszatt, Norway

Early-life exposure to toxic and nutrient elements in relation to the infant microbiome as a possible mediator or modifier of autism-related social behaviors

Presenter: Hannah Laue, Department of Epidemiology, Geisel School of Medicine at Dartmouth College, Hanover, United States

Authors: H. E. Laue[1], S. A. Korrick[2], E. R. Baker[3], J. C. Madan[4], M. R. Karagas[1];
[1]Department of Epidemiology, Geisel School of Medicine at Dartmouth College, Hanover, NH, [2]Department of Environmental Health, Harvard T.H. Chan School of Public Health; Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, MA, [3]Department of Obstetrics and Gynecology, Dartmouth-Hitchcock Medical Center, Lebanon, NH, [4]Department of Epidemiology, Geisel School of Medicine at Dartmouth College; eDepartments of Pediatrics and Psychiatry, Children's Hospital at Dartmouth, Hanover, NH.

Background/Aim: In our previous analysis in the New Hampshire Birth Cohort Study, we identified associations between nutrient-toxic element mixtures and the early-life microbiome. The role of nutrient toxic mixtures and microbiome changes are being examined for their associations with autism-related social behaviors at age three years. However, there is limited information on the extent to which the microbiome mediates or modifies the association between a broader range environmental elements and childhood behaviors. Methods: In a subset of infants from a prospective birth cohort, six-week-old toenail clippings were analyzed for eleven elements (manganese, iron, nickel, copper, zinc, arsenic, selenium, cadmium, tin, mercury, and lead) using inductively coupled plasma mass spectrometry. Stool samples were collected from diapers at six weeks and one year of age, metagenomic sequencing was performed, and taxa/gene functions were inferred following established pipelines. At three years, parents completed the Social Responsiveness Scale, 2nd Edition (SRS-2), which assesses the frequency of autism-related social behaviors (higher scores indicate worse behavior). Covariates were determined a priori, and a complete case analysis was conducted. Results: Both nutrient and toxic elements were associated with microbial taxa in six-week-old and one-year-old stools, but none of these taxa was also associated with social behaviors. Arsenic and tin were associated with decreased relative abundance of vitamin B6 biosynthesis genes (PWY0-845) in one-year-old stools, increased abundance of which was found to be negatively associated with SRS-2 total T-scores. In contrast, lead was associated with increased relative abundance of PWY0-845 in six-week-old stools, which was also found to be negatively associated with SRS-2 total T-scores. Formal mediation/modification analyses based on these preliminary findings is underway. Conclusions: Investigation of the potential mediating or modifying role of microbiome may help to elucidate the mechanisms by which environmental exposures influence autism-related social behaviors.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 13
Microbiome and the Environment
Chairs: Merete Åse Eggesbø,Norway & Nina Iszatt, Norway

Arsenic-gut microbiome interaction: effects on exposed popopulations of Bihar, India

Presenter: Debapriya Mondal, University of Salford, Salford, United Kingdom

Authors: D. Mondal[1], D. Paul[2], Y. Shouche[2], S. Suman[1], R. Kumar[3], A. Ghosh[3], M. Rahman[4];
[1]University of Salford, Salford, UNITED KINGDOM, [2]National Centre For Microbial Resource, Pune, INDIA, [3]Mahavir Cancer Institute and Research Center, Patna, INDIA, [4]The University of Newcastle, Callaghan, AUSTRALIA.

Background: Arsenic exposure from drinking water and food continues to pose an important environmental public health challenge especially in south-east Asia where millions are affected. Though numerous mechanisms have been proposed for arsenic induced diseases, no scientific consensus has been reached. Ability of arsenic to affect gut microbes has been proposed as a possible mode of action. The aim of this study is to determine the effects of arsenic exposure on the gut microbiome in exposed populations of Bihar, India. Methods: Samples were collected from participants residing in arsenic contaminated areas of Bihar, India, as a part of on-going Nutri-SAM project. After taking informed consent, data on dietary intake using FFQ and 24-hour recall methods, data on demographic, socio-economic and health status were collected using questionnaires. Food and drinking water samples were collected from every household and analysed for arsenic. Fecal samples were collected from both male and female and bacterial community structure was investigated by high-throughput V4 region specific 16S rRNA gene sequencing using Illumina MiSeq platform. Results: We estimated the overall inorganic arsenic exposure from drinking water, cooked rice, potato and wheat intake and obtained a mean exposure of 1.99 µg/kgbw/day (n=153, 0.03-11.17µg/kgbw/day) in the surveyed population. Among 38 participants with gut microbial data till date, 14 had overall inorganic arsenic exposure <0.3µg/kgbw/day (mean±SD: 0.19±0.06) considered as low exposed group and 24 had exposure ≥0.3µg/kgbw/day (mean±SD: 1.85±1.52) considered as the high exposed group. Among the four most prevalent phyla in the studied population, we found an increased relative abundance of Firmicutes and Bacteriodates and decreased abundances of Proteobacteria and Actinobacteria in the high exposed group after adjusting for confounders. Conclusion: Arsenic exposure might influence the gut microbial diversity in the studied population. Even at the observed environmentally relevant concentrations of arsenic exposure the gut microbiota might get altered.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 13
Microbiome and the Environment
Chairs: Merete Åse Eggesbø,Norway & Nina Iszatt, Norway

The association between long-term ambient pesticide exposure and the gut microbiota in California adults

Presenter: Keren Zhang, Department of Epidemiology, University of California, Los Angeles, United States

Authors: Keren Zhang1, Kimberly C Paul1, Jonathan P Jacobs2, Irish del Rosario1, Beate Ritz13
1 Department of Epidemiology, University of California, Los Angeles, Los Angeles, California, United States
2 Division of Digestive Diseases, Department of Medicine , University of California Los Angeles , Los Angeles , California , USA.
3 Department of Neurology, UCLA School of Medicine, Los Angeles, California, USA

Background: The gut-brain axis theory hypothesizes that gut microbiota play a role in the development and progression of Parkinson disease (PD). However, the direction and magnitude of the crosstalk among the gut microbiota, the environment, and PD remain unclear. PD has also been associated with pesticide exposures and certain groups of pesticides may alter gut microbiota. Objective: To compare differences in gut microbiome profiles according to long-term ambient pesticide exposure in elderly not affected by PD. Methods: From 2017 to 2019, we recruited participants free of neurodegenerative diseases from central California. We collected demographic information from structured interviews, and fecal samples from which we sequenced the 16S ribosomal RNA. Incorporating Pesticide Use Reports and Land Use data in California, we employed a geographic information system-based approach to assess exposure to pesticides within a 10-year period before sample collection. We compared the alpha diversity (Observed, Shannon, and Chao1), beta diversity (Unifracs, Bray-Curtis dissimilarity), and taxa abundance in participants exposed to organophosphate (OP) pesticide, antimicrobial and microbial pesticides with unexposed participants. Results: Among the 70 participants, alpha diversity was associated with exposure to microbial pesticides (P(Observed)=0.002, P(Chao1)=0.07, P(Shannon)=0.005) and antimicrobial pesticide (P(Observed)=0.24, P(Chao1)=0.24, P(Shannon)=0.031). After controlling for potential confounders, Bray-Curtis dissimilarity differed between microbial pesticide exposure groups (P=0.007); OP pesticide exposure was associated with a reduction of Actinobacteriota phylum (75% reduction), and exposed also showed differential abundance in 29 genera. Microbial pesticide exposure is associated with a reduction of Cyanobacteria phylum (99% reduction), and exposed also showed differential abundance in 24 genera. Antimicrobial pesticides exposure was associated with differential abundance of 21 genera. Conclusion: Our analyses suggest that long-term ambient pesticide exposure is associated with differences in gut microbial profiles. Our next step will be to explore difference between these controls and PD patients in the context of pesticide exposures.
Keywords: Gut microbiome, ambient pesticide exposure, organophosphate pesticide, antimicrobial, microbial

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 8
Addressing Environmental and Social Determinants of Emerging Slum Health Challenges in Sub-Saharan Africa
Chair: Eric Coker, US

Proliferation of Slums in Sub-Saharan Africa: Environmental Exposures and Human Health Effects

Presenter: A. Kofi Amegah, University of Cape Coast, Cape Coast, Ghana

Authors: A. Amegah;
University of Cape Coast, Cape Coast, GHANA.

Slum settlements are a very prominent feature of the urban landscape of developing countries owing to uncontrolled urbanization in these countries. In Sub-Saharan Africa (SSA) for example, cities such as Accra, Lagos, Nairobi, Addis Ababa, Johannesburg and Durban are home to some of the world's largest slum settlements. SSA and South Asia are the most rapidly urbanizing regions of the world. The highest population growth in urban areas are found in these two regions and are concentrated mainly in slum settlements. SSA records the highest number of slum dwellers with about 62% of its urban population residing in slums. Slum settlements are characterized by poor and damp housing, poor sanitation, open drains, and worsening air quality from unpaved roads, increased use of biomass fuels for cooking and open burning of solid waste. These deplorable environmental conditions exposes slum dwellers to pathogens and air pollution. Lack of pipe-borne water in slum areas has also meant consumption of unsafe water owing to reliance on ground and surface water which are often polluted by open drains and nearby pit latrines. Pit latrines are also in widespread use in these settlements.The environmental exposures in slum settlements have been attributed to the high burden of disease and ill-health recorded in these areas including diarrhea, cholera, gastroenteritis, respiratory illnesses, adverse pregnancy outcomes, and cardiovascular diseases. There is growing epidemiological evidence associating these environmental exposures with the listed adverse health outcomes. In this talk, drawing on evidence from the limited studies conducted in slum settlements of SSA cities, an overview of the environmental exposures and the frequently reported health conditions in these settlements will be provided. Solutions for addressing the deplorable environmental conditions in slum settlements will also be proffered for improved health of slum dwellers and for population health gains.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 8
Addressing Environmental and Social Determinants of Emerging Slum Health Challenges in Sub-Saharan Africa
Chair: Eric Coker, US

Determinants of household air pollution exposure mitigating factors in urban Uganda

Presenter: Eric Stephen Coker, University of Florida, Gainesville, United States

Authors: E. S. Coker;
University of Florida, Gainesville, FL.

Background/Aim: Urban slum populations in sub-Saharan Africa (SSA) can be subject to high levels of exposure to household air pollution (HAP) from domestic use of polluting fuels. We know very little, however, about the local determining factors that can mitigate or exacerbate exposure to HAP among SAS's urban poor. Methods: Among urban households in Kampala, Uganda (N=1294), we administered cross-sectional surveys and used multivariable logistic regression to identify household, demographic and local contextual determinants that can mitigate or exacerbate exposure to HAP from cooking with polluting fuels. Results: Most households used solid fuels for cooking (93%). Multivariable logistic regression revealed that households whose children were indoors during cooking (OR=3.93), or who used a polluting fuel (kerosene lantern) for lighting the home (OR=2.56), had significantly ($p<0.05$) higher odds of never opening windows during cooking with solid fuels indoors. Significantly higher odds of cooking indoors with polluting fuels was observed for households that light their home with a polluting fuel (OR=2.00), report being very concerned about neighborhood traffic-related air pollution (OR=1.57), have higher educational attainment (OR=1.51), or who cook more meals per day (OR=1.47). Lower household income (OR=3.65), younger child age (OR=8.16), cooking in a structure separate from the main living area (OR=3.56), or younger age for those who perform cooking duties in the home, were all significantly associated with higher odds of keeping the child indoors during cooking with polluting fuels indoors. Conclusions: Multiple household and demographic characteristics, as well as local contextual factors, were strongly associated with factors that can either mitigate (e.g., children outdoors during cooking) or exacerbate (kerosene for lighting) exposures to HAP from polluting cooking fuels. Tailored and targeted HAP interventions in urban SSA slum populations are needed that are sensitive to local contextual (traffic-related air pollution), demographic (age and income), and exposure-mitigating factors.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 8
Addressing Environmental and Social Determinants of Emerging Slum Health Challenges in Sub-Saharan Africa
Chair: Eric Coker, US

Short-term association between respiratory disease admissions and PM10 in Cape Town, South Africa, 2011 - 2016: a time series study

Presenter: Temitope Christina Adebayo Ojo, Swiss Tropical and Public Health, Basel, Switzerland

Authors: T. C. Adebayo Ojo[1], C. Schindler[1], J. Wichmann[2], N. Probst-Hensch[1], N. Kuenzli[1];
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BackgroundAir pollution is a significant contributor to the global burden of respiratory diseases. Particulate matter with aerodynamic diameter ≤10 (PM_{10}) has been reported to be associated with respiratory diseases. In this study, we examine whether short-term variation in respiratory disease can be explained by daily levels of ambient for PM_{10} concentration in Cape Town, South Africa from 2011 - 2016.
Method
Health data on daily respiratory disease (RD) admission and daily average of PM_{10} were used in a generalized linear quasi Poisson model (GLM) to evaluate associations. We adjusted for seasonal and temporal trends, temperature, wind speed, day of the week, public holidays and finally we stratified by season (warm and cold).Two-day mean for PM10 and three-day mean were used for the meteorological variables.
Results
A total of 58317 admissions were recorded, almost half of the admission were among ages 0 - 14 (n = 28518) and 51% among females (n = 29741). Mean PM_{10}, temperature and wind speed were 26.8 $\mu g/m^3$, 17.3 °C and 5.56 Km/h. The number of daily admissions for RD was positively associated with PM_{10} with a 1.2% (95% CI: 1.02% - 1.37%) increase in admission per 10$\mu g/m^3$ of PM_{10}. The results for the warmer and colder seasons were 1.78% (95% CI: 1.4% - 2.13%) and 0.9% (95% CI: 0.6% - 1.1%), respectively. Age group 15 - 64 and female showed the highest estimates with 1.3% (95% CI: 0.9% - 1.6%) and 1.2% (95% CI: 1.1% - 1.5%) respectively.
Conclusion
The results suggest that short-term increases in exposure to PM_{10} may account for increases in RD admissions in the colder and warmer season, particularly among age groups 15-64 and females. Further analysis will assess temperature variations on the day or days before admission and effects of multiple air pollutants and respiratory diseases.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 8
Addressing Environmental and Social Determinants of Emerging Slum Health Challenges in Sub-Saharan Africa
Chair: Eric Coker, US

Addressing inequality in health in sub-Saharan Africa through robust measurement of socio-economic status

Presenter: Adetoun Mustapha, Nigerian Institute for Medical Research, Lagos, Nigeria

Authors: A. Mustapha;
Nigerian Institute for Medical Research, Lagos, NIGERIA.

Socioeconomic status (SES) is an important determinant of the likelihood that individuals and populations are exposed to environmental and other risk factors for health. Both single and composite measures from census and administrative databases of local authorities have been used to define the socio-economic characteristics of an area in developed countries. The situation in Nigeria, like many other developing countries, is that demographic data at district level is scarce, while the methodologies for defining socio-economic groups are less developed. For a study of air pollution and respiratory health of school children in Warri, Nigeria, a purpose-designed measure of deprivation had to be devised, using data that could be gathered in the field. Data on socio-economic and material deprivation indicators were gathered through a surveillance exercise and interacting with residents of the study area on multiple visits. Low SES in the selected neighbourhood and schools were characterised by the metrics of sixteen indicators such as lack of electricity, no clean water, use of pit latrines, open drainage, untarred roads, living in a multi-tenant houses with metal roofing sheets, cooking with firewood or kerosene, high traffic density and densely populated areas. Other metrics such as access to metered electricity, living in a flat or bungalow with aluminium roofing sheet and water-closet, in a sparsely populated, low traffic density, planned neighbourhood with tarred road and closed drainage; availability of pipe-borne water and use of gas for cooking characterised affluent neighbourhood. Understanding the strengths and limitations of different indicators and the context is vital not only for designing the study, but also to interpret its results. Controlling for SES in the study design such as this, and/or statistical analysis is important in defining the extent of exposure disease association and, more importantly, to determine the size of health benefit achievable through feasible exposure reductions.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 14
Impacts of Environmental Exposures amongst Children and Adolescents on Brain Health
Chairs: Leslie London, South Africa & Anna Oudin, Sweden

Short-term Ambient Fine Particulate Matter and Anxiety Symptoms in Adolescents with Generalized Anxiety Disorder

Presenter: Cole Brokamp, Cincinnati Children's Hospital Medical Center, Cincinnati, United States

Authors: C. Brokamp[1], S. Mossman[2], S. Varney[2], H. Schroeder[2], A. Levine[3], J. Strawn[2];
[1]Cincinnati Children's Hospital Medical Center, Cincinnati, OH, [2]University of Cincinnati, Cincinnati, OH, [3]Columbia University, New York City, NY.

Background: Short-term ambient fine particulate matter has been associated with exacerbations of psychiatric disorders in children and adolescents as measured by psychiatric emergency department utilizations. It is currently unknown if a similar association is seen with a continuous measure of symptom severity. We sought to determine if anxiety symptoms in adolescents with moderate-to-severe generalized anxiety disorder (GAD) were related to short-term ambient fine particulate matter concentrations.
Methods: An analysis of participants receiving a placebo in an ongoing clinical trial (FiESTAA; clinicaltrials.gov identifier: NCT02818751) designed to test the efficacy of a medication in pediatric GAD was conducted. The severity of anxiety symptoms was assessed weekly over 8 weeks using the Pediatric Anxiety Rating Scale (PARS) score administered by a psychiatrist. Participants' geocoded residential addresses and PARS assessment dates were used to estimate short-term ambient concentrations of particulate matter smaller than 2.5 μm ($PM_{2.5}$) using a previously validated spatiotemporal model. A Poisson fixed effects regression model with a participant-specific intercept was used to estimate the increase in PARS corresponding to a doubling in total ambient $PM_{2.5}$ concentrations two and three days prior to PARS assessment while adjusting for temperature and humidity.
Results: A subset of FiESTAA participants with currently available data (n = 5) representing 33 total PARS assessments were analyzed. A doubling of the total ambient $PM_{2.5}$ concentrations two and three days prior to the assessment were associated with a 1.21 fold increase (95% CI: 0.98, 1.48) in the PARS score.
Conclusions: These results will be replicated using the full FiESTAA dataset and within an additional clinical trial for GAD when all data is available. Initial results suggest that short-term ambient air pollution may influence the severity of anxiety symptoms in adolescents with GAD and future work should examine the impact of ambient air pollution on the pathoetiology of anxiety disorders.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 14
Impacts of Environmental Exposures amongst Children and Adolescents on Brain Health
Chairs: Leslie London, South Africa & Anna Oudin, Sweden

Umbilical cord Metals concentration and Neurodevelopment in a birth cohort - Pipa Project - Rio de Janeiro - Brazil

Presenter: Nataly Damasceno Figueiredo, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Authors: N. Figueiredo, A. Natividade, M. Araujo, C. Froes;
Federal University of Rio de Janeiro, RIO DE JANEIRO, BRAZIL.

The world population, in general, is simultaneously exposed to various metals that can affect children's neurodevelopment. Aims: Analyze the association between metal concentrations in umbilical cord blood and the child's neurodevelopment up to the sixth month old. Methods: A pilot study was conducted from October 2017 to August 2018, at the Maternity School of the Federal University of Rio de Janeiro, Brazil. Infant's neurodevelopment was evaluated using Denver Developmental Screening Test II (Denver-II) at six months old. The neurodevelopment assessment considered the conclusions according to the test criteria and the proportion of failure according to the test analysis fields. Exposure was assessed for lead (Pb), Arsenium (AS), Mercury (Hg) and Cadmium (Cd) based on tertiles. Results: 135 babies participated in the cohort, 58 attended the 6 month follow-up and among these 5.17% were considered suspected according to the classification criteria for neurodevelopment of DENVER II. The analysis of the occurrence of failures showed a total of 31.7%, 4.8% in personal social development, 4.8% fine motor, 4.8% language and 19.5% gross motor. The concentration of metals in the umbilical cord blood, classified by tertile, did not show a clear association for lead (RR = 0.735 95% CI - 0.199 - 2.714) and mercury (RR = 0.59 95% CI 0.191 - 1.828). Arsenic and cadmium showed an association with the proportion of failures only in the first month of follow-up, with RR = 6.26 (0.856 - 45.85) when comparing the second tertile of AS with the first (reference). And the Cd RR = 0.18 CI 95% 0.024 - 1.298). New studies with a greater number of follow-ups are needed to reinforce the rejection of such notes. The PIPA Project cohort will start in the year 2020 and allow greater power of analysis.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 14
Impacts of Environmental Exposures amongst Children and Adolescents on Brain Health
Chairs: Leslie London, South Africa & Anna Oudin, Sweden

Effect of Air Pollution on the Cognitive Function of Adolescents (ATENC!Ó): An Experimental Study in High Schools in Barcelona, Spain

Presenter: Florence Gignac, ISGlobal, Institute for Global Health, Barcelona, Spain

Authors: F. Gignac[1], J. Barrera-Gómez[1], C. Persavento[1], C. Solé[2], È. Tena[2], J. Júlvez[3], F. Amato[4], D. Couso[2], J. Sunyer[1], X. Basagaña[1];
[1]ISGlobal, Institute for Global Health, Barcelona, SPAIN, [2]Centre de Recerca per a l'Educació Científica i Matemàtica (CRECIM), Universitat Autònoma de Barcelona, Barcelona, SPAIN, [3]Pere Virgili Institute for Health Research (IISPV), Hospital Universitari Sant Joan de Reus, Reus, SPAIN, [4]Institute of Environmental Assessment and Water Research (IDAEA), Spanish Research Council (CSIC), Barcelona, SPAIN.

Background: The recent evidence of the short-term impact of air pollution on youth cognitive functions is based primarily on observational studies. We conducted an experimental study to assess whether air pollution in high schools can affect the adolescents' attention processes.

Methods: A total of 2124 adolescents (14-15 years old) were recruited in 33 high schools in Barcelona province (Spain). In each school, adolescents were randomly split into two equal-sized groups. For each school, each group was assigned to a different classroom. One classroom had an internal air purifier (recirculation and filtration) and the other had the same device but without the filter (only recirculation). Students were masked to intervention allocation and were asked to complete several computerized activities for two hours, including an attention test (Flanker task) to perform at baseline and after the intervention. We measured the response speed consistency, expressed as hit reaction time standard error (HRT-SE), as our primary outcome. Analyses were conducted using conditional linear regressions with classroom as strata, adjusted for variables that may differ from one class to another such as temperature, humidity and carbon dioxide concentration.

Results: Average levels of $PM_{2.5}$ and black carbon for the two hours of experiment were 89% and 87% lower in the classrooms with purified air than in the control classrooms. We found a non-significant 1.84% (95% confidence interval -2.27%, 6.12%) difference in the median of HRT-SE between classrooms with purified or normal air. Sensitivity analyses and results with secondary outcomes resulted in similar findings.

Conclusions: Cleaning the air of a classroom to reduce exposure to air pollutants for a duration of two hours did not have an impact on the attention of high-school students. Experimental studies with longer duration of the intervention could shed more light on the potential association between air pollution and adolescents' cognitive function.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 14
Impacts of Environmental Exposures amongst Children and Adolescents on Brain Health
Chairs: Leslie London, South Africa & Anna Oudin, Sweden

Early Life Exposure to Green Space and Childhood Cognition: A mediation analysis of physical activity and air pollution

Presenter: Marcia Pescador Jimenez, Harvard University T.H. Chan School of Public Health, Boston, United States

Authors: M. Pescador Jimenez[1], J. Shoaff[1], S. Korrick[2], S. L. Rifas-Shiman[3], M. Hivert[3], E. Oken[3], P. James[3];
[1]Harvard University T.H. Chan School of Public Health, Boston, MA, [2]Harvard University T.H. Chan School of Public Health and Channing Division of Network Medicine, Brigham and Women's Hospital, Boston, MA, [3]Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA.

Background: Natural vegetation, or “greenness,” may influence cognition by increasing physical activity or buffering air pollution exposure. Early life influences of greenness on cognition, and the mediating roles of physical activity and air pollution, are not well understood. Aim: We examined associations of early childhood neighborhood greenness with mid-childhood cognition. We quantified the extent to which physical activity and air pollution explained this association.Methods: We studied 857 mother–child pairs in Project Viva, a pre-birth cohort study in Massachusetts. In early childhood (median 3.2y), we estimated residential greenness using 30m resolution Landsat satellite imagery [Normalized Difference Vegetation Index], residential particulate matter using spatiotemporal models, and number of hours/day spent in active play, reported by parents, for physical activity. In mid-childhood (7.7y), we administered standardized assessments of verbal and nonverbal intelligence, visual motor abilities (VMA), and visual memory (VM) as outcomes. Using linear regression, we examined associations of early childhood greenness with mid-childhood cognition, adjusting for demographic and socioeconomic factors. We used a causal mediation framework to determine the mediation effect through physical activity and air pollution. Results: The mean(SD) for verbal IQ was 114(14), non-verbal IQ was 107(17), VMA was 93(17), and VM was 17(4). Children living in the highest 3 greenness quartiles vs. lowest in early childhood had higher verbal intelligence (2.0 points, 95%CI: -0.06, 4.1), and higher VM (1.0 point; 95% CI: 0.3, 1.8), but lower VMA (-2.6 points, 95%CI: -5.5, 0.2). We did not observe associations of greenness with non-verbal intelligence. The associations of greenness on verbal intelligence, VM or VMA were not mediated by air pollution or physical activity (e.g.indirect effect on verbal intelligence through air pollution:-0.5, 95%CI:-1.2,0.2). Conclusions: Early childhood greenness may affect verbal intelligence, VM and VMA through other mechanisms different than air pollution or physical activity, perhaps through lowering stress levels.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 14
Impacts of Environmental Exposures amongst Children and Adolescents on Brain Health
Chairs: Leslie London, South Africa & Anna Oudin, Sweden

Exposure to pesticides, their incarnation during pregnancy and their effect on the neurodevelopment of infants, children of mothers of families residing in coffee growing areas: Cohort study, in southwest Antioquia

Presenter: MONICA LUCIA SOTO VELASQUEZ, Universidad de Antioquia, Medellin, Colombia

Authors: M. SOTO VELASQUEZ, Y. Polanco;
Universidad de Antioquia, Medellin, COLOMBIA.

Background: The intensive agro-industry of coffee, with consumption of pesticides has ordered the course of life of men and women residents of municipalities in the territories of the Southwest Antioquia; Colombia. Colombia has a social processes of incarnation of pesticides that differ from other countries, with influence on neurodevelopment, unknown to date.Aim: To study the relationship between different pathways and patterns of incarnation of exposure to OP pesticides during pregnancy, and peripheral cholinesterase levels, with neurodevelopmental profiles in their infants inhabitants of eight (8) municipalities with conventional coffee growing systems.Methods: Prospective cohort and population base of 200 women. Data obtained through a survey during pregnancy. As biomarker of pesticide incarnation, erythrocyte acetylcholinesterase-AChE and serum butyrylcholinesterase-BChS were determined in three blood samples in the three trimesters of pregnancy The clinical and anthropometric data were obtained from the medical records, interviews and direct measurements of pregnant women and their children. Neurodevelopment was assessed in months 3 and 4 of postnatal life applying the neurodevelopmental scales of Bayley-IIIResults: Pregnant women who live in agro-farmer municipalities embody exposure to pesticides mainly because of their close ties not only to work but also to daily intensive agricultural production systems, a link that begins for most of them with their ancestors and could continue with their children. The trajectory of AChE during pregnancy described an ascending pattern throughout the trimesters of pregnancy and was not affected by the pathways of incarnation of pesticide exposure. On the contrary, the trajectory of the BChS during pregnancy described a downward trend throughout the quarters of pregnancy and was modified by the pathways of incarnation of pesticide exposure.In the development of neurodevelopment, a decrease in the fine motor domain score was related to exposure to pesticides in pregnant women.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 14
Impacts of Environmental Exposures amongst Children and Adolescents on Brain Health
Chairs: Leslie London, South Africa & Anna Oudin, Sweden

Fluoride Exposure and Concurrent Cognitive Outcomes in 7-15 Year Old Children from Mexico City, Mexico

Presenter: Deena Thomas, Cornell University, Ithaca, United States

Authors: D. B. Thomas[1], Y. Lin[2], K. Peterson[3], B. N. Sanchez[4], N. Basu[5], E. Martinez-Mier[6], A. Mercado-Garcia[7], L. Schnaas[7], C. Till[8], M. Hernandez-Avila[7], H. Hu[9], M. Tellez-Rojo[7];
[1]Cornell University, Ithaca, NY, [2]Brown University, Providence, RI, [3]University of Michigan, Ann Arbor, MI, [4]Drexel University, Philadelphia, PA, [5]McGill University, Montreal, QC, CANADA, [6]Indiana University, Indianapolis, IN, [7]Instituto Nacional de Slaud Publica, Cuernavaca, MEXICO, [8]York University, Toronto, ON, CANADA, [9]University of Washington, Seattle, WA.

BACKGROUND: Recent studies have reported an inverse association between fluoride exposure and IQ in children, but most were ecological in design. Few involved personal measures of exposure or adjusted for confounders.METHODS: This study utilized archived urine samples and data from offspring who participated in the Early Life Exposures in Mexico to Environmental Toxicants (ELEMENT) pregnancy and birth cohort project to study concurrent fluoride exposure and its association with cognitive outcomes in 565 children ages 7-15 years old. Generalized Additive Models (GAM) were used to test the association between specific gravity-adjusted urinary fluoride levels and total score from the Wechsler Abbreviated Scale of Intelligence (WASI), adjusting for child's sex, child's age, gestational age, birth weight, birth order, maternal intelligence score, maternal age, maternal education, marital status, maternal education, maternal smoking history, family possessions, and cohort. GAM were also re-run after stratifying by sex (NMales = 298, NFemales = 267). RESULTS: Concurrent urinary fluoride was not significantly associated with WASI scores in children, and sex did not modify the association. CONCLUSIONS: The results of this cross-sectional study do not support the hypothesis that concurrent fluoride exposure has an impact on cognitive function among children aged 7-15 years.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 4
ORAL SESSION 15
Air Pollution and Heart Disease:
What's New?
Chairs: Annette Peters, Germany & Cavin Ward-Caviness, US

An estimate of the exposure-response relationship between traffic-related ultrafine particles and systolic blood pressure

Presenter: Doug Brugge, University of Connecticut, Farmington, United States

Authors: D. Brugge[1], M. Eliasziw[2], N. Hudda[2], E. Reisner[3], J. Durant[4], W. Zamore[3];
[1]University of Connecticut, Farmington, CT, [2]Tufts University, Boston, MA, [3]Somerville Transportation Equity Partnership, Somerville, MA, [4]Tufts University, Medford, MA.

Exposure to traffic-related air pollution (TRAP) is associated with adverse health outcomes, including hypertension and elevated blood pressure; however, the nature of the exposure-response functions for these associations is not well established. In a previous three-exposure, three-period crossover trial we showed that using portable HEPA filters to reduce indoor infiltration of TRAP was significantly effective in preventing short-term average increases in systolic blood pressure (SBP). We measured particle number concentrations (PNC), black carbon (BC) concentrations, and room temperatures continuously during the trial, and we measured participant blood pressures every 10 minutes. We then examined the relationship between SBP and PNC. A total of 1321 SBPs arising from 76 participants were analyzed. The average age of the participants was 60 years, 79% were female, 77% were Asian, and 17% were White. None had serious health conditions. The average SBP was 120.0 mmHg and the average particle number concentration (PNC) was 13,000 particles/cm^3, ranging from 860 to 99,000 particles/cm^3. A linear mixed model was used to fit a curvilinear relationship between SBP and PNC. The model included BC concentrations and room temperatures as covariates, as well as a random intercept to account for the interdependence of multiple SBPs recorded from each participant. The resulting adjusted model, yielding statistically significant regression coefficients ($p < 0.001$), can be written as: $SBP = 117.54 + 1.22\ (PNC/5000) - 0.059\ (PNC/5000)^2$, which implies that SBP increases by 1.22 mmHg for every 5000 particles/cm^3 increase in PNC but tapers off at higher levels of PNC. For example, at 5000 particles/cm^3 the average SBP is expected to be 118.7 mmHg, but it increases to 121.0 mmHg at 15,000 particles/cm^3 and to 124.5 mmHg at 30,000 particles/cm^3. The results of the present study suggest an exposure-response function for SBP and PNC.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 4
ORAL SESSION 15
Air Pollution and Heart Disease:
What's New?
Chairs: Annette Peters, Germany & Cavin Ward-Caviness, US

Short-term Exposure to Fine Particulate Matter and Myocardial Injury among Patients Undergoing Cardiac Catheterization

Presenter: Alexandra Schneider, Helmholtz Zentrum München, Neuherberg, Germany

Authors: S. Zhang[1], S. Breitner[2], W. E. Cascio[3], R. B. Devlin[3], L. M. Neas[3], C. Ward-Caviness[3], D. Diaz-Sanchez[3], W. E. Kraus[4], E. R. Hauser[4], J. Schwartz[5], A. Peters[1], A. Schneider[1];
[1]Helmholtz Zentrum München, Neuherberg, GERMANY, [2]Ludwig-Maximilians University München, Munich, GERMANY, [3]US Environmental Protection Agency, Research Triangle Park, NC, [4]Duke University, Durham, NC, [5]Harvard T.H. Chan School of Public Health, Boston, MA.

Background/Aim: Fine particles ($PM_{2.5}$) are associated with a higher risk for coronary events. Cardiac troponin T (cTnT) is a myocardium-specific protein which is measured clinically for the diagnosis and prognosis of myocardial infarction (MI). An elevation in circulating cTnT also occurs in non-ischemic conditions and indicates myocardial damage. We aimed to investigate short-term $PM_{2.5}$ effects on cTnT and other myocardial injury-related biomarkers among participants undergoing cardiac catheterizations.Methods: This study included 7,497 plasma cTnT measurements conducted in 2,739 participants presenting to Duke University Hospital (2000 to 2012), partly alongside with measurements of C-reactive protein, fibrinogen, white blood cells, N-terminal-pro brain natriuretic peptide (NT-pro BNP), and partial oxygen pressure (PaO_2). Daily $PM_{2.5}$ was predicted by a neural network-based hybrid model at a 1km resolution and was assigned to participants' residential addresses. We applied generalized estimating equations to assess associations of $PM_{2.5}$ with biomarker levels and the risk of a positive cTnT test (cTnT>0.1ng/mL).Results: Mean $PM_{2.5}$ concentration was 11.8 $\mu g/m^3$. Median plasma cTnT was 0.05 ng/mL and the prevalence of a positive cTnT test was 35.6% at presentation. For a 10$\mu g/m^3$ increase in $PM_{2.5}$ one day before cTnT measurement, plasma cTnT increased by 11.1% (95% CI: 5.3–17.4) and the odds ratio of a positive cTnT test was 1.12 (95% CI: 1.03–1.23). Participants under 60 years [20.9% (95% CI: 10.2–32.6)] or living in rural areas [17.6% (95% CI: 7.3–28.7)] had stronger associations. There was additionally evidence for positive associations of $PM_{2.5}$ with fibrinogen and NT-pro BNP within one day after exposure, as well as negative associations with PaO_2 at lag 3-4 days. Conclusions: Our study suggests that acute $PM_{2.5}$ exposure may elevate indicators of myocardial injury and exertion, which substantiates the association of air pollution exposure with adverse cardiovascular events. This abstract does not necessarily represent EPA policy.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 4
ORAL SESSION 15
Air Pollution and Heart Disease:
What's New?
Chairs: Annette Peters, Germany & Cavin Ward-Caviness, US

Exposure to Fine Particulate Matter and Incidence of Coronary Events: The Mediation Effect by Atherosclerotic Progression

Presenter: Meng Wang, University at Buffalo, SUNY, Buffalo, United States

Authors: M. Wang[1], Y. Gao[2], Z. Hou[2], C. Huang[1], B. Lu[2];
[1]University at Buffalo, SUNY, Buffalo, NY, [2]Fuwai Hospital, Chinese Academy of Medical Sciences, Beijing, CHINA.

Background/Aim: Epidemiological evidence on the mechanisms for association between long-term exposure to fine particulate matters ($PM_{2.5}$) and coronary events is limited. We investigated the role of atherosclerotic progression, as potential mediator, in the association between $PM_{2.5}$ and incidence of coronary events. Methods: In a study of 294 Chinese patients with stable angina, we repeatedly measured coronary plaque phenotypes on computed tomography angiography, including coronary artery calcium (CAC), total, calcified and non-calcified plaque volumes between 2009 and 2014 and followed their incident events until 2016. Annual average $PM_{2.5}$ concentrations were estimated by a satellite-based exposure model and were aggregated to the year of the follow-up exam and the incident events at the participants' home. We conducted Cox analysis to estimate effect of $PM_{2.5}$ exposure on incident events and used mixed effect model to assess relationships between $PM_{2.5}$ and progression of atherosclerosis. Mediation analysis was applied to evaluate mediated effects by the atherosclerotic markers.
Results: Patients were on average 53 year's old with 15% experienced incident events. CAC increased by 20.3±3.5 Agatston units per year, and total plaque volumes by 28.0±8.9 mm3 per year. For each 20 $PM_{2.5}$ μg/m3 increase, CAC progressed by 7.7 Agatston units per year (95%CI: 2.3-13.2) and total plaque volumes increased by 20.3 mm3 per year (1.7-39.0), adjusting for risk factors. Using mediation analysis, we observed a positive direct effect of $PM_{2.5}$ on incidence of coronary events (HR=1.20, 95%CI: 1.08-1.32) and an indirect effect mediated by increased total plaque volumes (HR=1.06, 95%CI: 1.01-1.13) accounting for 25.5% of the total effect. The proportion mediated through CAC progression accounting for 18.8%. No associations were observed between $PM_{2.5}$ and other plaque phenotypes.
Conclusion: This study provided insight of evidence on the role of atherosclerotic progression in association between ambient $PM_{2.5}$ and coronary events in a susceptible population.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 4
ORAL SESSION 15
Air Pollution and Heart Disease:
What's New?
Chairs: Annette Peters, Germany & Cavin Ward-Caviness, US

Dynamics of skin microvascular blood flow in 4-6 year old children in association with pre- and postnatal black carbon and particulate air pollution exposure

Presenter: Katrien Witters, Hasselt University, Diepenbeek, Belgium

Authors: K. Witters, Y. Dockx, J. Vangronsveld, M. Plusquin, B. G. Janssen, T. S. Nawrot;
Hasselt University, Diepenbeek, BELGIUM.

Background: A growing body of evidence shows that cardiovascular disease in adulthood, in particular that of the microcirculation, could find its roots during prenatal development. In this study we investigated the association between pre- and postnatal black carbon and particulate air pollution exposure on heat-induced skin hyperemia as a dynamic marker of the microvasculature. Methods: In 139 children between the age of 4 to 6 who are followed longitudinally within the ENVIRONAGE birth cohort, we measured skin perfusion by Laser Doppler probes using the Periflux6000. Residential black carbon (BC) and particulate (PM_{10} and $PM_{2.5}$) air pollution levels were modelled for each participant's home address using a high-resolution spatiotemporal model. We assessed the association between skin hyperemia and pre- and postnatal air pollution using linear regression models while adjusting for relevant covariates. Results: Prenatal residential BC exposure averaged (IQR) 1.38 (1.05 - 1.62) µg/m³, PM_{10} 18.72 (14.44 - 22.78) µg/m³ and $PM_{2.5}$ 13.43 (9.19 - 17.26) µg/m³. An IQR increment in BC exposure during the third trimester of pregnancy was associated with a 13.8 % (95% CI: -22.7 to -3.9; p = 0.008) lower skin hyperemia. Similar effect estimates were retrieved for PM_{10} and $PM_{2.5}$ (respectively 11.7 % (95% CI: -20.6 to -1.8; p = 0.022) and 14.2 % (95% CI: -25.1 to -1.8; p = 0.027) lower skin hyperemia). Postnatal exposure to BC, PM_{10} or $PM_{2.5}$ was not associated with skin hyperemia at the age 4 to 6 and did not alter the previous reported prenatal associations. Conclusion: These findings support that BC and particulate air pollution exposure even at low concentrations during prenatal life can have long-lasting consequences on the microvasculature. This proposes a role of prenatal air pollution exposures in the microvascular origin of cardiovascular disease development later in life.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:30 / Parallel 4
ORAL SESSION 15
Air Pollution and Heart Disease:
What's New?
Chairs: Annette Peters, Germany & Cavin Ward-Caviness, US

Exposure to Fine Particulate Matter and Inflammatory Cytokines and DNA Methylation in Healthy Young Adults

Presenter: Shaowei Wu, School of Public Health, Peking University, Beijing, China

Authors: Y. Sun[1], J. Huang[2], Y. Zhao[2], L. Xue[2], L. Zhang[2], S. Wu[2];
[1]School of Public Health, Capital Medical University, Beijing, CHINA, [2]School of Public Health, Peking University, Beijing, CHINA.

Background/Aim: Protective benefits of indoor air filtration in areas with high pollution levels are not fully understood. This study aims to examine whether short-term air filtration intervention could attenuate the hazards from acute exposure to fine particulate matter (PM2.5), and investigate the potential impact of this exposure on inflammatory cytokines and DNA methylation.
Methods: A randomized, double-blind crossover trial of true or sham indoor air filtration was conducted among 29 healthy young adults in Beijing, China. Each episode covered a typical air pollution smog event, and 38 cytokines and their corresponding DNA methylation in the study participants were measured at three time points: pre-smog, during smog, and post-smog. Indoor PM2.5 concentrations were measured using an aerosol spectrometer and outdoor PM2.5 concentrations were collected from fixed-site monitoring stations. Linear mixed-effect models were used to evaluate the associations between exposure and outcome variables.
Results: The indoor PM2.5 concentration with true filtration was 67.8% lower than sham filtration (13.8 μg/m3 vs. 42.8 μg/m3). Air filtration was significantly associated with decreases of 6.61% to 35.46% in 13 cytokines. Time-weighted personal PM2.5 exposure was significantly associated with changes in 11 cytokines and methylation at 27 CpGs. Specifically, PM2.5 exposure was associated with increases in MCP-1, MCP-3 and sCD40L, but hypomethylation in corresponding genes.
Conclusions: This trial suggests that indoor air filtration might attenuate the adverse effects of PM2.5 exposure through changing cytokines and DNA methylation.

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ABSTRACT E-BOOK

August 25, 2020 / 10:00 - 11:00 / Parallel 5
EMS 4
Relaxed US Asbestos Use Policy: Global Workers Shoulder the Risks
Chair: David Goldsmith, US

Relaxed US Asbestos Use Policy: Global Workers Shoulder the Risks

Authors: David F. Goldsmith, Milken Institute School of Public Health, George Washington University, United States; Tuan Nguyen, California State Compensation Insurance Fund; United States; Mary O'Reilly, State University of New York, Albany, !Workplace Health Without Borders-United States

The 2019 EPA rule provides a legal loophole that would permit new U.S. mining, continued importation and uses of asbestos for chemical manufacturing, brake pads, and gaskets. By loosening the current regulations on asbestos, the U.S. administration has provided policy openings in other countries suggesting greater use of asbestos products now and into the future, and it goes against the recommendations of the WHO and ILO that all types of asbestos are carcinogenic and do not have a safe threshold for use. Asbestos use is banned in 55 countries, current and past exposure to respirable asbestos fibers is estimated to cause 255,000 deaths annually and to cost $18 billion worldwide. Asbestos-related diseases include mesothelioma, lung cancer, asbestosis, laryngeal cancer, and auto-immune diseases are well recognized. There are nearly 40,000 deaths annually linked to asbestos exposure in the U.S. even though fiberglass has replaced asbestos for the past 3-4 decades. WHWB-US is very concerned that new US asbestos rules will lead to more health problems among developing nations, and that uncontrolled asbestos exposure in the workplace and the general environment will rise worldwide. India and Vietnam are two of the 10 nations with the greatest use of asbestos as low-cost building materials. Vietnam is drafting a Decree on the management of construction materials, including policies to encourage the production of environmentally sound products with strict control of asbestos containing materials. However, the Decree will push out elimination of chrysotile and all types of asbestos to 2030 instead of 2020. In India, asbestos is classified as hazardous substance, but without proper enforcement, the continued use of asbestos is harmful to people's health, and the future economic loss will far exceed the taxable amount of asbestos construction materials industry has brought in. Loosening of US asbestos rules, will continue to wreak havoc on the health of workers. Overall, this adds weight for passage of a federal law to ban all uses of asbestos in the US [Arban] and it behooves business leaders and scientists in Vietnam and India to seek less toxic replacements for asbestos products.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 16
Challenges and Opportunities in Assessing Aggregate/Concomitant Exposures and Their Impact on Health
Chairs: Elizabeth Radke-Farabaugh, US & Suril Mehta, US

Matrix selection in the biomonitoring of per- and polyfluoroalkyl substances (PFAS)

Presenter: Julianne Botelho, CDC, Atlanta, United States

Authors: J. C. Botelho, K. Kato, K. Hubbard, L. Wong, A. Calafat;
CDC, Atlanta, GA.

Human exposure to per- and polyfluoroalkyl substances (PFAS) is of public health interest. PFAS are environmentally persistent man-made chemicals. Some epidemiologic studies suggest that PFAS may affect immunity and reproduction and may increase the risk for certain cancers, hypercholesteremia, and thyroid function. In the United States, exposure to PFAS is widespread with universal detection in the general population. Long-alkyl chain “legacy”, short alkyl-chain, and alternative PFAS have been detected in drinking water around the world. The elimination half-life of PFAS varies from days to years in the human body. The selection of the appropriate human matrix to quantify PFAS is important to properly report concentrations of PFAS in the population. The CDC developed isotope dilution liquid chromatography-tandem mass spectrometry methods to accurately quantify PFAS in human serum (or plasma) and urine. CDC has reported population-based concentrations of PFAS in serum since NHANES 1999-2000. In 2013-2014, NHANES paired serum-urine samples were analyzed for legacy, short-alkyl chain, and alternative PFAS. The majority of the U.S. population did not have detectable urinary concentrations of PFAS, with 67.5% with no detectable PFAS in urine. By contrast, almost 100% of the same population had detectable concentrations of PFAS in serum. In addition, when PFAS were detected in urine and serum, serum concentrations were markedly higher. For example, the geometric mean (GM) serum concentration of perfluorooctane sulfate was 3.45 µg/L while GM urine concentration was < 0.1 µg/L. Similar findings were presented in MMWR (July 2019), with targeted biomonitoring in 30 persons with contaminated drinking water from Cape Fear River, NC in 2017. In this study, only one sample showed detectable concentrations of PFAS in urine versus all 30 samples with detectable concentrations in serum. The findings support the use of serum in biomonitoring of PFAS in the general population.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 16
Challenges and Opportunities in Assessing Aggregate/Concomitant Exposures and Their Impact on Health
Chairs: Elizabeth Radke-Farabaugh, US & Suril Mehta, US

Evaluating Metal Mixture Effects across Multiple Media

Presenter: Yuri Levin-Schwartz, Icahn School Of Medicine, New York, United States

Authors: Y. Levin-Schwartz[1], B. Claus Henn[2], C. Gennings[1], B. A. Coull[3], D. Placidi[4], D. R. Smith[5], R. Lucchini[1], R. O. Wright[1];
[1]Icahn School Of Medicine, New York, NY, [2]Boston University School of Public Health, Boston, MA, [3]Harvard T. H. Chan School of Public Health, Boston, MA, [4]University of Brescia, Brescia, ITALY, [5]University of California, Santa Cruz, Santa Cruz, CA.

Background/Aim: We developed multi-media biomarkers (MMBs) that integrate information across chemical exposure estimates when multiple biomarker media are used. Since each chemical has unique toxicokinetics and each medium (hair, urine, etc.) reflects differences in kinetics, no single medium is an ideal biomarker of exposure for all chemicals in a mixture. MMBs integrate exposure measures into a common metric that can be used in mixtures analyses. We propose that this will reduce exposure misclassification. Methods: Levels of lead (Pb) and manganese (Mn) were quantified in 5 media- blood, hair, nails, urine, and saliva. MMBs were constructed for both metals using weighted quantile sum (WQS) regression and the 5 media. We estimated the joint effects of both metals on Wechsler Intelligence Scale for Children (WISC) IQ scores in the Public Health Impact of Metals Exposure (PHIME) project, a study of Italian adolescents aged 10-14 years (N~720). Models were adjusted for age, sex, and SES. We compare the mixture effect of Pb and Mn, estimated using WQS regression, when Pb and Mn levels are quantified using MMBs and the original biomarkers. Results: Joint exposure to Pb and Mn was associated with decreased Verbal IQ when Pb and Mn exposure levels were estimated using hair (-0.7, 95% CI [-1.3, -0.1]), saliva (-0.8, 95% CI [-1.3, -0.2]), and MMBs (-1.1, 95% CI [-1.8, -0.5]). Total IQ was associated with Pb and Mn when exposure was assessed using MMBs (-0.71, 95% CI [-1.3, -0.1]) and not with individual biomarkers. Weights indicate that blood and hair contributed most to the MMB for Pb, whereas hair and saliva contributed most to the MMB for Mn. Conclusions: Mixture analyses are improved by using MMBs to estimate exposure. Combining information across multiple biomarkers through MMBs enables greater accuracy in measuring mixture effects and provides increased statistical power over single biomarkers.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 16
Challenges and Opportunities in Assessing Aggregate/Concomitant Exposures and Their Impact on Health
Chairs: Elizabeth Radke-Farabaugh, US & Suril Mehta, US

A congener-specific and mixtures analysis of plasma polychlorinated biphenyl (PCB) levels and incident breast cancer in the Carolina Breast Cancer Study

Presenter: Humberto Parada Jr., San Diego State University, San Diego, United States

Authors: H. Parada Jr.[1], T. Benmarhnia[2], X. Sun[3], C. Tse[3], L. S. Engel[3], E. Hoh[1], A. F. Olshan[3], M. A. Troester[3];
[1]San Diego State University, San Diego, CA, [2]University of California San Diego, La Jolla, CA, [3]University of North Carolina at Chapel Hill, Chapel Hill, NC.

Background: Polychlorinated biphenyls (PCBs), which are carcinogens and endocrine disrupting chemicals with innate heterogeneity, are hypothesized to influence risk of breast cancer. However, studies assessing PCB mixtures and breast cancer are lacking. Herein, we examined plasma levels of 17 PCBs as individual congeners and as mixtures in association with breast cancer. Methods: This study included 845 White and 562 Black women who participated in the case-control Carolina Breast Cancer Study Phase I. Cases (n=748) were women with a first diagnosis of histologically confirmed invasive breast cancer identified from the North Carolina (NC) Central Cancer Registry. Population-based controls (n=659) were identified from NC Department of Motor Vehicles or Health Care Financing Administration lists. PCBs were measured in plasma samples obtained at the time of the case-control interview. We used logistic regression to estimate adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for the associations between individual lipid-adjusted PCB congeners and breast cancer. We used quantile g-computation (qgComp) to assess PCB mixtures, and in sensitivity analyses compared results to those from generalized weighted quantile sum regression (WQS). We examined effect measure modification by race (white vs. black). Results: The highest (vs. lowest) tertiles of PCBs 74, 99, 194, and 201 were associated with breast cancer ORs of 1.30 (95%CI=0.95-1.79), 1.39 (95%CI=1.02-1.89), 1.27 (95%CI=0.91-1.77), and 1.24 (95%CI=0.90-1.72), respectively. These PCBs also showed dose-response relationships is models using ln-transformed continuous PCB levels. Using qgComp, among all women a one-unit change in all PCB quantiles was associated with an OR of 1.29 (95%CI=1.00-1.67). In stratified analyses, associations of PCB mixtures were stronger among black women (OR_{qgComp}=1.55, 95%CI=1.05-2.30), than among white women (OR_{qgComp}=1.13, 95%CI=0.80-1.60). Conclusion: Exposure to PCBs may increase the risk of breast cancer. Additional studies are needed that consider mixtures of PCB congeners in association with breast cancer.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 16
Challenges and Opportunities in Assessing Aggregate/Concomitant Exposures and Their Impact on Health
Chairs: Elizabeth Radke-Farabaugh, US & Suril Mehta, US

Socioeconomic Status, Diet and Hormone Therapy Predict Three-year Changes in Phthalate Metabolite Levels in a Multi-ethnic Cohort of Mid-life Women: the Study of Women's Health Across the Nation (SWAN)

Presenter: Mia Peng, University of Michigan School of Public Health, Ann Arbor, United States

Authors: M. Q. Peng, C. Karvonen-Gutierrez, S. D. Harlow, B. Mukherjee, S. K. Park;
University of Michigan School of Public Health, Ann Arbor, MI.

Background: Within-person variations in urinary phthalate metabolite concentrations are substantial, but little is known about what predicts these variations. This knowledge is important to the design, analyses and interpretation of epidemiologic studies. We examined whether within-person change in urinary phthalate metabolite concentrations between 1999/2000 and 2002/2003 differed by population characteristics in a cohort of mid-life women. Methods: We measured 11 urinary phthalate metabolites (monoethyl phthalate (MEP), mono-n-butyl phthalate (MnBP), mono-isobutyl phthalate (MiBP), monobenzyl phthalate (MBzP), mono(2-ethylhexyl) phthalate, mono(2-ethyl-5-hydroxyhexyl) phthalate, mono(2-ethyl-5-oxohexyl) phthalate, mono(2-ethyl-5-carboxypentyl) phthalate, mono-carboxyoctyl phthalate (MCOP), mono-carboxy-isononyl phthalate, and mono(3-carboxypropyl) phthalate (MCPP)) in 1221 women who had baseline demographics (age, race/ethnicity, study site, income, education) and dietary data (daily total calorie intake, dietary fat content), menopausal status and hormone therapy (HT) use at both time points. We used multiple linear regression to predict within-person change in metabolite concentrations, defined as the three-year difference in log-transformed metabolite concentrations, with baseline demographics and within-person changes in diet, menopausal status and HT use. Results: Over three years, concentrations of most metabolites significantly decreased, except for MiBP and di(2-ethylhexyl) phthalate (DEHP) metabolites. Income and education were associated with differential changes in MCOP, MCPP, MBzP and DEHP metabolites, but the associations were not monotonic. Increasing intake of dietary fat was significantly associated with smaller decreases in MnBP and MBzP. Compared to women who remained pre-menopausal with no HT use, women who started HT had greater decreases in MnBP and MCPP, while those who used HT at baseline had smaller decreases in MEP. Conclusion: Urinary phthalate metabolite concentrations changed differentially by population characteristics. Secular changes in sources of exposure may not apply uniformly to all socioeconomic groups. Changing behaviors may further alter metabolite concentrations. Given this, taking the mean or constructing trajectories of repeatedly sampled metabolite concentrations may better characterize phthalate exposure over an extended period.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 16
Challenges and Opportunities in Assessing Aggregate/Concomitant Exposures and Their Impact on Health
Chairs: Elizabeth Radke-Farabaugh, US & Suril Mehta, US

Breast Cancer Related Chemicals in Ingredient Lists of Personal Care Products: A Big Data Crowdsourcing Approach

Presenter: Amit Rosner, Clearya, Hod Hasharon, Israel

Authors: A. Rosner[1], R. Dodson[2];
[1]Clearya, Hod Hasharon, ISRAEL, [2]Silent Spring Institute, Newton, MA.

Background
Chemicals found in personal care and beauty products have been associated with endocrine disruption and cancer. Consumers seeking product information online often lack information as to the presence of chemicals identified on hazard lists.
Aims
(A) Assess the prevalence of breast cancer related chemicals in personal care and beauty products sold by online retailers.
(B) Develop a data analytics platform for future research on environmental contaminants in products.
(C) Provide a decision supporting tool for consumers assisting in safer product selection.
Methods
We developed an internet browser extension for consumer shopping for products online. Using this extension, we crowdsourced ingredient lists of 8,091 personal care and beauty products, offered by online U.S. retailers between July and October 2019. Approximately 190,000 ingredient names were isolated and matched against 15 authoritative hazard (toxicology) datasets. We tagged toxicants as breast cancer related if they were previously identified as mammary gland carcinogens in rodent studies or estrogen receptor agonists in high-throughput assays.
Results
Of the 8,091 products scanned, 120 contained at least one of 19 known or suspected carcinogens, including two breast cancer related chemicals. 1,455 products contained at least one of 19 estrogen receptor agonists. Approximately 40% of the products contained ingredients prone to trace contamination by breast cancer related carcinogens: ethoxylated ingredients (1,4-dioxane, potential manufacturing byproduct, 3,026 products); petrolatum (PAHs, potential refining residue, 214 products); polyacrylamides (acrylamide, potential residual monomer, 168 products); butane or isobutane (1,3-butadiene, potential refining residue, 71 products).
Conclusions
Personal care products sold online in (and exported from) the US may expose consumers to breast cancer related ingredients and trace contaminants. Many of the toxicants identified here are banned in cosmetics or restricted as residual trace contaminants in Canada and the EU but allowed in the US.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 16
Challenges and Opportunities in Assessing Aggregate/Concomitant Exposures and Their Impact on Health
Chairs: Elizabeth Radke-Farabaugh, US & Suril Mehta, US

Critical windows of prenatal and early life exposure to toxic metals and early childhood kidney function

Presenter: Alison Sanders, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: A. P. Sanders[1], P. Curtin[1], M. Tamayo-Ortiz[2], I. Pantic[3], G. Estrada-Gutierrez[3], S. Parra-Hernandez[3], L. Torres Olascoaga[4], R. O. Wright[1], M. M. Tellez-Rojo[4], M. Arora[1], C. Austin[1];
[1]Icahn School of Medicine at Mount Sinai, New York, NY, [2]National Council of Science and Technology, Cuernavaca, MEXICO, [3]National Institute of Perinatology, Mexico City, MEXICO, [4]National Institute of Public Health, Cuernavaca, MEXICO.

Introduction: As renal development and maturation processes begin in utero and continue through early childhood, metal exposures during these periods may be sensitive windows for subclinical renal toxicity in children with implications for later life risk of hypertension and kidney disease. We used novel dentine biomarkers of toxic metal exposure to identify critical windows of susceptibility to lead (Pb) and chromium (Cr) and associations with children's kidney function at age 8-9 years.
Methods: Participants included 86 children in the Programming Research in Obesity Growth, Environment and Social Stress (PROGRESS) longitudinal birth cohort study based in Mexico City. Estimated glomerular filtration rate (eGFR) was assessed for children 8-9 years of age using serum cystatin C measures, while pre- and postnatal Pb and Cr concentrations were reconstructed in weekly increments by analyzing deciduous teeth with laser ablation-inductively coupled plasma-mass spectrometry. We used reverse distributed lag models (rDLMs) to examine time-varying associations between weekly metal exposure and children's eGFR while adjusting for child's age, sex, and height.
Results: We identified a critical window of susceptibility to Pb exposure, wherein postnatal Pb exposure 24-26 weeks after birth was associated with children's decreased eGFR at 8 to 9 years of age. We also identified both pre- and postnatal windows of vulnerability to Cr exposure associated with decreased eGFR in children.
Conclusions: Using tooth-matrix biomarkers, we identified discrete developmental exposure windows wherein Pb and Cr were associated with reduced renal function in childhood. Further work investigating eGFR trajectories with longitudinal measures through adolescence will be important to understanding the implications of these findings for later life renal health.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 2
SYMPOSIUM 9
Beyond Temperature: Assessing the Global Burden of Disease from Climate Change
Chairs: Susan Anenberg, US & Kristie Ebi,US & John Balbus, US

Climate change and vector-borne diseases

Presenter: Cyril Caminade, University of Liverpool, Liverpool, United Kingdom

Authors: C. Caminade;
University of Liverpool, Liverpool, UNITED KINGDOM.

Vector-borne diseases (VBD), such as Zika, dengue, chikungunya, yellow fever, leishmaniasis, malaria, Rift Valley Fever, Lyme disease and bluetongue are transmitted by exothermic arthropod vectors such as mosquitoes, flies, midges and ticks that do not regulate their internal temperature. Precipitation provides breeding sites for the early larval stages of the vectors, while temperature modulates their development, mortality rate and the time required for the pathogen to replicate in their body. As a consequence, climate change in addition to an ever-increasing mobility of goods and people and other socio-economic risk factors, will very likely affect the distribution of vector-borne diseases in future. Coupling mathematical disease models with climate observations and ensemble of future climate change scenarios, allow to explore potential future changes in VBD distribution and assess related uncertainties. This presentation will review research carried out at the University of Liverpool in collaboration with several international partners over the past decade. Our work confirmed the impact of the 2006 heatwave on the emergence of bluetongue, a midge-borne disease affecting ruminants, into northern Europe. In 2011 another publication anticipated the northward spread of Aedes albopictus, the Asian tiger mosquito, in Europe and into southern UK. In a study published in 2014 we showed that malaria risk could increase over tropical altitude regions while it could decrease over the warmer regions during the 2080s under the most extreme RCP8.5 scenario. In 2017, a study showed that the climatic conditions related to the 2015 El Niño event favoured the Zika outbreak that had a large impact on Latin America that year. Many other research groups anticipated the spread of vectors and the diseases they can transmit worldwide. This fact demonstrates the value and usefulness of such predictive risk models; and importantly that we need to take urgent measures to tackle anthropogenic climate change.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 2
SYMPOSIUM 9
Beyond Temperature: Assessing the Global Burden of Disease from Climate Change
Chairs: Susan Anenberg, US & Kristie Ebi,US & John Balbus, US

Climate change will exacerbate maternal malnutrition globally

Presenter: Emily Smith, George Washington University, Washington , United States

Authors:

Maternal malnutrition is a major public health problem. Low pre-pregnancy weight, inadequate weight gain during pregnancy, and micronutrient deficiencies are significant risk factors for adverse pregnancy outcomes. Infants who are born too small or born too soon face a higher risk of mortality, morbidity, and suboptimal cognitive development. Investments in maternal nutrition have long been neglected, despite improved measurement of the global burden of disease related to maternal and newborn health. Nearly 40% of women are estimated to be anemic during pregnancy. The global prevalence of low body mass index among women of reproductive age is decreasing worldwide, but there are still regions of the world where millions of women are underweight. Climate change may further exacerbate these problems.
Women and girls around the world often eat last and eat the least. When food insecurity gets worse, women and girls suffer the most. And while nutrient availability has increased over time, the Global Nutrient Database project shows that the smallest gains have been made in the poorest parts of the world. Despite improved caloric availability everywhere, improvements in protein and micronutrient availability have been smallest in low- and middle-income countries. Balanced energy and protein, plus micronutrients, are essential for a positive pregnancy experience. So, we must be especially concerned that atmospheric changes tied to climate change, such as elevated CO2, are hypothesized to diminish the micronutrient composition of staple crops. These CO2-related mineral deficiencies may disproportionately affect agriculture in southeast Asia and Africa. Better nutrition and resilience in the face of climate change is linked to each and every one of the Sustainable Development Goals. But we must focus on equity in innovations to address the changing nutrient landscape and global food insecurity so that women and girls are not left behind.
Mesaj yazın

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 2
SYMPOSIUM 9
Beyond Temperature: Assessing the Global Burden of Disease from Climate Change
Chairs: Susan Anenberg, US & Kristie Ebi,US & John Balbus, US

Leveraging data from the Global Burden of Disease Study to appraise the potential impact of climate change

Presenter: Katrin G Burkart, University of Washington, Seattle, United States

Authors: K. G. Burkart[1], S. C. Anenberg[2], J. Stanaway[1], M. Brauer[1];
[1]University of Washington, Seattle, WA, [2]George Washington University, Washington D.C., DC.

The global burden of disease (GBD) annually models deaths and diseases as disability adjusted life years (DALYs), years of life lost (YLLs) and years of life lost due to disability (YLDs) for more than 350 diseases and injuries in 195 countries and 990 sub-national locations, by age and sex, from 1990 to the present. In addition, the GBD entails a comprehensive risk assessment framework in which a multitude of metabolic, behavioral and environmental risk factors are systematically assessed. The internal consistency of the GBD allows comparison over time, across age groups and gender, as well as in between populations, causes and risk factors. In 2019, an initial assessment of the role of climate the GBD included non-optimal temperature as a risk factor and estimated the burden attributable to high and low temperature exposure. Globally, the study attributed 2.0 million (95%UI=1.7-2.2) deaths and 37.6 million (95%UI=32.4-44.3) DALYs to non-optimal temperature exposure with a large number due to cardiovascular disease as well as metabolic and respiratory diseases. External causes, such as suicide, homicide and injuries were strongly affected by high temperature while low temperature exerted a protective effect. Currently, we are extending this work to future projections until 2100, considering climate and population change. Beyond the assessment of these direct and very immediate impacts of temperature, the GBD contains additional information relevant to climate impact assessment. Here, we present a framework for future use of GBD data to assess the global disease health burden related to climate change. We outline causes and risks that may be related to climate change and illustrate how the potential future impact of global warming versus other drivers such as demographic and epidemiological changes can be evaluated.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 2
SYMPOSIUM 9
Beyond Temperature: Assessing the Global Burden of Disease from Climate Change
Chairs: Susan Anenberg, US & Kristie Ebi,US & John Balbus, US

Beyond temperature: risk estimates for adaptation planning

Presenter: Sari Kovats, LSHTM, London, United Kingdom

Authors: S. Kovats, G. Turner;
LSHTM, London, UNITED KINGDOM.

The Climate Change Risk Assessment (CCRA) for the UK is a statutory requirement under the Climate Change Act. The Evidence Report for the Third CCRA, due 2020, will assess key current and future risks to public health from climate change and consider present and planned adaptation strategies to limit impacts on the UK population. The third CCRA function assesses whether current actions are sufficient to manage the climate risks to an acceptable level, and also to assess whether such actions improve or exacerbate adverse health outcomes and health inequalities. As essential part of the risk assessment process is the scientific evidence on current and likely future impacts of population health. More than 10 separate risks for public health are currently included in the assessment but published modelling estimates on health outcomes are only available for 1 risk - heat impacts on mortality and morbidity for the UK population. The Evidence Report will be used to develop the third iteration of the UK National Adaptation Plan (NAP) for actions to be taken in 2023-2028. The shift in focus from modelling future risks to the assessment of adaptation strategies has been developed in conjunction with key stakeholders. The long-term health and social consequences of climate change over the century are considered through a range of future scenarios, that consider both potential policy, and building and environmental “lock-ins”. Such lock-ins include potential risks to inhabitants from overheating due to building regulations failing to address increasing ambient temperatures. Climate change presents a challenge for organisations to deliver national policy responses ensuring that adaptation remains equitable and optimal for health.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 2
SYMPOSIUM 9
Beyond Temperature: Assessing the Global Burden of Disease from Climate Change
Chairs: Susan Anenberg, US & Kristie Ebi,US & John Balbus, US

Quantifying the health impacts of extreme events caused by climate change: next steps for detection and attribution

Presenter: Kristie Ebi, University of Washington, Seattle, United States

Authors: K. Ebi, E. Kazura, C. Boyer;
University of Washington, Seattle, WA.

Background: Several recent extreme weather and climate events, particularly extreme heatwaves and geophysical changes in the Arctic, could not have occurred without climate change. Other climate-related health impacts, such as the dengue epidemics in 2019, although not currently attributable to climate change, nonetheless highlight the potential magnitude of the impacts of climate change on health. As attribution science continues to evolve, opportunities exist to quantify the extent to which current health burdens are attributable to climate change.
Objectives: We 1) categorize extreme weather and climate events for which detection and attribution studies concluded that climate change was a major driver of the event; and 2) quantify the numbers of injures, hospitalization, and deaths that occurred.
Methods: Detection and attribution is a formal statistical method for determining the extent to which climate change altered the frequency or intensity of an extreme weather or climate event. The method then determines whether the occurrence of adverse health outcomes changed with the event, and the extent to which that change was attributable to climate change. Using a case study approach, data were collected on extreme events attributed to climate change and on the numbers of adverse health consequences. Discussion: Detection and attribution studies can inform evidence-based management to reduce current and plan for future changes in health risks by explicitly highlighting inter-linkages between climate change and adverse health outcomes. These studies also can inform international discussions of the health system aspects of loss and damage by identifying situations where adaptation options are insufficient to avoid climate change-related risks. Gaining a better understanding of the magnitude, timing, and distribution of the climate change-related burden of disease requires more knowledge about the factors that confound and modify the effects of climate on health, and refinement of analytic techniques.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 17
Chemical Mixtures, Social Stressors and Children's Environmental Health
Chairs: Devon Payne-Sturges, US & Berna van Wendel de Joode, Costa Rica

Using Environmental Risk Score to study a mixture of phenols and parabens in association with gestational age in a Puerto Rican cohort

Presenter: Amira Aker, University of Toronto Scarborough, Scarborough, Canada

Authors: A. M. Aker[1], Y. Yu[2], S. Park[2], B. Mukherjee[2], J. Meeker[2];
[1]University of Toronto Scarborough, Scarborough, ON, CANADA, [2]University of Michigan, Ann Arbor, MI.

Background: Most studies of associations between exposure to environmental chemicals and adverse health outcomes have focused on individual chemicals in isolation. However, in reality, people are exposed to multiple chemicals simultaneously, and assessing chemical mixtures may provide more realistic risk estimates. Various phenols, parabens and triclocarban have been associated with gestational age. We explored the association of phenols and parabens as a mixture with gestational age using the Environmental Risk Score (ERS), a weighted sum of chemical concentrations. Methods: We examined 11 combined phenol, paraben and triclocarban urinary biomarkers in relation to gestational age in the Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) cohort (N=515). We randomly split the dataset into training and validation sets and used elastic net regression coefficients for predicting gestational age from the training set to obtain coefficients for the ERS calculation. Individual biomarkers, biomarker-biomarker interactions and squared biomarker measures were included in the joint elastic net model. ERS was examined in association with gestational age in the validation set, while controlling for specific gravity, maternal age and socioeconomic status. Results: The biomarkers driving the ERS scores were 2,4-dichlorophenol, 2,5-dichlorophenol, benzophenone-3, triclosan, triclocarban, ethyl-, methyl- and propyl- paraben. There was a statistically significant association between ERS and gestational age, such that an increase in an ERS standard deviation was associated with a 0.45 day increase in gestational age (95% CI: 0.29, 0.62). This increase in gestational age was consistent with findings from individual chemical biomarker analyses from the same cohort. Conclusions: This study shows the utilization of ERS powered by modern machine learning tools to study multi-pollutants, while allowing for chemical interactions and correlations.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 17
Chemical Mixtures, Social Stressors and Children's Environmental Health
Chairs: Devon Payne-Sturges, US & Berna van Wendel de Joode, Costa Rica

Exposure to metal mixtures and blood pressure among Bangladeshi children aged 5-7 years

Presenter: Maria Argos, University of Illinois at Chicago, IL, United States

Authors: M. Argos[1], Y. Shih[1], M. Shahriar[2], B. Jackson[3], S. Farzan[4], C. Howe[4], H. Ahsan[2];
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Background: Early life elevated blood pressure has been linked to hypertension later in life, a significant risk factor for cardiovascular disease. However, evidence connecting metal exposures to childhood blood pressure is limited, and most of the existing research has focused on evaluating the toxicity of one or two metals. Aim: This study aims to evaluate the associations between exposure to metal mixtures and blood pressure among Bangladeshi children aged 5-7 years. Methods: We investigated the associations between 17 metals, measured in toenails, and blood pressure using linear regression models (single-metal model and mutually-adjusted model). Additionally, principal component analysis (PCA), weighted quantile sum (WQS) regression, and Bayesian kernel machine regression (BKMR) were conducted as secondary analyses to test the robustness of findings and potential exposure patterns. Results: Selenium and mercury were positively and inversely, respectively, associated with diastolic blood pressure in linear regression models in the overall study population and among boys. While for girls, we observed an inverse association of tin with systolic blood pressure and a positive association of copper with diastolic blood pressure. Secondary analyses examining metal mixtures yielded similar results. Furthermore, interactions between metals were not found. Conclusions: Findings from linear regression modeling and secondary analyses using PCA, WQS, and BKMR, suggest an important role for selenium with childhood blood pressure, especially among boys. Future research is needed to understand better the mechanisms underlying these possible sex-specific effects of metal mixtures.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 17
Chemical Mixtures, Social Stressors and Children's Environmental Health
Chairs: Devon Payne-Sturges, US & Berna van Wendel de Joode, Costa Rica

Effects of accumulated host, social and environmental exposures on early childhood educational outcomes

Presenter: Mercedes Bravo, RTI International, Durham, United States

Authors: M. A. Bravo[1], M. Miranda[2];
[1]RTI International, Durham, NC, [2]Rice University, Houston, TX.

Background: Persistent disparities in academic performance may result from a confluence of adverse exposures accruing disproportionately to specific subpopulations.
Objective: To investigate how multiple exposures experienced over time affect early childhood educational outcomes.
Methods: We link geocoded North Carolina birth data for non-Hispanic white (NHW) and non-Hispanic black (NHB) children to blood lead surveillance data and end-of-grade (EOG) test scores at 4th grade (n = 65,151). We construct a local, spatial index of racial isolation (RI) for NHB at the block group. We fit race-stratified multi-level models of EOG scores regressed on birthweight percentile for gestational age, blood lead level, maternal smoking, economic disadvantage, and neighborhood RI exposures, adjusting for maternal- and child-level covariates and neighborhood median household income.
Results: NHB children were more likely than NHW children to be economically disadvantaged (80% vs. 40%), live in block groups with elevated RI (46% vs. 5%), have higher blood lead levels (4.6 vs. 3.7 µg/dL), and lower birthweight percentile for gestational age (39% vs. 51%). Higher birthweight percentile was associated with higher reading and math EOG scores. Economic disadvantage was associated with decrements in reading scores of 2.23 (1.94, 2.52) and 2.61 (2.41, 2.80) points among NHB and NHW, respectively. NHB children with blood lead levels >10 µg/dL had reading scores 1.82 (1.16, 2.49) points lower than NHB children with blood levels of <1 µg/dL. NHW children with blood levels >10 µg/dL had reading scores 1.38 (0.74, 2.02) points lower than NHW children with blood levels of <1 µg/dL. NHB children in neighborhoods in the highest quintile of RI had reading scores 1.54 (0.74, 2.34) points lower than NHB children in neighborhoods in the lowest RI quintile. Results were similar for mathematics scores.
Conclusion: Key adverse host, environmental, and social exposures accrue disproportionately to NHB children, resulting in lower EOG scores.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 17
Chemical Mixtures, Social Stressors and Children's Environmental Health
Chairs: Devon Payne-Sturges, US & Berna van Wendel de Joode, Costa Rica

Prenatal exposure to select endocrine disruptors and child behaviour: a multi-pollutant approach based on a cohort with repeated exposure assessments

Presenter: Ariane Guilbert, La Tronche, France

Authors: A. Guilbert[1], M. Rolland[1], I. Pin[1], C. Thomsen[2], A. Sakhi[2], A. Sabaredzovic[2], R. Slama[1], K. Guichardet[3], C. Philippat[1];
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Background: Recent studies have suggested the involvement of several endocrine disruptors, including synthetic phenols and phthalates, in the development of infant behavioural disorders. These studies usually assessed exposure from one spot urine sample and did not consider mixture effect. Data regarding substitutes of bisphenol A and phthalates are also needed.
Methods: We assessed concentrations of 12 phenols, 13 phthalate and 2 non-phthalate plasticizer metabolites in pools of multiple urine samples (up to 42 per individual) collected during the second and third trimesters of pregnancy in 397 women from the French SEPAGES mother-child cohort. Behaviour of their child was described at two years in terms of Externalizing score (related to attention and aggressiveness) and Internalizing score (related to emotion, anxiety/depression, somatic complaints and social withdrawn) using the Child Behaviour CheckList 1.5-5 (CBCL). Associations between prenatal exposure to the chemical mixture and child behaviour were analysed using adjusted linear Weighted Quantile Sum (WQS) regressions stratified on child sex.
Results: The WQS indexes were associated with behaviour scores in girls but not in boys. In girls, the Externalizing and Internalizing scores increased by 3.69 points (95% Confidence Interval (CI) [0.92;6.47]) and 2.84 points (95%CI [0.84;4.85]) respectively, for an increase of one tertile of the WQS index (indicating worse behaviour). Main contributors for these associations were triclosan, mono-n-butyl phthalate (MnBP), bisphenol A and molar sum of non-phthalate plasticizer di(isononyl)cyclohexane-1,2-dicarboxylate (ΣDiNCH) for Externalizing score and monobenzyl phthalate (MBzP), ΣDiNCH, monoethyl phthalate (MEP) and MnBP for Internalizing score.
Conclusions: These results suggested adverse associations between in utero exposure to a mixture of phenols, phthalates and non-phthalate plasticizers and child behaviour, especially in girls. They also highlighted the relevance of multi-pollutant approaches to more realistically model exposure.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 17
Chemical Mixtures, Social Stressors and Children's Environmental Health
Chairs: Devon Payne-Sturges, US & Berna van Wendel de Joode, Costa Rica

A mixtures approach to assessing relationships between environmental and social determinants of health and neonatal size and body composition in the Healthy Start cohort

Presenter: Sheena Martenies, Colorado State University, Fort Collins, United States

Authors: S. E. Martenies[1], L. Hoskovec[1], A. Wilson[1], B. Moore[2], A. P. Starling[3], W. B. Allshouse[4], J. L. Adgate[4], D. Dabelea[3], S. Magzamen[1];
[1]Colorado State University, Fort Collins, CO, [2]The University of Texas School of Public Health, Austin, TX, [3]University of Colorado Anschutz Medical Campus, Aurora, CO, [4]Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, CO.

Background: Previous studies have identified neighborhood-level environmental and social exposures associated with birth weight, but no studies have quantified the effects of simultaneous exposures across these domains. Here we used Bayesian Kernel Machine Regression (BKMR) to estimate the independent and joint effects of environmental and social exposures on birth weight in the Healthy Start cohort in Denver, CO. Methods: The initial selection of exposures was guided by an environmental justice screening tool developed for California. Data on neighborhood-level environmental (e.g., fine particulate matter, traffic counts, impervious surfaces) and social (e.g., hospitalization rates, educational attainment, and crime rates) exposures were assigned to pregnant mothers based on their census tract at enrollment. Birth weight was abstracted from medical records. We used a two-step approach to fit our model. First, we used a Bayesian nonparametric variable selection model to reduce the number of candidate exposures. Second, we fit a BKMR model with the exposures, interaction terms for all exposure pairs, and individual-level covariates. Results: We had complete data on birth weight, exposures, and covariates for 792 infants. Out of 19 exposures originally considered, the non-parametric Bayesian model selected 9 (3 environmental and 6 social). BKMR results showed a mixture with all exposures above the median was associated with decreased birth weight. The mixture components selected most frequently by the model were respiratory hospitalization rate and the percentage of households in poverty. Respiratory hospitalization rates had the greatest effect on birth weight (β = -0.03, SE = 0.06) when all other exposures were held at the 75th percentile. For some exposures (e.g., fine particulate matter), relationships with birth weight appeared non-linear. Conclusions: We identified joint effects of environmental and social exposures on birth weight. Results suggest that analyses within one domain may limit the identification of important interactions that are associated with neonatal outcomes.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 17
Chemical Mixtures, Social Stressors and Children's Environmental Health
Chairs: Devon Payne-Sturges, US & Berna van Wendel de Joode, Costa Rica

Urban environment during early-life and blood pressure in children

Presenter: Charline Warembourg, ISGlobal, Barcelona, Spain

Authors: C. Warembourg[1], M. Nieuwenhuijsen[1], F. Ballester[2], M. de Castro[1], L. Chatzi[3], A. Esplugues[2], B. Heude[4], L. Maitre[1], R. McEachan[5], O. Robinson[6], R. Slama[7], J. Sunyer[1], J. Urquiza[1], J. Wright[5], X. Basagaña[1], M. Vrijheid[1];
[1]ISGlobal, Barcelona, SPAIN, [2]Universitat de València, Valencia, SPAIN, [3]University of Southern California, Los Angeles, CA, [4]INSERM-Center for Research in Epidemiology and Statistics, Paris, FRANCE, [5]Bradford Institute for Health Research, Bradford, UNITED KINGDOM, [6]Imperial College London, London, UNITED KINGDOM, [7]INSERM-Institute of Advanced Biosciences, Grenoble, FRANCE.

Background. The urban environment is characterised by many exposures that may influence hypertension development, but studies evaluating multiple urban exposures from pregnancy onwards are lacking. Methods. Using a sample of 4,279 children enrolled in four European mother-child cohorts, associations between urban environmental factors and systolic and diastolic blood pressure (BP) measured at 4-5 years old were evaluated. The urban environment was characterized during pregnancy and childhood and included air pollution, built environment, natural spaces, traffic, noise, meteorology, and socioeconomic deprivation. Single- and multiple-exposure linear regression models adjusted for potential confounders were performed, together with a cluster analysis to identify groups of mother-child pairs sharing similar exposure patterns. Results. In multiple-exposure models (considering 27 prenatal and 30 postnatal exposures), higher BP, in particular diastolic BP, was observed in association with higher exposure levels to air pollution, noise and ambient temperature during pregnancy, and with higher exposure levels to air pollution and higher building density during childhood (e.g., mean BP change [95% confidence interval] for an interquartile range increase in prenatal NO_2=0.9mmHg[0.4;1.3]). Lower BP was observed in association with higher temperature the day before the BP measurement and better transport connectivity during childhood (e.g., postnatal temperature=-1.6[-2.2;-0.9]). The cluster analysis identified six clusters of mother-child pairs, among which two clusters represented a more harmful urban environment during pregnancy and childhood: one with higher air pollution, traffic and noise exposures, and the other with higher air pollution, greater urbanisation and lack of green spaces. Compared to the cluster representing the least harmful urban environment, these were both associated with higher diastolic BP (1.3[0.1;2.6] and 1.5[0.5;2.5]). Conclusion. This longitudinal study suggests that the urban environment, from the prenatal period onwards, may impact BP regulation in children. These findings reinforce the importance of designing cities that promote healthy environments to reduce long-term risk of cardiovascular diseases.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 10
How GREAT is GRADE? Taking Stock of GRADE for Evidence Review in Environmental Epidemiology
Chairs: Hanna Boogaard, US & David Savitz, US

Systematic Review on the Health Effects of Long-term Exposure to Traffic-Related Air Pollution

Presenter: Hanna Boogaard, Health Effects Institute, Amsterdam, Netherlands

Authors: Allison Patton, Health Effects Institute Boston MA USA
Dan Crouse, Health Effects Institute Boston MA USA
Eleanne Van Vliet, Health Effects Institute Boston MA USA
Annemoon Van Erp, Health Effects Institute Boston MA USA
Meltem Kutlar, Joss Swiss TPH Basel Switzerland

The health effects of traffic-related air pollution (TRAP) continue to be of important public health interest. Following its well-cited 2010 critical review, the Health Effects Institute (HEI) is conducting a systematic review of the epidemiological literature on the health effects of long-term exposure to TRAP, with a new expert Panel. The Panel consists of 14 experts in epidemiology, exposure assessment and biostatistics, and is chaired by Francesco Forastiere (King's College London) and Fred Lurmann (Sonoma Technology). Results are being combined quantitatively to evaluate the strength of evidence, where appropriate. The quantitative results of the review may be useful for future risk and health impact assessments of TRAP. The Panel is using a systematic approach to search the literature, assess study quality, summarize results, and reach conclusions about the body of evidence. To this end, a review protocol was developed and registered in Prospero. An extensive search was conducted of literature published between January 1980 and July 2019. Selected health outcomes include all-cause and cause-specific mortality, respiratory effects, cardiovascular effects, diabetes, and adverse birth outcomes. In addition, the Panel has developed an exposure framework to guide the selection and evaluation of epidemiological studies on TRAP. The review is now well underway, and preliminary results will be presented. After a broad search, the Panel has identified 1100 studies relevant for further screening; about 400 of which met the inclusion criteria and will be considered in the systematic review. Effect estimates were reported for all-cause mortality (40 papers), cardiovascular effects (70 papers), respiratory effects (180 papers), and birth outcomes (100 papers). The systematic review will undergo peer-review in 2020 and publication is aimed for 2021. The new review will be an authoritative update of HEI's most-cited report for use by researchers and policymakers.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 10
How GREAT is GRADE? Taking Stock of GRADE for Evidence Review in Environmental Epidemiology
Chairs: Hanna Boogaard, US & David Savitz, US

Risk of Bias Assessments in Evidence Review: Strengths and Limitations

Presenter: Tracey Woodruff, University Of California, San Francisco, San Francisco, United States

Authors: Tracey J Woodruff, Program on Reproductive Health and the Environment, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco, CA, USA
Stephanie M Eick, Program on Reproductive Health and the Environment, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco, CA, USA
Dana Goin, Program on Reproductive Health and the Environment, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco, CA, USA
Nicholas Chartres Program on Reproductive Health and the Environment, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California San Francisco, CA, USA

Systematic review methods are increasingly the norm for evaluating evidence of environmental exposure and health effects to inform environmental health decisions as they support greater transparency in the scientific basis and judgements behind public health decisions. Systematic reviews have been adapted from clinical medicine (e.g. GRADE and Cochrane), where data comes largely from randomized, controlled trials. However, environmental health human studies typically rely on human observational studies due to ethical considerations. Thus, methods have been developed in environmental health to evaluate observational human studies that are adapted from Cochrane/GRADE to the environmental health context, and include the UCSF Navigation Guide systematic review method and the U.S. National Toxicology Program (NTP)'s Office of Health Assessment and Translation (OHAT) method. U.S. EPA has also developed methods for the Integrated Risk Information System (IRIS) and the U.S. EPA Toxic Substances Control Act (TSCA). The evaluation of the risk of bias (ROB) or internal validity of included human studies in a systematic review is a critical component in the method. ROB is a feature of a study's methodological design, conduct, or analysis that may lead to a systematic bias in the true effect of the study. The ROB assessments conducted inform decisions on how the body of evidence will be analyzed. Several tools have been developed from the empirically based tools used to evaluate clinical interventions while accounting for observational human studies conducted in environmental health. This talk will compare strengths and limitations of different tools in assessing ROB tools used by UCSF Navigation Guide, NTP's OHAT, U.S. EPA's IRIS program, and by U.S. EPA under TSCA and how they compare to GRADE. Additionally, this talk will review best practices and those not recommended, including use of "overall quality scores", via a case study relevant to human environmental epidemiology and discuss implications for systematic reviews in environmental health.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 10
How GREAT is GRADE? Taking Stock of GRADE for Evidence Review in Environmental Epidemiology
Chairs: Hanna Boogaard, US & David Savitz, US

How GREAT is GRADE? Taking stock of GRADE for evidence review in environmental epidemiology

Presenter: Francesco Forastiere, National Research Council
, Rome, Italy

Authors: Forastiere Francesco, National Research Council Rome, Italy

It has been proposed to apply the GRADE approach to the evaluation of environmental hazards using the same criteria already used for clinical evaluation, i.e. anchored to the principle that RCT is the gold standard. GRADE defines four levels of evidence quality: very low, low, moderate, and high. Evidence is given a starting quality level (high for RCTs, lower for observational studies) that may decrease (risk of bias, inconsistency, indirectness, and publication bias) or increase (large magnitude of the effect, all plausible confounding would reduce the demonstrated effect or increase the effect if no effect was observed, a dose-response relationship). GRADE recommends against making modifications to the approach, although the literature on different attitudes to applying GRADE is growing.
The proposed application of GRADE to environmental risks presents conceptual and operational difficulties. In clinical medicine, the aim is mostly to establish the efficacy of a treatment, whereas in the assessment of environmental exposures the harmfulness of an exposure is of concern. Two different perspectives. In the first case, the main interest is to minimize the number of false positives when the null hypothesis is true (i.e. the treatment is ineffective) with the aim of preventing an ineffective treatment to be used. In the second case, it is necessary to minimize the number of false negatives when the environmental exposure is actually harmful, because it is essential to protect the population (even at the cost of accepting false positive results).
GRADE works with a system of downgrading and upgrading of evidence. However, some crucial aspects are not considered: 1. number of studies that constitute the body of the evidence; 2. consistency of the effects across populations that differ in factors such as time, location, and/or exposure assessment; 3. consistency of the effects across studies with different design features. Finally, the assessment of the risk of bias is particularly critical as currently there is no gold standard for such evaluation.
In sum, it is obvious that the immediate application of GRADE to environmental issues is not straightforward.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 10
How GREAT is GRADE? Taking Stock of GRADE for Evidence Review in Environmental Epidemiology
Chairs: Hanna Boogaard, US & David Savitz, US

Why using algorithms for evidence synthesis is wrong: triangulation is needed

Presenter: Neil Pearce, London School Of Hygiene And Tropical Medicine, London, United Kingdom

Authors: Neil Pearce, London School of Hygiene and Tropical Medicine, London, UK
Jan Vandenbroucke, London School of Hygiene and Tropical Medicine, London, UK

The concept that one should consider all of the available evidence in order to decide whether a particular exposure can cause a particular disease has been increasingly challenged in recent years, both scientifically and politically. The scientific challenge has come from modern 'causal inference' methodologies which focus on the randomized controlled trial (RCT) as the scientific gold standard, with other types of evidence being downgraded by algorithm-based methods for evidence synthesis. One major example of this approach is the use of packaged algorithms for assessing studies, such as GRADE, and ROBINS. The political challenge has come largely from various vested interests (including industry) which have skillfully employed calls for greater accountability in science that have resonated in the present US administration – and supports methods that downgrade types of evidence that are inconvenient. This development has produced considerable concern about pressures to exclude most epidemiological evidence from consideration by regulatory and advisory committees, thereby weakening regulatory standards. In fact, modern 'causal inference' methods emphasizing emulations of randomized controlled trials (RCT) do not provide the gold standard, but are just a part of the epidemiological toolkit. Similarly, algorithm-based methods are just a part of the toolkit of methods that can be used for evidence synthesis. When used carefully, they may assist the assessment of possible biases in studies of some particular exposure-outcome associations. However, when used inappropriately to score studies, and to reject evidence on the basis of such scores, these algorithm-based systems have considerable potential for harm, both to science and to the public health.

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ABSTRACT E-BOOK

August 25, 2020 / 12:00 - 13:00 / Parallel 5
EMS 5
Incorporating New Epidemiological & Economic Evidence in Estimating Air Pollution-Related Health Impacts with BenMAP-CE
Chair: Stefani Penn, US

Incorporating new epidemiological and economic evidence when estimating air pollution-related health impacts in US EPA's BenMAP-CE benefits assessment tool

Authors: Evan Coffman, North Caroline, United States; Elizabeth Chan, US EPA, Durham, United States; Stefani Penn, Industrial Economics, Inc., Belmont, United States

The US Environmental Protection Agency (US EPA) has recently published updated Integrated Science Assessments (ISAs) for fine particulate matter (PM2.5) and ozone. The evolution of epidemiological evidence identified in these ISAs will inform human health benefit analyses conducted as part of future federal rulemakings for these pollutants. US EPA has undertaken a rigorous process to update the set of health impact functions included in its BenMAP-CE benefits analysis tool to reflect advances in our understanding of the scope of mortality and morbidity impacts with a causal or likely causal link to these pollutants. These new functions also better reflect impacts related to more recent pollutant concentrations in the US, as well as impacts to different age groups.
In this session, we will describe US EPA's process for evaluating the epidemiologic literature; highlight key changes in US EPA's understanding of the health impacts of PM2.5 and ozone resulting from that review; explain how those changes have been translated into a new set of BenMAP-CE's standard concentration-response functions; and review the process used to identify appropriate studies and risk models, as well as supporting data for baseline incidence and economic valuation. We will share methods for using BenMAP-CE to quantify incidence of the relevant suite of health impacts for PM2.5 and ozone associated with changes in pollutant concentrations based on these updates. We will encourage questions from session attendees related to new concentration-response and valuation functions, methods for quantifying air pollution-attributable incident cases of health impacts, and practical use of BenMAP-CE to perform similar analyses.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Socioeconomic isolation and exposure to air toxics in the St. Louis metropolitan area, USA

Presenter: Christine Ekenga, Washington University in St. Louis, Saint Louis, United States

Authors: C. Ekenga;
Washington University in St. Louis, Saint Louis, MO.

Background: A growing body of research has examined the association between neighborhood residential segregation and exposure to hazardous air pollutants in the United States. However, few studies have incorporated neighborhood-level measures of segregation that account for contextual factors throughout an entire study area. We used spatial analyses to investigate the relationship between socioeconomic isolation and exposure to carcinogenic air toxics in the St. Louis metropolitan area. Methods: We developed spatial measures of neighborhood-level poverty isolation and neighborhood-level unemployment isolation. To construct these isolation measures, we obtained census tract-level sociodemographic data from the US Census Bureau. Air pollution data were obtained from the US Environmental Protection Agency and spatial analyses, conducted in ArcGIS, were used to identify air pollution hotspots. We used multivariable logistic regression to examine the association between poverty isolation, unemployment isolation, and exposure to air pollutants. Results: We identified four distinct air toxic hotspots in the St. Louis metropolitan area. Census tracts in the highest quartile of poverty isolation were eight times more likely to be located in an air toxic hotspot than tracts in the lowest quartile (95% Confidence Interval, 4.8-11.9). Census tracts in the highest quartile of unemployment isolation were three times more likely to be located in an air toxic hotspot than tracts in the lowest quartile (95% Confidence Interval, 1.9-4.6). Conclusions: Spatial analyses revealed that poor neighborhoods are disproportionately exposed to air pollutants. Despite improvements in US air quality since the 1970s, racial and economic disparities in exposure to hazardous air pollutants persist. Future investigations are warranted to identify sources of hazardous air pollutants and inform public health efforts to advance environmental justice.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Introducing Machine Learning to Environmental Health Research; Exploring Random Forest in Prediction Modeling

Presenter: Jaclyn Parks, Simon Fraser University, Burnaby, Canada

Authors: J. P. Parks[1], K. McLean[2], L. McCandless[1], R. J. de Souza[3], J. R. Brook[4], J. Scott[4], S. E. Turvey[5], P. J. Mandhane[6], M. B. Azad[7], T. J. Moraes[8], D. L. Lefebvre[3], M. R. Sears[3], P. Subbarao[8], T. K. Takaro[1]; [1]Simon Fraser University, Burnaby, BC, CANADA, [2]BC Center for Disease Control, Vancouver, BC, CANADA, [3]McMaster University, Hamilton, ON, CANADA, [4]University of Toronto, Toronto, ON, CANADA, [5]University of British Columbia, Vancouver, BC, CANADA, [6]University of Alberta, Edmonton, AB, CANADA, [7]University of Manitoba, Winnipeg, MB, CANADA, [8]University of Toronto & Hospital for Sick Children, Toronto, ON, CANADA.

BackgroundAccurately assessing tobacco smoke exposure in early life is important to understanding and preventing childhood asthma. In populations with relatively low smoking exposure, it becomes challenging to characterize the main exposure sources of tobacco smoke exposure. When creating a prediction model of questionnaire items to explain variability in nicotine metabolite concentrations, traditional approaches include using directed acyclic graphs, change-in-estimate procedure, comparing AIC and/or R^2 statistics, and stepwise selection. These approaches may be improved upon with machine learning. MethodsUsing the CHILD Cohort Study, we measured urinary concentrations of nicotine biomarkers (cotinine and trans-3'-hydroxycotinine (3HC)) at low detection levels (0.03ng/mL) and questionnaire responses related to smoking and other lifestyle factors. Urine samples were collected along with questionnaires at 3-4 months of age. The concentrations were corrected for specific gravity. Random forest regression was used to assign variable importance scores to questionnaire items based on how well they predicted the urinary cotinine and 3HC concentrations. Combining knowledge from this machine learning technique with traditional model selection strategies, a multivariable linear regression prediction model was selected to assess how well questionnaires explained urinary cotinine and 3HC concentrations. Results76% and 89% of the infants had detectable urinary cotinine and 3HC levels, with the geometric mean levels consistent with light or intermittent second-hand smoke, third-hand smoke or possibly from diet. Final models explained 32% and 41% of cotinine and 3HC concentration variation in our sample (n=2,017). Questions related to prenatal smoking exposure, second-hand smoke, housing, breastfeeding, and socioeconomic factors were most important in predicting urinary concentrations at 3 months. ConclusionsTo facilitate complex exposure assessment in interdisciplinary projects, researchers have more sensitive tools from outside their traditional disciplines to improve models and generate new hypotheses. Variable importance plots are a relatively easy and interpretable way to incorporate machine learning into environmental health research.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Prenatal Exposure to Stress and Lung Function in 8-10 year old Children

Presenter: Marcela Tamayo-Ortiz, CONACYT-INSP, Cuernavaca, Mexico

Authors: M. Tamayo-Ortiz[1], A. Mercado-García[2], N. Rivera[3], G. D. Tore[4], D. Bush[3], A. Lee[3], A. C. Just[3], I. Kloog[3], M. M. Tellez-Rojo[2], R. O. Wright[3], R. J. Wright[3], M. J. Rosa[3];
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Background Exposure to stress during pregnancy can have long term effects on children's lung function. This association appears to be sex dependent and has been previously demonstrated in 4-6 year old children. The aim of this study was to evaluate sex dependent associations between pre-natal stress exposure and lung function in 8-10 year old children. Methods Data is from 182 mother-child pairs of the ongoing Programming Research in Obesity, Growth, Environment and Social Stressors (PROGRESS) cohort in Mexico City. Stress levels in mothers were assessed as negative life events using the Crisis in Family Systems Revised (CRISYS) questionnaire during pregnancy. The score (0-11) was dichotomized at the median (3). We visited the child's home and performed spirometry tests according to American Thoracic Society guidelines. Results were overread by a pediatric pulmonologist. Spirometry results were analyzed using linear regression. Models were stratified by child's sex, and adjusted for maternal pregnancy exposure to PM 2.5, age at birth and child's gestational age, height and age at time of spirometry. Results We found significant positive associations between higher stress and improved lung function. The associations were stronger in girls compared to boys. For percent predicted FVC and FEV1 higher vs lower stress in boys (β:3.81, 95% CI [-1.60, 9.24]) and (β:2.33 , 95% CI [-3.42, 8.08]) vs girls (β:5.76 , 95% CI [0.92, 10.59]) and (β:5.00 , 95% CI [0.57, 9.43]). Conclusions Prenatal stress is positively associated with children's lung function and appears to be sex-dependent with females demonstrating improved lung function compared to males. Results highlight the importance of considering susceptibility by sex in studies of chemical and stress co-exposures.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Age standardization using reweighting in complex survey data and its application in regression

Presenter: Yutaka Aoki, National Center for Health Statistics, Hyattsville, United States

Authors: Y. Aoki;
National Center for Health Statistics, Hyattsville, MD.

Age standardization is often used in analyzing complex survey data to compare subgroups with different age distributions. Conventionally, age-standardized estimates are derived as weighted averages of age-specific estimates applying weights based on a standard population of choice. Age adjustment, to be distinguished from age standardization, is compatible with widely-used, regression-based techniques for assessing time trends. Those techniques are much harder to use in conjunction with the conventional age standardization method. A reweighting-based alternative method, which can readily accommodate regression-based time trend assessment, is described in this presentation. The alternative involves modification of sampling weights that force age composition for each subgroup to match that of the standard population. To illustrate an application of the alternative, time trend assessments of erythrocyte metal measurements by race/Hispanic origin subgroup in the National Health and Examination Nutrition Survey (NHANES) 1999-2016 are used. The estimand of interest is age-standardized geometric mean derived from Tobit regression that treats measurements below the lower limit of detection as left-censored. When ordinary least square-type regression was used in place of Tobit regression, the reweighting-based method produced age-standardized estimates that exactly matched those obtained using the conventional method, as expected mathematically. When Tobit regression was used, the conventional and alternative methods produced slightly different age-standardized geometric mean estimates for erythrocyte concentration of lead, cadmium, and mercury by sex, race/Hispanic origin, and survey cycle with the difference within ± 5% in 193 out of 198 metal-subgroup combinations. The reason for the difference was investigated to inform potential method improvement for reducing the difference. Annual percentage changes and p-values from orthogonal contrast-based tests for linear, quadratic, and other higher order trends can be produced easily in conjunction with the reweighting-based age standardization.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Assessing disparity using measures of racial and educational isolation

Presenter: Mercedes Bravo, RTI International, Durham, United States

Authors: M. A. Bravo[1], M. Leong[2], A. Gelfand[3], M. Miranda[4];
[1]RTI International, Durham, NC, [2]Rice University, Houston, TX, [3]Duke University, Durham, NC, [4]Rice University, Houst, TX.

Background: We previously developed a local, spatial measure of racial isolation (RI). Here, we extend the isolation concept to educational attainment, which has been consistently linked to health and wellbeing. Methods: Using 2010 Census data, we develop a local, spatial measure of educational isolation (EI) for census tracts across the continental United States (US). We also calculate RI at census tracts across the continental US. We develop a novel measure of local correlation to understand how the relationship between RI and EI varies across space. We also evaluate how local RI-EI correlations differ by urbanicity. Results: Patterns of EI and RI differ substantially across the US. EI tends to be lower (higher) in urban (rural) areas. In contrast, RI is relatively low across much of the US but is high across the Southeast, in cities along and east of the Mississippi River, and in West Coast cities. The global EI-RI correlation (0.21) masks substantial local variations in heterogeneity. In the South, there are strong local RI-EI correlations: high RI tracts in the South are often also educationally isolated. High RI-EI correlations are observed elsewhere (e.g., Northeast, West Coast), but these high correlations more often reflect low levels of both isolation measures. We observe greater heterogeneity in EI in tracts with low RI than in tracts with high RI. This is most pronounced for suburban and rural tracts. In rural tracts with RI < 0.10, EI values range from 0.30 to 0.95; for rural tracts with RI > 0.50, corresponding EI values are > 0.75. Thus, residents of tracts with high RI are more likely to be both educationally and racially isolated. Conclusion: RI and EI are important to consider jointly given their different geographic distributions. Future work should assess the importance of these measures as predictors of health outcomes/disparities.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Hyper-localized air pollution measures and preeclampsia in Oakland, CA

Presenter: Joan Casey, Columbia University Mailman School of Public Healthh, New York, United States

Authors: D. Goin[1], S. Sudat[2], C. Riddell[3], J. Apte[4], R. Morello-Frosch[3], M. Glymour[1], J. A. Casey[5];
[1]University of California, San Francisco, San Francisco, CA, [2]Sutter Health, Walnut Creek, CA, [3]University of California, Berkeley, Berkeley, CA, [4]University of Texas, Austin, Austin, TX, [5]Columbia University Mailman School of Public Healthh, New York, NY.

Background: Air pollution, measured via fixed-site monitors, has been associated with preeclampsia (a hypertensive disorder of pregnancy). However, fixed-site monitors provide relatively crude estimates of ambient air pollution exposure that do not usually allow estimation of within-community disparities. Here, we use high-resolution (30-m) mobile air pollution measures to evaluate the association between black carbon (BC), nitrogen dioxide (NO_2), and ultrafine particulate matter (PM) and preeclampsia among pregnant women in West and Downtown Oakland, California, an area ~17 square-kilometers.
Methods: Google Street View cars measured air quality 50 on average on every block face within West and Downtown Oakland between 2015-2018. Monitors measured combustion-related pollutants: BC, NO_2, and ultrafine PM. We identified 1118 pregnant women, including those with preeclampsia based on diagnosis codes from Sutter Health electronic health records from 2014-2016. These mothers' babies composed >90% of West and Downtown Oakland births during the study period. We linked air pollution measures to mothers based on the 30-m segment on which they lived. Using regression analysis with confounding adjustment, g-computation, and bootstrapping for confidence intervals, we estimated the risk difference of a hypothetical intervention in which women with pollutant levels above the first quartile were set to the first quartile.
Results: 7.2% of the women had a preeclampsia diagnosis. The median (IQR) levels of air pollutants were: BC, 0.34 $\mu g/m^3$ (0.27, 0.42), NO_2, 9.0 ppb (6.7, 13.0), and ultrafine PM, 29.2 # $10^3/cm^3$ (26.6, 32.6). Reassignment to the first quartile of exposure was associated with fewer preeclampsia cases: -10 per 1000 (95% CI: -23, 3), -15 per 1000 (95% CI: -26, -4), and -5 per 1000 (95% CI: -18, 7) for BC, NO_2, and ultrafine PM, respectively.
Conclusions: Even within a small geographic region, we identified positive associations between air pollution at mother's home addresses and preeclampsia.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Developing a framework to connect health equity energy, and green infrastructure for heat impacts mitigation in New York City

Presenter: Lauren Smalls-Mantey, NYC Department of Health, New York, United States

Authors: L. Smalls-Mantey[1], S. Johnson[1], B. Gunther[2], K. Charles-Guzman[3], K. Ito[1];
[1]NYC Department of Health, New York, NY, [2]NYC Department of Parks and Recreation, New York, NY, [3]NYC Maryor's Office of Resiliency, New York, NY.

Background:Every summer, over 500 New Yorkers visit the emergency room for a heat related illness, and researchers estimate that over 100 excess deaths are associated with extreme heat events. In New York City (NYC), heat risks disproportionately impact under-privileged populations due to historical disinvestment in housing, neighborhood green infrastructure and air conditioning (AC) prevalence. Therefore, heat mitigation strategies must consider equity.Methods: In the summer of 2019, the NYC Department of Health, Mayor's Office of Resilience, and NYC Parks conducted a comprehensive data collection campaign in heat vulnerable neighborhoods, as previously determined through an epidemiological analysis considering social and environmental factors. Data collection included: (1) outdoor air temperature measurements using ~35 sensors in every neighborhood; (2) indoor temperature measurements and surveys in 64 residential units and 9 libraries; and (3) energy consumption associated with AC use in 40 locations. We modeled outdoor afternoon (6-9 pm) and nighttime (3-5am) air temperature as a function of neighborhood land-use and vegetative cover. Indoor temperatures were characterized in relation to outdoor temperature, AC types and energy usage. Results: Indoor temperatures were lower in the units with ACs and correlated with the energy usage, but the type of AC and locational characteristics within the building modified these relationships. Outdoor temperatures were negatively associated with the density of vegetative cover (both grass/shrub and tree-canopy) and positively associated with impervious surfaces and building cover. Conclusions: Given that AC prevalence in some heat vulnerable neighborhoods is low (e.g., 75%), the immediate mitigation for thermal safety needs to consider providing and paying for AC in these neighborhoods. In addition, a substantial increase in vegetative cover would be needed to mitigate the projected future increase in outdoor air temperature in these neighborhoods.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 1
PECHA KUCHA SESSION 2
Chairs: Molly Kile, US & Melissa Furlong, US

Gestational Exposure to Stress and Growth Velocity from Birth to Six Months of Age

Presenter: Marcela Tamayo-Ortiz, CONACYT-INSP, Cuernavaca, Mexico

Authors: R. S. Alcántara-Rangel[1], R. Rivas-Ruiz[2], E. Ortiz-Panoso[1], M. Tellez-Rojo[1], M. Solano-González[1], R. O. Wright[3], R. J. Wright[3], M. Rosa[3], M. Tamayo-Ortiz[4];
[1]Instituto Nacional de Salud Pública, Cuernavaca, MEXICO, [2]Mexican Institute of Social Security,, CDMX, MEXICO, [3]Icahn School of Medicine at Mount Sinai, New York, NY, [4]CONACyT - Instituto Nacional de Salud Pública, Cuernavaca, MEXICO.

Background: Exposure to stress during gestation has been associated with birth weight as well as overweight and obesity development during childhood and adolescence, however less is known about its association with growth velocity. An altered growth velocity during the first 6 months postpartum can have an impact on future health. Our aim was to analyze the association between gestational stress and growth velocity from birth to 6-months of life. Methods: Our study population included 549 mother-infant pairs that are part of the Programming Research in Obesity Growth Environment and Social Stressors (PROGRESS) cohort from Mexico City. Maternal psychosocial stress was assessed using the Negative Life Events (NLE) additive scale from Crisis in Family Systems - Revisted (CRISYS-R) instrument during the 3rd trimester of pregnancy covering the previous six months. We defined growth velocity as the change in Z-scores proposed by the WHO between birth and 6-months of age of weight for length, weight for age and length for age z-scores. We generated multivariable linear models adjusted by infant's sex, gestational age at birth, lactation, maternal age, maternal education, 2nd trimester maternal BMI, parity, tobacco smoke exposure and socio-economic status (SES). Results: Our results show that higher stress in pregnancy is associated with a decrease in growth velocity in terms of weight for length (β -0.05 p=0.048 CI 95% -0.11 -0.0005) and weight for age (β -0.087 p=0.02 CI 95% -0.162 -0.013). No association was observed with length for age. Conclusions: Our findings suggest gestational stress exposure affects weight gain in the first postpartum semester. The mechanism could involve fetal programming of offspring's adrenal pituitary hypothalamic axis, however further research is needed in order to elucidate underlying mechanisms. Future work will focus on determining if decreased growth velocity during this time period may predict obesity risk in later life.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 18
Air Pollution: Spatial Analysis and Respiratory Outcomes

Chairs: Nelson da Cruz Gouveia, Brazil & Mildred Maisonet, US

Development of a land use regression model for characterizing intra-urban spatial variation of fine particles in an Andean valley

Presenter: Sara Grisales Vargas, Universidad de Antioquia, Medellin, Colombia

Authors: S. C. Grisales Vargas, R. M. Agudelo Cadavid, L. A. Londoño Ciro;
Universidad de Antioquia, Medellin, COLOMBIA.

Background: Air pollution is an environmental and public health problem of special interest due to its impacts on human health. In recent years, $PM_{2.5}$ levels in the city of Medellin and the Aburrá Valley (Colombia), mainly linked to mobile emission sources, have exceeded the national threshold and WHO guidelines. Although there is an active air quality monitoring network, an important limitation related to spatial distribution is associated. Methods: To characterize the spatial distribution of fine particles in the city of Medellin, Land Use Regression (LUR) models were developed based on $PM_{2.5}$ monthly average for august 2018, available for 13 monitoring stations. The models were built with meteorological, demographic, traffic and urban land uses data, with buffers of 50 to 500 m. Based on the specification criteria of the Ordinary Minimum Squares (OLS) method, the best model for the month of august was selected and a predictive map was developed for the entire study area. Results: Sampler height above ground surface, average monthly wind speed, distance to residential land use from the monitoring station, and vehicle flow within a buffer of 300 m, explained 79% of variability of $PM_{2.5}$. Based on the prediction map, the most contaminated areas were found in the southern region of the study area, with levels between 18 and 30 $\mu g/m^3$. In addition, the least contaminated areas were found in the northwest region, with levels below 16 $\mu g/m^3$. Conclusions: The selected model included a variable that represented emission sources and pollutant dispersion, showing the influence of vehicle fleet and meteorology on $PM_{2.5}$ levels. The LUR methodology is a simple and replicable alternative to estimate exposure to particulate matter; however, this method is susceptible to limited measurements sites.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 18
Air Pollution: Spatial Analysis and Respiratory Outcomes

Chairs: Nelson da Cruz Gouveia, Brazil & Mildred Maisonet, US

Health improvements associated with reduced power plant emissions in the United States between 2005 and 2012

Presenter: Lucas Henneman, Harvard TH Chan School of Public Health, Boston, United States

Authors: L. R. Henneman[1], C. Choirat[2], C. Zigler[3];
[1]Harvard TH Chan School of Public Health, Boston, MA, [2]Swiss Data Science Center, ETH Zürich and EPFL, Lausanne, SWITZERLAND, [3]University of Texas at Austin and Dell Medical School, Austin, TX.

Background. Emissions from coal power plants have fallen dramatically since the passage of the 1990 Clean Air Act Amendments. We quantify and compare changes in 10 health outcomes among US Medicare beneficiaries attributable to two different—but related—metrics over this time period: total $PM_{2.5}$ and exposure to pollution derived from coal-fired power plant emissions.
Methods. We use a new approach—the HYSPLIT average dispersion model, or HyADS—to quantify changes in ZIP code level exposure to SO_2 emissions from each of 1,036 U.S. coal power plants between 2005 and 2012. We conduct an analogous analysis using ZIP code level $PM_{2.5}$ ambient exposure. We use a first differences regression approach to compare how the change in health outcome rates from 2005 to 2012 is associated with changes in $PM_{2.5}$ and coal exposure during the same period.
Results. Most ZIP codes saw reductions in $PM_{2.5}$ and coal exposure across the study period. Decreases in the rates of five health outcomes between 2005 and 2012—all cardiovascular disease, cardiovascular stroke, heart failure, ischemic heart disease, and respiratory tract infection—show statistically significant associations with both reduced $PM_{2.5}$ concentrations and reduced coal exposure. Decreases in rates of heart rhythm disorders, peripheral vascular disease, and all-cause mortality do not show relationships with changes in either exposure. Coal exposure reductions are associated with decreases in rates of chronic obstructive pulmonary disorder, whereas reductions in $PM_{2.5}$ exposure are not.
Conclusions. Results show consistent relationships between coal power plant emission reductions from 2005 to 2012 and decreases in multiple Medicare health outcomes. Further, differences are apparent between health impacts of changing exposure to $PM_{2.5}$ and coal-fired power plant emissions. The approach provides more direct evidence of the benefits of regulations on coal power plants than previous approaches that employ relationships between observed air quality and health.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 18
Air Pollution: Spatial Analysis and Respiratory Outcomes

Chairs: Nelson da Cruz Gouveia, Brazil & Mildred Maisonet, US

Effect of changes in $PM_{2.5}$ concentrations throughout the day on the response of acute respiratory adaptability to exercise in athletes of Medellín, 2018

Presenter: Juan Gabriel Pineros-Jimenez, Universidad de Antioquia, Medellin, Colombia

Authors: M. Acevedo- Ortíz, J. Pineros-Jimenez;
Universidad de Antioquia, Medellin, COLOMBIA.

In Medellín, a daytime cycle of $PM_{2.5}$ is described with higher concentrations between 6am and 10am, which is explained by the variation in the height of the Atmospheric Limit Layer and the changes of surface emissions during the day. This phenomenon indicates a differential exposure to air pollution that affects the daily activities of different population groups, such as athletes whose training is usually done outdoors in the early hours of the morning. The aim of the study was to describe the response of acute respiratory adaptability associated with exercise when this was done at different times of the day. A quasi-experimental exploratory study was conducted in which lung function parameters (forced vital capacity: FVC, forced expiratory volume in 1 second: FEV1 and FEV1/FVC) were measured before and after the performance of a physical effort test in 3 scenarios with different schedules (A: 7am to 10am, B: 12pm to 3pm and C: 6pm to 9pm), and hourly concentrations of $PM_{2.5}$ were determined. To establish respiratory adaptability, the differences between the results before and after were calculated for each lung function parameter and these differences were compared between the different scenario used the Wilcoxon test. In scenario A was $PM_{2.5}$ hourly concentrations higher than the other two stages (A: 30.3 $\mu g/m^3$, B: 17.9 $\mu g/m^3$ and C: 18.6 $\mu g/m^3$). All parameters of lung function were among the ranges of normal values and improved in post-exercise spirometry reflecting normal acute adaptations to exercise. When comparing scenarios A vs. C, less respiratory adaptability was found according to the CVF differences (-0.06 vs. 0.15, $p = 0.02$) and FEV1 differences (0.02 vs. 0.25, $p = 0.01$). This study suggests that between 7am and 10am, acute physiological adaptation to the exercise of the respiratory system of athletes was lower compared to other times.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 18
Air Pollution: Spatial Analysis and Respiratory Outcomes

Chairs: Nelson da Cruz Gouveia, Brazil & Mildred Maisonet, US

Perinatal exposure to particulate matter, environmental tobacco smoke and respiratory symptoms in Mexican children

Presenter: Nadya Rivera Rivera, Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: N. Y. Rivera Rivera[1], M. Tamayo-Ortiz[2], A. Mercado Garcia[3], A. C. Just[1], I. Kloog[4], M. M. Téllez-Rojo[3], R. O. Wright[1], R. J. Wright[5], M. J. Rosa[1];
[1]Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, NY, [2]National Council of Science and Technology (CONACYT), National Institute of Public Health (INSP), Mexico City, MEXICO, [3]Center for Nutrition and Health Research, National Institute of Public Health, Cuernavaca, MEXICO, [4]Department of Geography and Environmental Development, Ben-Gurion University of the Negev, Beer Sheva, ISRAEL, [5]Kravis Children's Hospital, Department of Pediatrics, Icahn School of Medicine at Mount Sinai, New York, NY.

Background: Particulate matter <2.5 microns in diameter ($PM_{2.5}$) and environmental tobacco smoke (ETS) are associated with respiratory morbidity starting in utero. However, their potential synergistic effects have not been completely elucidated. Here, we examined the joint effects of perinatal $PM_{2.5}$ and prenatal ETS exposure on respiratory outcomes in children. Methods: We studied 514 mother-child dyads in the Programming Research in Obesity, Growth, Environment and Social Stressors study in Mexico City. Exposure to $PM_{2.5}$ was estimated using residence in pregnancy and child's first year of life and a satellite-based spatio-temporal model. ETS exposure was assessed by caregiver's report of any smoker in household during second or third trimester. Outcomes included report of ever wheeze, wheeze in the past 12 months (current wheeze) and ever diagnosis of asthma assessed at 6-7 year visit in separate models. Associations were modeled using distributed lag models with daily $PM_{2.5}$ averages for pregnancy and the first year of life, adjusting for child's sex, birth weight z-score, mother's age and education at enrollment, maternal asthma, season and stratified by prenatal ETS exposure (yes/no). Results: Exposure to ETS was reported in 178/514 participants (34.6%). We found significant associations between higher perinatal $PM_{2.5}$ exposure and higher cumulative odds of ever wheeze
(OR:3.72, 95%CI [1.37, 10.10] per 5 $\mu g/m^3$) and wheezing in the past year at age 6 (OR:6.98, 95%CI [1.30, 37.50] per 5 $\mu g/m^3$) only in children with ETS exposure. We did not find any evidence of an association between perinatal $PM_{2.5}$ exposure and report of ever diagnosis of asthma or effect modification of the association by ETS exposure. Conclusions: Exposure to prenatal ETS modified the association between perinatal $PM_{2.5}$ exposure and respiratory outcomes at age 6-7 years. It is important to consider concurrent chemical exposures to more comprehensively characterize children's environmental risk.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 18
Air Pollution: Spatial Analysis and Respiratory Outcomes

Chairs: Nelson da Cruz Gouveia, Brazil & Mildred Maisonet, US

Spatial decomposition analysis of NO_2 and $PM_{2.5}$ air pollution in the United States

Presenter: Yuzhou Wang, University of Washington, Seattle, United States

Authors: Y. Wang[1], M. J. Bechle[1], S. Kim[1], P. J. Adams[2], S. N. Pandis[2], A. Pope[3], A. L. Robinson[2], L. Sheppard[1], A. A. Szpiro[1], J. D. Marshall[1];
[1]University of Washington, Seattle, WA, [2]Carnegie Mellon University, Pittsburgh, PA, [3]Brigham Young University, Provo, UT.

Background: Length scales for spatial variability of air pollution concentrations depend on the pollutant and the location, from meters to 100s or 1000s of km. Spatial patterns of the concentration at a location could reveal information on pollution sources. Methods: Here, we develop a readily scalable algorithm based on “spatial-increment”, to decompose the air pollution concentration into four spatial components: long-range, mid-range, neighborhood, and near-source. We apply the algorithm to annual-average predicted concentrations of outdoor nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$) for all (n ≈ 6 million) census blocks in the contiguous US, from national empirical models. We analyze the within-city patterns of the decomposed concentrations and summarize the national decomposition results by state, geographic region, and urban area size. We also calculate how much each empirical regression component contributes to the spatial decomposition results. Results: Our results show that for NO_2, “neighborhood” and “mid-range” components dominate both with-city and inter-city concentration differences (both are ~5-fold larger in large urbanized areas than rural areas). Urban area size plays a more important role in the component concentrations than geographic regions. For $PM_{2.5}$, the “long-range” component dominates; this component varies by region (e.g., three times greater in the Midwest [7 μg/m^3] than in the West [2.3 μg/m^3]), whereas variation by urban area size is relatively minor. Conclusions: Our study provides the first nation-level fine-scale decomposed pollution surfaces to date, that can be used to estimate, at least to a zeroth order, the contribution of sources at different distances from the receptor to the annual average pollution in the location of interest.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 2
ORAL SESSION 18
Air Pollution: Spatial Analysis and Respiratory Outcomes

Chairs: Nelson da Cruz Gouveia, Brazil & Mildred Maisonet, US

The influence of spatial resolution on NO2-attributable pediatric asthma burden estimates at the global, national, and urban scale

Presenter: Arash Mohegh, George Washington University, Washington DC, United States

Authors: M. Mohegh, D. Goldberg, S. Anenberg;
George Washington University, Washington DC, DC.

Recent studies have shown significant effects of surface NO_2 on pediatric asthma incidence in children (<18 years old). Researchers have estimated the NO_2-attributable pediatric asthma burden globally using different sources of NO_2 concentrations (e.g. satellite observations, land use regression models) with different spatial resolutions (land use regression model ~100m x 100m, satellite data ~ 10km x 10km, global chemistry models ~ 100km x 100km, ⋯). In this project we investigate the influence of spatial resolution on estimated NO_2-attributable pediatric asthma burdens at global, national, and urban scales. We use epidemiologically-derived health impact functions with surface NO_2 concentrations from a land use regression model aggregated from the original resolution of 100m to coarser resolutions up to 100km. We do not change any of the inputs (e.g. population, baseline disease rates) other than the aggregation of the input data to isolate the effect of spatial resolution of analysis. We observe an “artificial dilution” effect on NO_2 concentrations as we aggregate to coarser resolutions, which results from averaging higher urban concentrations with nearby lower rural concentrations. Due to the differences in urbanicity and heterogeneity of concentration of NO_2 in U.S. and India, the decrease in health outcome differs in two countries. We find that NO_2-attributable asthma burden estimates are only 1% lower when using 1km resolution compared with 100m resolution in both countries, but 7% and 32% lower when using 10km and 100km resolutions in U.S, and 5% and 17% lower in India, respectively.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 11
Seasonal Pesticide Use and Transient Physiological and Mental Health Alterations from Childhood to Adulthood
Chair: Jose Suarez-Lopez, US

Repeated exposure to chlorpyrifos results in impaired sustained attention and increased impulsivity in rats.

Presenter: Mary Louise Risher, Marshall University, Huntington, United States

Authors: M. Risher[1], A. V. Terry[2];
[1]Marshall University, Huntington, WV, [2]Augusta University, Augusta, GA.

Introduction: Organophosphates such as chlorpyrifos remain in heavy use in the US and across the globe. Likelihood of unintentional subacute exposure to organophosphates is of great concern for populations that live within rural farming communities. Risk of exposure is highly dependent on pesticide dispersion and proximity to use and has the potential to contaminate the food and water supply. It is well documented that acute exposure to chlorpyrifos can cause cognitive deficits; however, the long-term effects are not well understood. Therefore, the aim of this study was to determine if repeated low-level exposure to chlorpyrifos impaired performance in an animal model of sustained attention.
Methods: Adult male Wistar rats were food restricted to approximately 85% of their age-dependent, free-feeding weights based upon Harlan Laboratories growth rate curves. After one week of food restriction animals began training on the 5-choice serial reaction time task (5C-SRTT). Upon stable responding animals were treated with vehicle or chlorpyrifos 18.0 mg/kg daily for 14 consecutive days or every other day for 30 days. Behavioral testing occurred daily during the chlorpyrifos-exposure period and throughout a 30 day washout period to assess recovery. Cholinesterase activity was assessed 24 hours after the last exposure and after a 31 day washout period.
Results: All chlorpyrifos-treated animals exhibited deficits in percent correct, an increase in omissions and premature responses without signs of impaired motivation or overt toxicity. Deficits in 5C-SRTT accuracy were significant well into the 30-day washout period despite recovery of cholinesterase activity.
Conclusion: These results indicate that repeated exposure to chlorpyrifos lead to protracted impairments of sustained attention and an increase in impulsive behaviors in rats that may not be directly related to impaired cholinesterase activity.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 11
Seasonal Pesticide Use and Transient Physiological and Mental Health Alterations from Childhood to Adulthood
Chair: Jose Suarez-Lopez, US

Biomarkers profile and neurobehavioral functioning in pesticide exposed populations in northern Chile.

Presenter: Floria Pancetti, Universidad Católica del Norte, Coquimbo, Chile

Authors: F. Pancetti[1], L. Zúñiga-Venegas[2], C. Farías-Gómez[1], S. Corral[3], M. Ramírez-Santana[1];
[1]Universidad Católica del Norte, Coquimbo, CHILE, [2]Universidad Católica del Maule, Talca, CHILE,
[3]Universidad de Chile, Santiago, CHILE.

Background. In Chile, several organophosphates (OP) pesticides banned in other countries are still used for insect control in agriculture. Acute intoxications of agricultural workers frequently occur and they must be notified to the surveillance system of the Ministry of Health. However the impact of chronic and environmental pesticide exposure in the general population has been less studied. Long-term exposure to OP is associated to neurobehavioral impairment and is also considered a risk factor for neurodegenerative pathologies. Methods: We recruited volunteers from rural towns located in northern Chile were agricultural activities are carried on. Volunteers (men and women among 18 and 50 years old, with at least 5 years living in the area or working in agriculture) were classified as environmentally (EE) or occupationally exposed (OE) according to a survey that asked sociodemographic, morbidity and exposure antecedents. Each participant underwent a neuropsychological evaluation using a battery of 21 test that covered areas of memory, attention, executive functions, praxis, psychomotricity and emotion. Inhibition values of blood acetylcholinesterase (AChE) and butyrilcholinesterase (BChE) activities during the spray season were obtained in both exposure groups. Results and Discussion: BChE activity was significantly inhibited in EE and OE, showing the EE group the highest magnitude of inhibition. Frequencies of inhibition above 30% (biological tolerance limit declared by Chilean legislation) indicated that AChE is the most frequently inhibited enzyme in the OE whereas BChE is for EE. In pre-spray neurobehavioral evaluations, the OE group showed the highest frequency of low-performance individuals, followed by the EE group. For the majority of tests, the performance worsened during the spraying season. The most affected domains were memory, executive function, and psychomotricity. Poor associations were found between enzyme activities and neurobehavioral outcomes. Systematic biomonitoring and health outcomes studies are necessary to improve environmental and occupational health policies in Chile.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 11
Seasonal Pesticide Use and Transient Physiological and Mental Health Alterations from Childhood to Adulthood
Chair: Jose Suarez-Lopez, US

Associations of acetylcholinesterase inhibition between pesticide spray seasons with depression and anxiety symptoms in adolescents, and the role of sex and adrenal hormones on gender moderation

Presenter: Jose Ricardo Suarez-Lopez, University of California San Diego, La Jolla, United States

Authors: J. R. Suarez-Lopez[1], A. Nguyen[1], J. Klas[1], S. Gahagan[1], H. Checkoway[1], D. Lopez-Paredes[2], D. R. Jacobs Jr.[3], M. Noble[1];
[1]University of California San Diego, La Jolla, CA, [2]Fundacion Cimas del Ecuador, Quito, ECUADOR, [3]University of Minnesota, Minneapolis, MN.

Background:Cholinesterase inhibitor pesticides, especially organophosphates, are endocrine disruptors and a few existing studies have linked self-reports of exposure with increased depression and anxiety. Some evidence suggests that associations may be stronger in women, but the mechanism of this gender difference is unclear. We assessed whether acetylcholinesterase (AChE) inhibition between 2 time points (reflecting greater pesticide exposure) during different agricultural seasons in the year was associated with anxiety/depression symptoms.
Methods: We examined 300 adolescents (ages 11-17y, 51% female) living near agricultural settings in Ecuador (ESPINA study) twice in 2016: April and July-October. We assessed AChE activity (finger stick), estradiol, testosterone, dehydroepiandrosterone, cortisol (saliva) and anxiety and depression scales (CDI-2 and MASC-2).
Results:The mean (SD) depression and anxiety scores were 52.8 (9.3) and 58.1 (9.6), respectively. The median (25th, 75th percentile) AChE change (July-October vs April) was -3.94% (-10.45%, 5.13%). For every 10% decrease in AChE activity, there was a 0.96 unit (95%CI: 0.01, 1.90) increase in depression symptoms and an OR of elevated depression score of 1.67 (1.04, 2.66). These associations were stronger in girls (OR=2.72 [1.23, 6.00]) than boys (1.18 [0.59, 2.37]). Adjustment for cortisol, testosterone and dehydroepiandrosterone reduced gender differences by 18-62%. No associations were observed with anxiety.
Discussion: Inhibition of AChE activity at 2 points in time during different pesticide spray periods was associated with greater depression symptoms, affecting girls more than boys. Gender differences may be partly explained by endocrine disruption. These findings suggest that AChE inhibition may transiently affect the mood of adolescents.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 11
Seasonal Pesticide Use and Transient Physiological and Mental Health Alterations from Childhood to Adulthood
Chair: Jose Suarez-Lopez, US

Time after a peak-pesticide use period and neurobehavior among Ecuadorian children and adolescents: the ESPINA study

Presenter: Cristina Espinosa da Silva, University of California San Diego, La Jolla, United States

Authors: C. Espinosa da Silva[1], S. Gahagan[1], J. Suarez-Torres[2], D. Lopez-Paredes[2], H. Checkoway[1], J. R. Suarez-Lopez[1];
[1]University of California San Diego, La Jolla, CA, [2]Fundacion Cimas del Ecuador, Quito, ECUADOR.

Background. Peak pesticide spray seasons appear to transiently affect neurobehavioral performance of children in agricultural settings, but few studies exist. We previously observed that children examined sooner after the end of a peak pesticide spray season (Mother's Day flower harvest [MDH]) had lower neurobehavioral performance than children examined later. The present study builds on our previous work by incorporating longitudinal analyses from childhood through adolescence.
Methods. In 2008 and 2016, 313 3-10 year-old and 535 11-17 year-old participants were examined in Pedro Moncayo County, Ecuador, respectively (231 were assessed in both exams). Participants were examined primarily during a period of low flower production between 63-100 days after the MDH in 2008 and 82-172 days after the MDH in 2016. Neurobehavior was assessed using the NEPSY-II (domains: Attention/Inhibitory Control, Language, Memory/Learning, Visuospatial Processing, and Social Perception). Generalized estimating equations were used to examine the association between examination time (days) after the MDH and neurobehavior, adjusting for demographic, anthropometric, and socio-economic variables.
Results. Participants in 2008 (vs 2016) had lower mean [SD] scaled scores in Attention/Inhibitory Control (7.8 [2.2] vs. 8.4 [2.2]) and Language (6.6 [2.4] vs. 7.0 [2.0]), but higher scores for Visuospatial Processing (9.6 [3.1] vs. 8.7 [2.3]). Among participants in 2016, we found significant (and borderline) positive associations between time after the MDH and Attention/Inhibitory Control (difference per 10 days [β]= 0.21 points [95% CI: 0.02, 0.40]) and Language (β= 0.16 points [-0.03, 0.34]). In longitudinal analyses (2008-2016), we observed positive and significant curvilinear associations with Attention/Inhibitory Control, Language, and Visuospatial Processing.
Conclusions. This study is among the largest to assess seasonal effects of pesticide exposures on neurobehavior. Our results suggest that peak-pesticide spray seasons may transiently decrease neurobehavioral performance of children for weeks, while greater time after MDH resulted in higher performance. This is consistent with previous findings.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 11
Seasonal Pesticide Use and Transient Physiological and Mental Health Alterations from Childhood to Adulthood
Chair: Jose Suarez-Lopez, US

Changes in Biomarkers and Neurodevelopmental Outcomes Among Male Adolescent Pesticide Applicators and Non-Applicators

Presenter: Diane S Rohlman, University of Iowa, Iowa City, United States

Authors: D. S. Rohlman[1], H. Eadeh[1], G. A. Rasoul[2], A. Ismail[3], O. Hendy[2], K. Wang[1], J. R. Olson[4], M. R. Boner[4];
[1]University of Iowa, Iowa City, IA, [2]Menoufia University, Shebin El-Kom, EGYPT, [3]Menoufia University, Sebin El-Kom, EGYPT, [4]State University of New York Buffalo, Buffalo, NY.

Background. Although organophosphorus pesticides are increasingly restricted for use in the United States, many of these pesticides are still being used in low- and middle-income countries. This may lead to adolescents being environmentally and occupationally exposed to pesticides. While most human and animal research has focused on exposures during the perinatal period, and a few studies have focused on exposure during childhood, there is a paucity of data examining exposures during adolescence, a critical period of brain organization.
Methods. Male adolescent pesticide applicators and non-applicators in Egypt (N=249) were recruited to characterize changes in biomarkers and neurobehavioral (NB) outcomes across application seasons. Test sessions included the collection of biological samples and NB testing.
Results. Urinary 3,5,6-trichloro-2-pyridinol (TCPy) metabolite levels, a chlorpyrifos-specific metabolite, increased in both applicators and non-applicators during the application season and recovered after application ended. Biomarkers of effect, e.g., butyrylcholinesterase (BChE) activity, showed a pattern of inhibition and recovery associated with chlorpyrifos (CPF) application that is repeated across years. TCPy levels, were inversely associated with BChE activity. Importantly, adolescents show BChE inhibition at much lower levels of TCPy (28.9 µg/g creatinine) than adults (>110µg/g creatinine). Neurobehavioral deficits among male applicators increased during the application season and persisted after application ceased. These sustained deficits were present in the absence of red blood cell AChE inhibition. An exposure response gradient between symptoms of attention and hyperactivity/impulsivity and TCPy levels was identified.
Discussion. These findings demonstrate that occupational exposure among male adolescents were predictive of sustained cognitive problems, while also demonstrating that youth living in agricultural communities in the Nile Delta are receiving significant environmental exposures. Due to the large number of adolescents living and working in rural communities worldwide, there remains a critical need to investigate the vulnerability of adolescents, who may be both occupationally and environmentally exposed to pesticides.

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ABSTRACT E-BOOK

August 25, 2020 / 15:00 - 16:00 / Parallel 4
EMS 6
Womens Networking
Chair: Joan Casey, US

Womens Networking

Presenter: Joan Casey, Columbia University Mailman School of Public Health, New York, United States

Authors:

This early morning session will feature coffee and an opportunity for female ISEE members to eat, meet, and discuss career, mentoring, and life. Academia, government, and industry environmental epidemiology positions present unique challenges and opportunities for women. This forum will provide an informal setting in which student, early-career, and senior female ISEE members can gather to share experiences and strategies on how to deal with challenges and embrace opportunities in each of these settings. In particular, we hope discussions will cover writing grants, publishing, collaborations, managing up, time management, how to say “no” to requests in order to further career goals, and work-life balance. Finally, we will have initial talks regarding an ISEE-sponsored women’s mentorship program linking early-career researchers to more senior mentors at other institutions.

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ABSTRACT E-BOOK

August 25, 2020 / 16:00 - 17:00 / Parallel 5
EMS 7
How Can We Shrink the Carbon Footprint of ISEE Conferences?
Chair: Alistair Woodward, New Zealand

How can we shrink the carbon footprint of ISEE conferences?

Authors: Alistair Woodward, University of Auckland, Auckland, New Zealand; Mathilde Pascal, Sante Publique France, France; Ruth Etzel, George Washington University, Washington, United States; Shilu Tong, Shanghai Children's Medical Center, Shanghai, China

Climate change is perhaps the most radical, the most difficult and the most serious environmental threat of all. ISEE must examine its own contribution to the problem, and think hard about what steps can be taken to lower carbon costs while retaining the benefits of membership. The annual conference is the major attraction of ISEE membership, it is the premier event in the Society's calendar. COVID-19 compelled a new approach to the 2020 meeting. Will this be a one-off? What can we learn from the experience, and how should the Society approach future conferences? This one hour session will be introduced by Alistair Woodward, Mathilde Pascal will outline the Greening the International Society for Environmental Epidemiology statement that was approved by ISEE Council in May, and Shilu Tong and Ruth Etzel will lead open discussion.

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ABSTRACT E-BOOK

August 25, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 19
Health Inequities: Considering the Role of Air Pollution, Green Space, and Neighborhoods
Chairs: Tamarra James-Todd, US & Ami Zota, US

Prenatal Ambient Air Pollutants and Maternal Depressive Symptoms at 12 months Postpartum

Presenter: Theresa Bastain, University of Southern California, Los Angeles, United States

Authors: T. M. Bastain[1], T. Chavez[1], R. Habre[1], F. Lurmann[2], S. Farzan[1], B. Grubbs[1], G. Dunton[1], I. Lagomasino[1], S. P. Eckel[1], C. Breton[1];
[1]University of Southern California, Los Angeles, CA, [2]Sonoma Technology, Inc., Petaluma, CA.

Background: Depression is the leading cause of mental health-related morbidity, particularly among women. Ambient air pollutants are modifiable exposures that have increasingly been associated with depression and pregnancy is a period that may increase maternal susceptibility to environmental exposures. We examined whether exposures to prenatal ambient air pollutants are associated with maternal depressive symptoms at 12 months postpartum. Methods: Women participating in the MADRES cohort—an ongoing cohort of predominantly low income, Hispanic women in Los Angeles—were followed from pregnancy through 12 months postpartum with a series of visits and phone calls. At the 12-month study visit, women were orally administered the Center for Epidemiologic Studies-Depression (CES-D) scale as part of a questionnaire on home exposures, social stressors, sociodemographics, and health history. Residential address histories were recorded from one year prior to conception through 12 months postpartum and average ambient pollutant estimates of NO_2, PM_{10}, $PM_{2.5}$ and O_3 were spatially interpolated at participants' residential locations. Logistic regression models were fitted to evaluate associations between trimester-specific and 9-month average levels across pregnancy of ambient air pollutants and probable depression (score of ≥16 on the CES-D) at 12 months postpartum, adjusting for maternal age and recruitment site (N=101). Results: We found that second trimester ambient NO_2 levels were associated with a two-fold increased odds of probable depression at 12 months (OR=2.03 per SD increase in NO_2 exposure, 95% CI: 1.24, 3.33). Similar results were found for 9-month prenatal average NO_2 (OR=1.88, 95% CI: 1.07, 3.32). Prenatal ambient PM_{10}, $PM_{2.5}$, and O_3 levels were not significantly associated with depressive symptoms at 12 months postpartum. Conclusions: Prenatal ambient NO_2 levels were associated with increased maternal depressive symptoms at 12 months postpartum. These results underscore the need to better understand the contribution of modifiable environmental risk factors during critical susceptible exposure periods.

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ABSTRACT E-BOOK

August 25, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 19
Health Inequities: Considering the Role of Air Pollution, Green Space, and Neighborhoods
Chairs: Tamarra James-Todd, US & Ami Zota, US

Socioeconomic disparity in the association between long term exposure to $PM_{2.5}$and mortality in 2640 Chinese counties

Presenter: Chunlei HAN, Monash university, Melbourne, Australia

Authors: C. HAN;
Monash university, Melbourne, AUSTRALIA.

Background: Although the association between long-term exposure to Fine particulate matter($PM_{2.5}$) and mortality has been evaluated intensively, little is known about the socioeconomic disparity in the association.Methods: We collected data on annual all-cause mortality, $PM_{2.5}$ concentration, socioeconomic and demographic characteristics of 2640 counties from the two most recent Chinese censuses in 2000 and 2010. We applied the difference-in-differences (DID) method to estimate $PM_{2.5}$-mortality association for counties at different quartiles of literacy rate, college rate, urbanization rate and GDP per capita.Results: Overall, every 10 $\mu g/m^3$ increase in annual average $PM_{2.5}$ was associated with 3.8% (95% confidence interval [CI]: 3.0-5.0) increase of all-cause mortality. For counties of the lowest quartile(Q_1) of literacy rate, college rate, urbanization rate and GDP per capita, the effect estimates were 6.0%(95% CI: 4.2-7.7), 4.4%(95% CI: 2.8-6.0), 3.5%(95% CI: 2.0-5.1) and 4.9%(95% CI: 2.7-7.1), respectively, while the $PM_{2.5}$-mortality associations in counties of the highest quartile(Q_4) were not statistically significant. The differences in $PM_{2.5}$-mortality associations between Q_4 and Q_1 of all socioeconomic factors were statistically significant (P-value for difference<0.05).Conclusions: There was a socioeconomic disparity in the $PM_{2.5}$-mortality association in China. Less developed counties dwellers are more vulnerable to deaths from the long-term exposure to ambient $PM_{2.5}$.

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ABSTRACT E-BOOK

August 25, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 19
Health Inequities: Considering the Role of Air Pollution, Green Space, and Neighborhoods
Chairs: Tamarra James-Todd, US & Ami Zota, US

Could equalizing neighborhood socioeconomic status and greenness reduce racial disparities in all-cause mortality among men with prostate cancer?

Presenter: Hari Iyer, -Dana-Farber Cancer Institute, Boston, United States

Authors: H. S. Iyer[1], S. L. Gomez[2], M. P. Fabian[3], L. Valeri[4], J. T. Chen[5], P. James[6], J. E. Hart[7], F. Laden[7], T. Rebbeck[1];
[1]-Dana-Farber Cancer Institute, -Boston, MA, [2]University of California San Francisco, San Francisco, CA, [3]Boston University School of Public Health, -Boston, MA, [4]Columbia Mailman School of Public Health, New York, NY, [5]Harvard T. H. Chan School of Public Health, Boston, MA, [6]Harvard Pilgrim Healthcare Institute, -Boston, MA, [7]Brigham and Women's Hospital, -Boston, MA.

BackgroundNeighborhood contextual factors are associated with racial disparities among men with prostate cancer (CaP), but studies often separately emphasize socioeconomic status or built environment. We estimated the reduction in mortality disparities following a hypothetical joint intervention to equalize both neighborhood socioeconomic status and greenness across Black and White men with CaP. MethodsBlack and White men diagnosed with CaP from January 2000 to December 2015 were followed for up to 10 years using data from the Pennsylvania and Massachusetts Cancer Registries. Racial disparity was defined as the 10-year all-cause mortality risk difference between Black compared to White men, standardized to age, race, diagnosis year, state, and population density. The racial disparity was estimated using Cox models with 95% confidence intervals obtained using bootstrapping. Neighborhood contextual risk factors included socioeconomic characteristics (census block group income, poverty, racialized economic spatial polarization, educational attainment, home value) and greenness within 250m of residential address. We modeled the impact of modifying neighborhood contextual risk factors by z-scaling neighborhood characteristics to 0.5 standard deviation above or below the mean. This resulted in setting neighborhood poverty=3%, income=$56,000, home value=$164,000, 7% with high school diploma or lower, spatial polarization=0.10, and NDVI=0.60. ResultsThe cohort included 169,195 men (10% Black), with 38,672 deaths over 1,219,552 person-years of follow-up. There were 41.6 (95% CI: 35.6, 47.6) excess deaths per 1,000 over 10 years among Black men. The disparity was attenuated under the hypothetical intervention (17.1 deaths per 1,000, 95% CI: 7.8, 26.4), resulting in a 58.9% reduction in the racial disparity.Discussion An intervention to jointly equalize several neighborhood socioeconomic characteristics and neighborhood greenness among men with CaP could reduce racial disparities in mortality. Though this does not reflect a real-world policy, incorporating environmental improvements alongside efforts to reduce socioeconomic disparities could yield greater gains in reducing racial disparities.

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ABSTRACT E-BOOK

August 25, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 19
Health Inequities: Considering the Role of Air Pollution, Green Space, and Neighborhoods
Chairs: Tamarra James-Todd, US & Ami Zota, US

Chronic neighborhood stressors can modify the effect of nitrogen dioxide on term birthweight in New York City

Presenter: Richard Remigio, University of Maryland, College Park, College Park, United States

Authors: R. V. Remigio[1], J. E. Clougherty[2];
[1]University of Maryland, College Park, College Park, MD, [2]Drexel University, Philadelphia, PA.

Urban air pollution exposures are associated with decreased newborn birthweight and developmental impairments, potentially with stronger impacts in communities of lower socioeconomic position (SEP). Here, we examined 28 community stressors - which vary with neighborhood SEP - as potential modifiers of the nitrogen dioxide (NO_2)-birthweight association in New York City (NYC). We examined birth records data on 245,345 live births from 2007 to 2010 and administrative data on 28 social stressors aggregated to United Hospital Fund (UHF) areas (n = 34), categorized into quartiles. Residence-specific NO_2 exposure concentrations, averaged over each pregnancy, were created using NYC Community Air Survey (NYCCAS) and daily EPA regulatory data. We applied linear mixed-effects modeling using UHF as a clustering variable and tested interactions between social factors and NO_2. We observed an averaged 12.6-g (SE = 2.72) decrease in newborn birthweight per IQR increase in NO_2 (IQR= 6.24 ppb). We also observed significant decrements in birthweight with higher stressor exposures (main effects), including significant decreases across quartiles for assault rates (p=.02 for trend across quartiles), child abuse (p=.02), murder (p=.007), robbery (p=.03), and perceived lack of safety (p=.02). Interaction analyses revealed weaker NO_2- birthweight associations in areas with higher community stressors - including higher assault rates (p=.03), murder (p=.03), robbery (p=.04), or perceived lack of safety (p=.02). We found that birthweights in higher-pollution/higher-violence communities were substantially lower, on average, than in lower-pollution/lower-violence communities. These differences were driven, however, by strong direct associations between violence and birthweight; with very high violence exposures, impacts of pollution were dampened. Non-violent social stressors generally did not confer lower birthweights, nor did they substantially alter NO_2 effects. Our results suggest complex interactions among stressors and pollutants, including potential saturation effects at the high end of violence exposures. Research in larger datasets and more flexible methods are needed to characterize non-linear interactions.

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ABSTRACT E-BOOK

August 25, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 19
Health Inequities: Considering the Role of Air Pollution, Green Space, and Neighborhoods
Chairs: Tamarra James-Todd, US & Ami Zota, US

Association between residential green space during childhood and adult earnings: A longitudinal study of environmental determinants of the American Dream across ten United States cities

Presenter: Matthew Browning, Clemson University, Clemson, United States

Authors: M. H. Browning[1], A. Rigolon[2];
[1]Clemson University, Clemson, SC, [2]University of Utah, Salt Lake, UT.

Background: Growing up in poverty is associated with poor health, and the American Dream of upward mobility is becoming an illusion for many low-income children. But nearby green space can support academic achievement, creativity, and emotional regulation, and these traits might help children rise out of poverty. Objectives: To examine the relationship between recent incomes of children born into poverty in the ten largest U.S. cities and densities of residential green space during childhood. Methods: We calculate park proximity, park acreage, new park development, and NDVI greenness for 1980-1990 from Landsat and Trust for Public Land data. We obtain the 2014 income for children born between 1978 and 1982 into families in poverty from The Opportunity Atlas cohort, aggregated at the tract level (n = 5849). Results: Conditional autoregressive (CAR) models of tracts show statistically significant associations between income rank and above-average levels of greenness but not between income rank and park measures, adjusting for individual and neighborhood confounders and spatial autocorrelation. We estimate that, over a 30-year career, children growing up in tracts with the most vegetative cover will earn cumulatively $28,000 more than children growing up in tracts with the least cover, on average. Tracts with lower than average levels of precipitation, higher disadvantage, higher population density, or higher annual temperatures do not show beneficial effects of green space. Conclusions: Greenness may be weakly associated with children rising out of poverty in wetter, cooler, less-dense, more advantaged census tracts.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 1
KEYNOTE SESSION 3

Cities and Health: The Case for a Systems Approach to Urban Policies

Keynote Speaker: Audrey de Nazelle, Imperial College London, London, United Kingdom

Policies to tackle some of the world's greatest public health and environmental challenges- such as air pollution, physical inactivity, climate change, or traffic injuries- tend to be tackled with mostly single-focused, narrow-minded approaches. These sometimes have knock on effects with unintended consequences, and opportunities for synergies towards greater health benefits are missed. Changing the built environment can offer holistic solutions to promoting health. Policies to transform urban form, however, can be resisted against and difficult to implement. This talk will illustrate how comparing multiple impacts of urban policies may lead to different recommendations than using a single-focused assessment approach. The need for community and stakeholder buy-in will also be discussed. The talk will argue for a systems approach that both considers multiple outcomes and offers means to engage with a variety of stakeholders in the decision-making process.

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Coming of Age: Birth Cohorts on Air Pollution and Lung Health

Keynote Speaker: Ulrike Gehring, Utrecht University, Institute for Risk Assessment Sciences, Utrecht, Netherlands

During the past two decades, birth cohort studies have been instrumental in understanding the long-term consequences of air pollution exposure for children's lungs. Epidemiological evidence has been growing for effects of early life exposure to air pollution, especially from traffic, on asthma development and lung function growth through childhood and adolescence. By now the participants of several birth cohorts have reached adulthood. Further follow-up of these cohorts can provide unique opportunities to advance our knowledge on the impact of air pollution exposure on lung health through the life-course. This lecture will first review findings of and experiences from birth cohort research on air pollution and lung health and then then discuss research gaps and future prospects.

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Rapid Changes of the Population and the Environments in the East Asia and the Public Health Implications

Keynote Speaker: Ho Kim, Seoul National University, 관악구, Republic of Korea

Tokyo Olympic Games 2020 have been postponed to the next year but it's still not quite sure whether the Olympic Games will be happening in 2021 or not. But Tokyo hosted the Olympic games in 1964 and then Seoul and Beijing did it in 1988, and 2008, respectively. This is a symbolic sequence of events in East Asia to understand the time trend of industrialization of three countries. They have showed rapid changes of economic changes over decades. Korea was one of the poorest countries in the world after the Korean war in 1953 but it is the world's 12th economy in 2018. And this change means a lot for health and environment in this region. Environmental diseases became a major issue in Japan, like Minamata disease reported from 1956, and then

ABSTRACT E-BOOK

Korea and China followed similar paths; same story for social changes such as population ageing. And these changes have happened rapidly in a short periods of time so that adverse side effects have been inevitable. We have observed good examples of international cooperation on air pollution and climate change in Europe and North America, but it is difficult to expect such cooperation nowadays in East Asia even though three countries have shared many things in common such as culture, food, religion, and environment throughout history. Recent conflicts in the international politics seem to be another factor to make this collaboration unrealistic. In addition to the climate change and air pollution problems the current generation is facing, I will consider the effects of rapid urbanization and population aging in East Asia on health problems, and will discuss challenges for modern epidemiologists dealing with complicated public health problems taking covid-19 situation and international collaboration into consideration.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 20
Covid and the Environment in ASIA
Chairs: Pei Chen Lee, Taiwan & Dirga Kumar Lamichhane, South Korea

Limitations in Japanese Public Health Research and Policy: Lessons from Fukushima and Covid-19

Presenter: Yutaka Hamaoka, Keio University, Tokyo, Japan

Authors: Y. Hamaoka;
Keio University, Tokyo, JAPAN.

Background/Aim
The Covid-19 pandemic revealed national differences in public health systems. Japan suppressed PCR tests, did not conduct urban lockdown, and relied on contact tracing. As a result of these unique measures, in early stage, the number of patients and deaths from Covid-19 seemed small, but as of April 30, 2020, they reached 13,929 and 415 cases, respectively, and outbreaks are ongoing. In South Korea, they ware 10,765 and 247, respectively and peak was passed in early March. The purpose of this study is to clarify why the Japanese public health system (including research, policymaking, and implementation) failed to implement Covid-19 measures and to discuss remedial measures.
Methods
In this study, we compare the responses to the Fukushima nuclear disaster and Covid-19 in terms of measurement, information disclosure, policy planning, and risk communication. Since the two cases are currently on-going, a narrative analysis will be conducted using public documents.
Results
In Fukushima, direct measurement of thyroid exposure was limited to only 1060 children, and PCR testing was also suppressed at Covid-19. Although, in UK and US, forecast of the number of infections and deaths caused by Covid-19 are published with the models used, they are not disclosed in Japan. In both Fukushima and Covid-19, experts such as epidemiologist who appointed to advisory councils of the government, tend to provide advice that is in line with the government's desire to minimize the economic impact, rather than providing scientific advice. Due to diffusion of social media, circulation of false information such as “PCR testing is harmful due to false positives” were more serious in Covid-19 than Fukushima
Conclusions
In this study, we clarified common problems in public health in Japan that would be common in Hiroshima, Nagasaki, and Minamata. There is an urgent need to improve the public health system.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 20
Covid and the Environment in ASIA
Chairs: Pei Chen Lee, Taiwan & Dirga Kumar Lamichhane, South Korea

Public health actions for the COVID&lt-19 outbreak and improvement of air quality in South Korea

Presenter: Sun-Young Kim, National Cancer Center, Goyang, Korea, Republic of

Authors: S. Kim, O. Kim, M. Shin;
National Cancer Center, Goyang, KOREA, REPUBLIC OF.

The worldwide spread of the Coronavirus Disease 19 (COVID&lt-19) pandemic has led to catastrophic consequences but can still serve as an important opportunity to contribute to understanding and improving our environments and health. The effective containment of the outbreak in South Korea was a success story of quick and intensive preventive actions that included nationwide social distancing, contact tracing for those testing positive, and widespread diagnostic testing. These actions also affected changes in major pollution emissions such as traffic. We aimed to investigate whether public health actions implemented by the COVID&lt-19 outbreak induced the decrease in concentrations of six criteria air pollutants. Specifically, we evaluated the change in air pollution after the implementation of actions in a treatment city compared to the change in a control city using the Difference-in-Difference (DiD) analysis. We chose Daegu, a major southeastern city located 300 km away from Seoul, as a control city. The explosion of the South Korean outbreak began in Daegu with new cases making up 80% of all new cases in late February and early March, and the implementation of containment and mitigation began earlier and was more aggressive than in other cities. The pre- and post-periods of public health actions were defied as before and after February 23, 2020 when Daegu was designated as a specialized management region. Daily concentrations of six criteria air pollutants including PM10, PM2.5, NO2, SO2, CO, and ozone for 01/01/2010 through 05/04/2020 were obtained. Our DiD analysis showed significantly negative interaction effect estimates of the treatment and the period for PM10 and SO2, indicating the decrease of PM10 and SO2 in Daegu was larger than that in Seoul after the actions. Future studies should confirm these preliminary findings by including the data for extended time periods, accounting for various confounders, and expanding to health outcomes.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 20
Covid and the Environment in ASIA
Chairs: Pei Chen Lee, Taiwan & Dirga Kumar Lamichhane, South Korea

Changes in air quality during the COVID-19 lockdown in India

Presenter: Harish Phuleria, IIT Bombay, Mumbai, India

Authors: N. D. Chimurkar, G. Patidar, H. C. Phuleria;
IIT Bombay, Mumbai, INDIA.

Lockdown seems the most effective way to prevent the spread of Coronavirus disease (COVID-19) as no vaccine is available in the market to cure it. Thus, India has enforced nation-wide lockdown from 25th March to lower the spread of this contagious virus and associated illness. Thus, the anthropogenic activities have reduced significantly, as a result of which a decline in the air pollution levels is expected. This study aims to quantify the changes in pollution levels during the COVID-19 lockdown over 17 cities of India for 5 major criteria pollutants using publicly available air quality data. Hourly averaged data is accessed from the fixed air quality monitoring stations during the lockdown and immediate pre-lockdown periods and also corresponding data from the previous year (2019) to account for meteorological differences. After four weeks of lockdown, $PM_{2.5}$, PM_{10}, NO_2 and CO reduced significantly with relatively little changes in meteorological condition compared to pre-lockdown period. The major decline is observed at the ~09:00 and ~21:00 hours of the day for PM, NO_2 and CO with >40% reduction. The major impact is seen over metropolitan cities, with significant reduction in air pollutants levels (in particular in $PM_{2.5}$ and PM_{10}) resulting in 100% days during lockdown within the permissible air quality standards. $PM_{2.5}$ and PM_{10} show ~70% decline in pollution levels for Delhi which is the highest among all the cities. Overall, the Northern and the Southern regions show more improvement in air quality during lockdown than other regions. The strict lockdown due to COVID-19, resulting in shutdown of many anthropogenic activities, has helped India to improve the air quality across the cities.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 20
Covid and the Environment in ASIA
Chairs: Pei Chen Lee, Taiwan & Dirga Kumar Lamichhane, South Korea

Airborne transmission of COVID-19 and other coronaviruses in indoor and outdoor environments: a systematic literature review

Presenter: Sotiris Vardoulakis, Australian National University, Canberra, Australia

Authors: S. Vardoulakis[1], D. A. Espinoza Oyarce[1], G. Lo Iacono[2], G. Nichols[3], P. Lauriola[4], A. Zeka[5], G. Leonardi[3];
[1]Australian National University, Canberra, AUSTRALIA, [2]University of Surrey, Surrey, UNITED KINGDOM, [3]Public Health England, Chilton, UNITED KINGDOM, [4]Italian National Research Council, Pisa, ITALY, [5]Brunel University London, London, UNITED KINGDOM.

Most coronavirus infections are transmitted via respiratory droplets through the mucosa or direct inhalation route and are manifested as respiratory diseases. However, human coronaviruses such as SARS-CoV-2 (the COVID-19 virus) show environmental resistance that makes airborne transmission plausible. According to published evidence related to COVID-19, airborne transmission through droplet nuclei that propagate in air is limited to aerosol generating procedures during clinical care of COVID-19 patients. However, recent experimental studies have indicated that SARS-CoV-2 can remain viable in airborne aerosols potentially for hours. Studies in hospitals in Iran and China have reported undetectable levels of airborne SARS-CoV-2 RNA at distances over 2 m from patients' beds or in well sanitised spaces. Although fine particles, pollen and dust in ambient air have all been linked to other infectious diseases in the past, their role in the transmission of COVID-19 and other coronaviruses has not been systematically reviewed so far. Theoretically, inhalation of virus-laden airborne particles could transport the virus deeper into alveolar regions, which could increase the risk of infective transmission. In this rapid systematic review, we analyse the evidence on airborne transmission of COVID-19 and other coronaviruses in outdoor and indoor settings. We investigate how aerosols, including droplets, droplet nuclei, smoke particles, dust, pollen and other aeroallergens may act as carriers of coronaviruses in the air and into the human respiratory system causing infection. We analyse peer-reviewed studies (published or accepted) reporting on airborne transmission of any human coronavirus, including SARS-CoV-2. We include experimental, epidemiological, and mathematical modelling studies in any human population. No restrictions are imposed on the health status or age of these populations or setting (outdoor, indoor, residential, occupational). The primary outcomes of the review are confirmed coronavirus infections as well as positive environmental samples. We searched PubMed, MEDLINE, Scopus, Cochrane Library, and relevant government agency databases.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 20
Covid and the Environment in ASIA
Chairs: Pei Chen Lee, Taiwan & Dirga Kumar Lamichhane, South Korea

Effect of infectious disease outbreak on air quality: Impact of COVID-19 on changes in particulate matter concentrations in Taiwan

Presenter: Charlene Wu, National Taiwan University, Taipei, Taiwan

Authors: C. Wu[1], S. Chan[1], J. Lee[2], C. Chan[1];
[1]National Taiwan University, Taipei, TAIWAN, [2]Industrial Technology Research Institute, Hsinchu, TAIWAN.

Backgrounds: Abundant research has shed light on how climate change instigates and propels the spread of infectious diseases. Recently published literature reported that global epidemic of COVID-19 has reduced air pollutant emissions in several metropolises due to lockdown measures. This study aims to compare the ambient particulate matter concentrations in Taiwan in the past year during the same time frame. Methods: We examined air quality in 17 counties from Taiwan; concentrations of $PM_{1.0}$, $PM_{2.5}$, and PM_{10} detected by low-cost air quality sensors (LCS) from January to March of 2019 and 2020, were analyzed to demonstrate the spatiotemporal pattern air pollution prior to and during the COVID-19 outbreak. We examined monitoring data from 674 LCS and calculated monthly and seasonal mean levels, as well as Wilcoxon signed-rank test to assess whether changes in concentrations were statistically significant. Particulate matter concentrations detected by another type of LCS, hereafter denoted as microsensors, were also analyzed. Results: Ambient concentrations of $PM_{1.0}$, $PM_{2.5}$, and PM_{10} in January of 2019 did not differ significantly from those detected in 2020. However, decreases in $PM_{2.5}$ levels in February of 2020 reached statistical significance when we compared to levels detected in February of the previous year (30.35 10.38 and 28.13 8.22 $\mu g/m^3$, p =0.027). Differences in monthly mean $PM_{2.5}$ concentrations detected by microsensors were also statistically significant (22.57 7.05 and 21.61 7.13 $\mu g/m^3$, p =0.035). As the pandemic progressed and social distancing encouraged, decreases in levels of $PM_{1.0}$, $PM_{2.5}$, and PM_{10} in March of 2020 were statistically significant (p=0.004, p=0.0002, p<0.001). Similar decreases were detected by microsensors across Taiwan, with levels of $PM_{2.5}$ decreased from 24.40 to 21.39 $\mu g/m^3$, p<0.001). Conclusion: Initial analysis showed even though Taiwan did not enforce full nationwide lockdown amidst COVID-19 pandemic, reductions in anthropogenic activities have lowered air pollution levels.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 13
Children's Environmental Health in Latin America: Contribution of Birth Cohort Studies in the Region
Chair: Ana Maria Mora, Costa Rica & Agnes Soares da Silva, US

Birth Cohort of Environmental Exposure and Childhood Development - Pipa Project - Brazil

Presenter: Carmen Fróes Asmus, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Authors: C. F. Asmus[1], A. Rosa[2], S. Jacob[2], N. Damasceno[1], T. Fernandes[1], M. Seefeld[1], A. Natividade[1]; [1]Federal University of Rio de Janeiro, Rio de Janeiro, BRAZIL, [2]Oswaldo Cruz Foundation, Rio de Janeiro, BRAZIL.

Background/Aim: The PIPA project is a prospective cohort study, which will be initiated in the city of Rio de Janeiro (Southeastern Brazil), with the aim of investigating environmental pollutant effects on maternal-child health. The study will collect social, demographic, and health information, in addition to biological samples from parents and newborns, to evaluate metals, pesticides, and plasticizer exposure. All newborns will be followed for 48 months, and their landmarks of physical, neurological, psychological, and cognitive development recorded.Methods: The study population will be all children born at the Federal University of Rio de Janeiro Maternity School, Rio de Janeiro/Brazil, for a period of 12 months. The study protocol includes interviews, physical exams, and collection of biological samples at the 7th month of pregnancy, birth, and the postnatal period until the age of 4. Results: A pilot study was carried out between September 2017 and August 2018, totaling 142 enrolled pregnant women, ensuing 135 (95%) births and the collection of umbilical cord and mother blood samples, and both mother and newborn urine samples. The lead and arsenic concentration medians detected in mother (As: 11.13 µg L-1; Pb: 3.75 µg dL-1) and cord (As: 10.71 µg L-1; Pb: 3.69 µg dL-1) blood were above the levels reported in other national and international studies. A good correlation between all metals in mother and cord blood was observed. Pyrethroids with increasing means throughout the 1st, 3rd and 6th months were observed in 39 (17.5%) newborn urine samples, without statistical significance, and in 69 (48.6%) mother urine samples.Conclusion: These results indicate the need for the establishment of health surveillance programs in Brazil, to investigate and monitor environmental pollutant exposure in children since gestation.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 13
Children's Environmental Health in Latin America: Contribution of Birth Cohort Studies in the Region
Chair: Ana Maria Mora, Costa Rica & Agnes Soares da Silva, US

The Early Life Exposures in Mexico to ENvironmental Toxicants (ELEMENT) Project

Presenter: Martha M Tellez-Rojo, Instituto Nacional de Salud Pública, Cuernavaca, Mexico

Authors: M. M. Tellez-Rojo;
Instituto Nacional de Salud Pública, Cuernavaca, MEXICO.

ELEMENT (Early Life Exposures in Mexico to ENvironmental Toxicants) study was founded in 1994 as a collaboration between Harvard University and the National Institute of Public Health (INSP) in Mexico. ELEMENT is now administered by researchers at the University of Michigan (Karen Peterson) where the biorepository and database reside; fieldwork is conducted by investigators at the INSP (Martha M Téllez-Rojo), and investigators are housed at Michigan, Washington, Indiana, Toronto, York Universities and INSP. Funding from US and Mexico sources has supported data collection efforts over a 26-year period, demonstrating sustained research excellence and productivity. ELEMENT is an award-winning, 26-year longitudinal study comprising 3 epidemiologic birth cohorts sequentially-enrolled over a 10-year period in Mexico City. The original goal was to investigate the influence of lead exposure on fetal and infant development. Through subsequent research, repeat exposures to metal mixtures, fluoride, phenols and phthalates have been characterized as well as cognition, behavior, sexual maturation, dental health, cardio metabolic and obesity-related outcomes, including metabolomics. ELEMENT is an international collaboration with a demonstrated long-term commitment for research excellence; it has provided the basis for many spin-off studies including an ethnographic component, has created a structure for training >50 researchers, and has informed US and international policy guidelines regarding environmental health. The rigorous design of ELEMENT, its follow-up rates, and the multidisciplinary expertise of our team have allowed us to generate more than 100 publications in the international scientific literature.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 13
Children's Environmental Health in Latin America: Contribution of Birth Cohort Studies in the Region
Chair: Ana Maria Mora, Costa Rica & Agnes Soares da Silva, US

PROGRESS (Programming Research in Obesity, Growth, Environment and Social Stressors)

Presenter: Marcela Tamayo-Ortiz, Conacyt-INSP, Cdmx, Mexico

Authors: M. M. Tellez-Rojo;
Instituto Nacional de Salud Pública, Cuernavaca, MEXICO.

The PROGRESS (Programming Research in Obesity, Growth, Environment and Social Stressors) study is a collaboration between the Icahn School of Medicine (Robert and Rosalind Wright), the Columbia University (Andrea Bacarelli) in the United States with the National Institute of Public Health (Martha Téllez-Rojo) in Mexico. It is a prospective birth cohort founded in 2007 that began recruiting women in the second trimester of pregnancy who attended IMSS clinics in Mexico City in order to study the effects of metals mixtures and social stressors on children's health and neurodevelopment. Mother/child pairs have been uninterrupted and periodically assessed through several follow-up visits during pregnancy, childbirth, and subsequent visits every 2 years to date. Since then, PROGRESS has expanded its scope including new outcomes as IQ, attention, visual memory, spatial memory, and learning in children, as well neuroimaging to study brain development, lung function, and more recently, renal health. PROGRESS measures environmental exposures to metals such as Pb, As, Mn, Cd, Hg, among others 15 elements in blood, hair and teeth and to other chemicals such as BPA and phthalates in urine. Other environmental exposures are measured including air pollution, as well as social stressors such as psychosocial stress, violence, depression, negative life events, anxiety and salivary cortisol. PROGRESS also has a rich sample repository with blood, urine, hair, teeth, nails, and saliva samples. PROGRESS uses state of the art methods in social science, epidemiology, and toxicology to assess transdisciplinary risk factors impacting mother and child health outcomes. PROGRESS may be the first birth cohort specifically designed to prospectively address the joint impact of chronic stress and toxic metals on child development.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 13
Children's Environmental Health in Latin America: Contribution of Birth Cohort Studies in the Region
Chair: Ana Maria Mora, Costa Rica & Agnes Soares da Silva, US

The infant´s environmental health study (ISA) a birth cohort situated in rural Costa Rica

Presenter: Berna van Wendel de Joode, Universidad Nacional de Costa Rica, Heredia, Costa Rica

Authors: B. van Wendel de Joode;
Universidad Nacional de Costa Rica, Heredia, COSTA RICA.

The infant´s environmental health study (ISA) is a prospective cohort study on neurodevelopment, growth, and respiratory health of children and their mothers living in a banana growing region in Costa Rica, using ecosystem health approaches. This cohort is uniquely suited to provide information on health effects of pesticides used globally, as well as manganese, a key part of the fungicide mancozeb, in both children and their mothers.
We enrolled 451 pregnant women during 2010-2011, of whom 300 mother-children pairs are still actively followed. We performed 1-3 visits during pregnancy, and then followed mother-children pairs shortly after birth, and at the child age of 1, 5, 6, and 8 years. Results show mothers and children are exposed to a diverse group of pesticides, including: mancozeb, pyrimethanil, thiabendazole, chlorpyrifos, pyrethroids, and 2,4-D. We have explored exposure routes, and measured repeat biomarkers of exposure in urine, maternal blood and hair; we are well-suited for an exposome characterization. We found several biomarkers of exposure explain thyroid hormone concentrations, neurodevelopment and respiratory symptoms.
International collaborations have been key to the creation, development and maintenance of the cohort. Ever since we obtained more constant funding, the number of mother-child pairs has remained stable (n~300). The ISA team has gained extensive experience working with the study population of whom many live in conditions of vulnerability. We created an excellent rapport with both the women and children, as well as other community members. Finally, collaborations with the personnel of more than 30 primary schools situated in the study area has been crucial.
The ISA study also aims to contribute to the reduction of pesticide exposure and risk management. Future directions include studying the effects of mixtures of environmental exposures, explore possibilities to design an exposome, and the evaluation of strategies to mitigate the effect of pesticides on health.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 13
Children's Environmental Health in Latin America: Contribution of Birth Cohort Studies in the Region
Chair: Ana Maria Mora, Costa Rica & Agnes Soares da Silva, US

Intrauterine exposure to endocrine disruptors (phenols, parabens, triclosan and phthalates) & their influence on birth weight, SAMI cohort, Medellín - Colombia.

Presenter: Carlos Alberto Gómez Mercado, CES University, Medellin, Colombia

Authors: C. A. Gómez Mercado[1], G. Mejia Sandoval[1], A. Segura Cardona[1], C. Arango Alzate[1], D. Patiño Garcia[2], A. Barraza Villareal[3];
[1]CES University, Medellin, COLOMBIA, [2]Pontificia Universidad Católica de Chile, Santiago de Chile, CHILE, [3]INSP Mexico, Cuernavaca, MEXICO.

Intrauterine exposure to endocrine disruptors (phenols, parabens, triclosan and phthalates) and their influence on birth weight, SAMI cohort, Medellín - Colombia.Introduction: recent scientific evidence questions intrauterine exposure to endocrine disruptors influences birth weight. Objective: to evaluate the influence of intrauterine exposure and endocrine disruptors (phenols, parabens, triclosan and phthalates) on birth weight. Methodology: the study has 2 phases. Phase I (epidemiological): cohort of 400 women ≤ 12 weeks of gestation which were measured 5 phenols, 5 parabens, triclosan, triclocarban and 16 phthalates in urine. By means of multiple linear regression, the correlation between exposure to endocrine disruptors and birth weight and the selection of regression coefficients (β) was selected, and by means of multiple binary logistic regression, the relationship in exposure to compounds Chemicals and the risk of low birth weight and related risks (RR) are presented. Phase II (In Vivo model), based on the particles found in pregnant women, is designed in an experimental model in mice where the effect of prenatal exposure to a mixture of endocrine disruptors (BPA, DEHP, BBP, DBP, DEP is evaluated) on outcomes at birth in the offspring of mice of the wild type C57BL / 6J strain and presents the media differences between the 4 groups. Conclusions: phase I: for each increase of ng / mL of BPA, MEPA, ETPA, OXBE, MnBP, MBzP, MEHP, DEHP, OH-MiNP and oxo-MiNP, the birth weight is reduced. In addition, high exposure to BPA, ETPA, TRCS, MiBP, MnBP, MBzP, MEHP and cx-MiNP increases the risk of low birth weight. Phase II: Prenatal exposure to a mixture of endocrine disruptors (BPA, DEHP, BBP, DBP, DEP) reduces gestation time and birth weight.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 13
Children's Environmental Health in Latin America: Contribution of Birth Cohort Studies in the Region
Chair: Ana Maria Mora, Costa Rica & Agnes Soares da Silva, US

SEMILLA: Study of Environmental Exposure of Mothers and Infants Impacted by Large-Scale Agriculture

Presenter: Alexis J Handal, University of Michigan, Ann Arbor, United States

Authors: A. J. Handal[1], F. Orozco[2], S. Montenegro[2], S. D. Harlow[1], N. Kaciroti[1], B. Lozoff[1];
[1]University of Michigan, Ann Arbor, MI, [2]Universidad San Francisco de Quito, Cumbaya, ECUADOR.

Introduction Toxic exposure, combined with poor working conditions, poor nutrition, poverty, maternal stress, and other key social and economic factors, contributes to the loss of developmental potential in young children. Although fungicide use is growing exponentially in the United States and globally, a significant gap exists in scientific knowledge about the neurodevelopmental toxicity of fungicides, and their interaction with critical social and structural determinants of health. Ethylenebisdithiocarbamates are commonly-used fungicides in floriculture and horticulture, which metabolizes ethylenethiourea (ETU). Research indicates that prenatal ETU exposure may cause maternal and neonatal thyroid dysfunction, potentially leading to adverse pregnancy outcomes and impaired neurodevelopment. This presentation will describe the SEMILLA study, a community-engaged cohort study, building on years of previous work, which assesses environmental and occupational toxic exposures among women workers in a major flower-growing region of Ecuador. Methods SEMILLA follows pregnant workers and their infants up to 18 months of age, incorporating prenatal measures of ETU exposure. Methods include obtaining monthly prenatal urine samples and maternal and neonatal blood samples to assess thyroid hormone levels. At each visit throughout the study, we collect detailed data on key social and structural factors including working conditions, environmental exposures in home and work environments, stress, social support, maternal health and lifestyle, socio-economic and demographic factors. We will administer highly sensitive tests to assess neurodevelopment and visual function as well as growth and nutritional status in enrolled infants. Results and Discussion SEMILLA will contribute key data to inform our understanding of how toxic exposure, combined with key social and structural factors, impact child development; data which is critical for developing and initiating appropriate and sustainable interventions in affected communities that promote optimal child health and development, reduce environmentally-associated community exposures, and improve worker health policies. We will discuss important strengths and challenges in the implementation of SEMILLA.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 4
ORAL SESSION 21
Spatial Epidemiology and Environmental Health
Chairs: Shilu Tong, China & Yuming Guo, Australia

A Space/Time Data Fusion Method for Accurately Estimating Wildfire Smoke Concentrations During the October 2017 California Fires to Inform Population-Level Exposure

Presenter: Stephanie Cleland, Gillings School of Global Public Health, UNC-Chapel Hill, Chapel Hill, United States

Authors: S. Cleland, J. West, M. Serre;
Gillings School of Global Public Health, UNC-Chapel Hill, Chapel Hill, NC.

Background. Exposure to wildfire smoke causes a range of adverse health outcomes, suggesting the importance of accurately estimating wildfire smoke concentrations. While chemical transport models (CTMs) and spatial interpolation of observations are often used to assess smoke exposure, geostatistical methods can combine surface observations with modeled and satellite-derived concentrations to produce more accurate exposure estimates. Methods. Here we estimate ground-level $PM_{2.5}$ concentrations during the October 2017 California wildfires, using the Constant Air Quality Model Performance (CAMP) Method and the Bayesian Maximum Entropy (BME) Framework to bias-correct and fuse together three $PM_{2.5}$ datasets: concentrations from permanent and temporary monitoring stations, a CTM, and satellite observations. Four different BME space/time (s/t) kriging and data fusion methods using these three datasets were evaluated for accuracy. Results. All four BME methods produced more accurate estimates of ground-level $PM_{2.5}$ than the standalone CTM and satellite products, with the addition of temporary monitoring station data further improving accuracy. While BME s/t kriging on observations performed best near monitoring stations, the BME data fusion of observations with the CAMP-corrected CTM provided the best overall estimate, especially in smoke-impacted regions. Using these smoke concentrations, we estimate more than 60,000 people were exposed to very unhealthy air, $PM_{2.5}$ concentrations greater than 150.5 $\mu g/m^3$, during the 2017 wildfires. Conclusions. We show that the BME framework, used in combination with the CAMP correction method, can be used to accurately estimate ground-level $PM_{2.5}$ concentrations during a wildfire event. Our results emphasize the importance of combining multiple data sources to characterize population-level exposure during extreme air pollution events.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 4
ORAL SESSION 21
Spatial Epidemiology and Environmental Health
Chairs: Shilu Tong, China & Yuming Guo, Australia

The development of a spatially resolved retrospective ensemble forecast model of West Nile virus in Long Island, New York

Presenter: Nicholas DeFelice, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: N. DeFelice[1], M. Sorek-Hamer[2], S. Campbell[3], K. Vemuri[1];
[1]Icahn School of Medicine at Mount Sinai, New York, NY, [2]NASA Ames Research Center, Moffett Field, CA, [3]Suffolk County Department of Health Services, New York, NY.

The development of a spatially resolved retrospective ensemble forecast model of West Nile virus in Long Island, New York
Nicholas DeFelice, Meytar Sorek-Hamer, Scott R Campbell and Krishna Vemuri
West Nile virus (WNV) emerged in the western hemisphere in 1999, and has established itself as the leading cause of domestically acquired arboviral disease in the United States. Though the transmission of WNV exhibits a pronounced sensitivity to a complex seasonal ecology along with hydrological and meteorological conditions, our ability to predict the timing, duration, and magnitude of local WNV outbreaks remains limited. In Long Island, New York, annual peak estimates of WNV infected mosquitos have ranged from 1 in 300 to 1 in 50 resulting in anywhere from 0 to 24 reported human WNV cases, respectively. Here we report the development of a spatially refined model that uses ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) data to capture the variability in physical environmental factors (e.g., temperature and hydrology) along with a compartmental model describing WNV transmission dynamics, to retrospectively forecast WNV outbreaks in Long Island, New York. The inclusion of ECOSTRESS' high spatial (70m) and temporal (revisits every 4 days) resolution data will allow us to capture changes in the micro-ecosystem. Ensemble simulations with the WNV model are iteratively optimized using data assimilation methods and observations of human incidence, mosquito abundance, and mosquito infection rates. The ECOSTRESS meteorological and hydrological indicators are included in the core model structure to better constrain WNV amplification and transmission dynamics. The model-inference system can be used to better understand the spatial variability of the outbreak and estimate the relationship between zoonotic amplification and human outbreaks. This work represents an initial step in the development of a statistically rigorous system for a spatially resolved real-time forecast of seasonal outbreaks of West Nile virus.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 4
ORAL SESSION 21
Spatial Epidemiology and Environmental Health
Chairs: Shilu Tong, China & Yuming Guo, Australia

Modelling Nationwide Spatial Variation of Ultrafine Particles based on Mobile Monitoring

Presenter: Jules Kerckhoffs, Utrecht University, Utrecht, Netherlands

Authors: J. Kerckhoffs, G. Hoek, U. Gehring, R. Vermeulen;
Utrecht University, Utrecht, NETHERLANDS.

Background. Empirical land use regression models for ultrafine particles (UFP) are generally limited to urban areas, limiting their ability to be used in nationwide epidemiological studies. In this paper we combined monitoring of regional background and local variation of UFP concentrations, measured with a mobile platform, to evaluate for the first time the possibility to develop nationwide models. Method. We used an electric car to sample UFP concentrations in selected cities and town across the Netherlands over a 14-month period in 2016-2017. Routes were sampled 3 times and concentrations were averaged per road segment. In addition, we used kriging maps based on regional background monitoring (20 sites; 3x2weeks) over the same period. All road segments were used to model spatial variation of UFP with three different land-use (regression) approaches (stepwise regression, LASSO and random forest). For each approach, we also test a deconvolution method, which segregates the average concentration at each road segment into a local and background signal. Model performance was evaluated with short-term (400 sites; 3x30min) and external longer term measurements (42 sites; 3x24hour). We also compared predictions of all six models on 1000 random addresses spread over the country. Results. We found similar predictive performance for all models, with R^2 values of 0.28 to 0.35 for short-term measurements and 0.51 to 0.60 for longer term external measurements. Models with and without deconvolution had similar predictive performance. Correlations between predictions on random addresses were high with Pearson correlations between 0.83 and 0.99. Mobile models overestimated exposure at the short-term and long-term sites by about 20-30% in all cases, with small differences between regions and road type. Conclusion. We developed nation-wide models for long-term UFP exposure, with minor differences in predictive performance between different algorithms. The models will be applied in Dutch nation-wide health studies.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 4
ORAL SESSION 21
Spatial Epidemiology and Environmental Health
Chairs: Shilu Tong, China & Yuming Guo, Australia

Meteorological factors are associated with asthma prevalence in England

Presenter: Nicholas Osborne, University of Queensland, Herston, Australia

Authors: N. J. Osborne[1], C. Sarran[2], M. P. Cherrie[3];
[1]University of Queensland, Herston, AUSTRALIA, [2]Met Office, Exeter, UNITED KINGDOM, [3]University of Edinburgh, Edinburgh, UNITED KINGDOM.

Background/Aim
Several exposures contribute to human vitamin D levels including solar irradiation, diet, behaviour and genes. This study was designed to examine meteorological factors that influence the geography of asthma across England, with influence of solar irradiation as primary factor.
Methods
General practitioner data from 2005 was used to determine the prevalence of asthma in primary care in England. Additional data such as smoking rates and obesity were merged at lower super output level (population ~1000). Meteorological data was obtained from Met Office UK and Joint Research Centre, EU and averages for the period of June 2002 to July 2003 were used. The meteorological data was reprocessed to postcode district level and aggregated to a mean annual measurement. The meteorological data was mapped using ArcMap 10. Associations between climactic factors such as solar irradiation, temperature and humidity and asthma prevalence were tested with a principle component analysis, with spatial auto correlation accounted for.
Results
Asthma prevalence from GPs in England was 5.9% (95% CI, 5.8-5.9). In the highest UVvitd quartile (2.1-2.5 kJ/m2/day), asthma had an 8% reduction in prevalence compared to the lowest quartile. Similar reductions were found in the higher temperature 0.91 (95% CI, 0.88-94). The opposite was found with relative humidity 1.09 (95% CI 1.05 to 1.12). A combination of high temperature and UVvitd highlighted postcode districts in the South East of England with a climate beneficial to reduced risk asthma, whereas in the North West there was a climate detrimental to asthma with increased risk.
Conclusions
Weather variables were shown to associate with asthma prevalence in England. Understanding the complex contribution of multiple climatic factors and the relationship with the indoor environment could help to explain the population distribution of asthma.

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ABSTRACT E-BOOK

August 26, 2020 / 08:00 - 09:30 / Parallel 4
ORAL SESSION 21
Spatial Epidemiology and Environmental Health
Chairs: Shilu Tong, China & Yuming Guo, Australia

A spatiotemporal early warning system for dengue outbreak in Guangzhou, China

Presenter: Zhoupeng Ren, Institute of Geographic Sciences and Resources Research, Beijing, China

Authors: Z. Ren;
Institute of Geographic Sciences and Resources Research, Beijing, CHINA.

Background: Dengue fever has become a big public concern in Guangzhou after the unprecedented dengue outbreak in 2014. However, there was no efficient early warning system to help public health authorities to control dengue outbreaks several months in advance. Methods: Here, we built a spatio-temporal early warning system based on the Bayesian spatio-temporal probabilistic forecasts. A spatio-temporal Bayesian hierarchical model was formulated, using monthly dengue cases, from 2011 to 2017, for 167 townships as the response variable. Explanatory variables included temperature anomaly (averaged over the preceding 3 months), relative humidity, road density and dengue relative risk lagged by 3 months. To assess the performance of this model, we compared the observed and predicted dengue incidence rate (DIR) in each township in September, 2014 (high risk period) and September, 2015 (low risk period). We calculated the probability of dengue incidence falling into predefined categories. We defined the low, medium, and high risk categories as dengue case is lower than 1, between 1 and 10, and higher than 10. To assess the performance of warning system, we calculate the rank probability skill score (RPSS), which measures the improvement of the probabilistic forecast skill relative to the skill of a benchmark forecast. We calculated the benchmark probability by long-term average distribution of dengue cases in Guangzhou, September, 2011-2017. Results: Similar spatial pattern was found between observed DIR and predicted DIR, both in high and low epidemic risk period. R-square value (0.783) indicate good agreement between observed and predicted log DIR. Skill was high in townships in the downtown area with high risk of dengue, indicating warning system performed well. Conclusions: This early warning system may be useful to prevent the next dengue outbreak, not only before the peak dengue season each year, but also to assign medical resources accurately at fine geographic scale.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 22
Air Pollution and Brain/Cognitive Health in Adults
Chairs: Melinda Power, US & Sabah Quraishi, US

Association between long-term exposure to air pollution and ambient noise with altered resting-state brain connectivity in the 1000BRAINS study

Presenter: Lina Glaubitz, Environmental Epidemiology Group, Institute of Occupational, Social and Environmental Medicine, Centre for Health and Society, Medical Faculty, Heinrich-Heine University, Duesseldorf, Germany

Authors: L. Glaubitz[1], J. Stumme[2], C. Jockwitz[2], S. Lucht[1], S. Moebus[3], K. Jöckel[4], S. Caspers[5], B. Hoffmann[1];
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Background/Aim: Long-term air pollution (AP) is associated with cognitive impairment and altered brain structure. These changes are also observed during normal aging. Studies in younger children additionally hint at an age-related functional brain reorganization, i.e. reduced resting-state functional connectivity (RSFC) within functional brain networks and increased RSFC between different brain networks. The current study examined the associations between long-term AP and ambient noise (AN) with RSFC reorganization in older adults.
Methods: We used data from participants of the German 1000BRAINS study. To measure AP at the participant's residences for the years 2000-2003, we applied land use regression and spatiotemporal European Air Pollution Dispersion Chemistry Transport modeling. Exposure to AN was modeled as weighted 24-h (L_{den}) means and night-time (L_{night}) means. Between 2011 and 2015, resting-state functional imaging brain scans were acquired. We defined seven resting-state brain networks (RSN): visual, sensorimotor, dorsal- and ventral attention, limbic, frontoparietal and default RSN and evaluated the degree of segregation as the ratio of within-network RSFC and inter-network RSFC. Multiple linear regression models adjusted for age, sex, socioeconomic status and lifestyle variables were used to estimate the relationship of AP and AN with RSFC.
Results: The analysis included 583 participants (44.1% female, mean age of 56 years). Overall, clearly decreased segregation patterns were not visible. Weak associations of particular matter ($PM_{2.5}$), soot and particle number concentration with decreased segregation were observed in the sensorimotor RSN (i.e. 0.088 [95%-Confidence-Interval: -0.170; -0.006] per 1.41 µg/m^3 increase in $PM_{2.5}$). For a 10 dB(A) increase of L_{den} and L_{night}, we observed weak decreases in segregation of the visual RSN.
Conclusions: In accordance with major aging theories, higher exposure to AP and AN could possibly lead to an acceleration of age-related functional brain reorganization. To verify these findings, further studies with larger sample size are needed.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 22
Air Pollution and Brain/Cognitive Health in Adults
Chairs: Melinda Power, US & Sabah Quraishi, US

Long-term exposure to ambient air pollution and risk of dementia: results of the prospective Three-City study

Presenter: Marion Mortamais, Inserm, Montpellier, France

Authors: M. Mortamais[1], L. Gutierrrez[1], K. de Hoogh[2], T. Benmarhnia[3], C. Helmer[4], C. Tzourio[4], J. Dartigues[4], N. Letellier[1], B. Jacquemin[5], C. Berr[1];
[1]Inserm, Montpellier, FRANCE, [2]Swiss Tropical and Public health Institute, Basel, SWITZERLAND, [3]Scripps Institution of Oceanography, University of California, San Diego, La Jolla, CA, [4]Inserm, Bordeaux, FRANCE, [5]Inserm, Rennes, FRANCE.

Background
Emerging epidemiological evidence suggests a relationship between exposure to various air pollutants (AP) (fine particles (PM2.5), ozone (O3), nitrogen dioxide (NO2)) and dementia. However, most of existing studies relied on population-based health administrative databases to obtain a dementia diagnosis. In a large French population-based cohort (the Three-City Study), we aimed at assessing the effects of different AP on dementia risk using reliable diagnosis tools.
Methods
Participants aged ≥65 years were recruited between 1999-2001 and followed for 12 years. At baseline and every 2 years, dementia diagnoses were preliminary made using DSM-IV criteria and validated by an adjudication committee. NO2, O3, Black Carbon and PM2.5 levels were obtained at the residential addresses of participants using land-use regression models (ELAPSE project). For each year of follow-up (FU), we estimated a 10-year moving window of mean past exposure to each pollutant for each subject. We used Cox Proportional Hazard models where exposure was included as a time-varying variable. Analyses were adjusted for individual (age, sex, education, APOE4 genotype, vascular risk factors, respiratory diseases) and contextual (neighborhood's deprivation index) level confounders.
Results
The mean (SD) age of the 8031 participants was 74.0 (5.4) years-old. Sixty-one percent of participants were women. The mean time of FU was 9.2 (3.6) years. The mean annual PM2.5 levels ranged from 15 to 33 µg/m^3 and 920 participants developed dementia during the FU. We observed a positive association between PM2.5 levels and dementia risk [HR=1.16, 95%CI (1.03-1.32) for a 5µg/m^3 increase in PM2.5]. We did not observe any relationship between the other AP exposures and dementia risk.
ConclusionIn this large cohort with reliable diagnosis of dementia and individual estimates of AP exposure, long-term exposure to PM2.5 was associated with higher dementia incidence. These results suggest that PM2.5 exposure might be a modifiable risk factor of dementia.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 22
Air Pollution and Brain/Cognitive Health in Adults
Chairs: Melinda Power, US & Sabah Quraishi, US

Air pollution, dementia, and related outcomes: an updated systematic review

Presenter: Melinda Power, George Washington University, Washington, United States

Authors: J. Weuve[1], E. Bennett[2], L. Ranker[1], K. Z. Gianattasio[2], M. Pedde[3], J. Yanosky[4], S. Adar[3], M. C. Power[2];
[1]Boston University, Boston, MA, [2]George Washington University, Washington, DC, [3]University of Michigan, Ann Arbor, MI, [4]Pennsylvania State University, University Park, PA.

Background/Aim: Since our prior review in 2016, the epidemiologic evidence examining the association between long-term exposure to air pollution and dementia and dementia-related outcomes has grown substantially. Our goal was to update this review and summarize the state of the evidence, highlighting consistencies, new developments, and continued methodological challenges.Methods: We systematically searched PubMed and EMBASE to identify new articles published through June 19, 2019. Systematic review methods followed those in the prior review. We collectively evaluated both newly identified, eligible studies and studies from our original review. Results: Based on our eligibility criteria, we included 36 reports (18 original + 18 new) in our review. Newer articles were more likely to report on associations with cognitive change, incident cognitive impairment, and neuroimaging outcomes. They also considered a broader range of pollutants and used exposure assessments with finer spatial resolution. Higher NO_2/NO_x exposures were consistently associated with lower cognitive level, without strong evidence of disparate impacts by cognitive domain. Analyses of $PM_{2.5}$ and PM_{10} were more mixed, although the weight of the evidence still suggests either a null or adverse association between particulate matter and cognitive health. Selection bias, timing of exposure ascertainment relative to outcome, and reliance on claims or medical records to identify dementia remain the most common threats to study validity. Conclusions: The literature on air pollution and late-life cognitive health has grown substantially since 2016, and continues to support the hypothesis that air pollution impacts late-life cognitive health. To strengthen confidence in these conclusions, additional studies are needed that attend to key methodological issues, especially robust dementia ascertainment. Future work should also recognize the heterogeneity of dementia pathogenesis, consider associations with biomarkers of pre-clinical dementia, and consider the impact of air pollution mixtures.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 22
Air Pollution and Brain/Cognitive Health in Adults
Chairs: Melinda Power, US & Sabah Quraishi, US

Long-term air pollution exposure and incident dementia in older adults in the Gingko Evaluation of Memory Study

Presenter: Erin Semmens, University of Montana, Missoula, United States

Authors: E. O. Semmens[1], A. Fitzpatrick[2], A. Hajat[2], C. Leary[1], C. Park[2], C. Adam[1], O. Lopez[3], J. D. Kaufman[2];
[1]University of Montana, Missoula, MT, [2]University of Washington, Seattle, WA, [3]University of Pittsburgh, Pittsburgh, PA.

Introduction: Air pollution is associated with reduced cognitive performance and accelerated cognitive decline in older adults. Less is known regarding air pollution's contribution to all-cause dementia, Alzheimer's disease (AD), and vascular dementia (VaD). Methods: Over 3,000 adults aged 75 years and older residing in four communities in the United States participated in the Ginkgo Evaluation of Memory Study (GEMS) between 2000-2008. Rigorous evaluations of dementia occurred every six months, and cases were identified by expert panel based on neuropsychological battery, neurological examination, and magnetic resonance imaging results. Fine particulate matter ($PM_{2.5}$) concentrations were predicted from a spatiotemporal model incorporating land-use regression and spatial smoothing approaches. Estimates were based on residential address histories obtained up to twenty years prior to study entry using the commercially available LexisNexis database. Cox models adjusted for age and date of randomization, site, gender, treatment assignment, education, smoking, and zip code level income were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs). Results: Mean follow-up time was 5.7 years for the 2,511 GEMS participants free of mild cognitive impairment and dementia at study entry who had information on exposure, dementia status, and relevant covariates. An approximate interquartile range (2 $\mu g/m^3$) increase in mean $PM_{2.5}$ exposure twenty years prior to study entry was associated with a 19% greater risk of all-cause dementia (HR: 1.19; 95% CI: 1.03, 1.37) in adjusted analyses. Risks appeared stronger for VaD and mixed VaD/AD (HR: 1.25; 95% CI: 0.96, 1.62) than for AD only (HR: 1.15; 95% CI: 0.97, 1.37). Conclusions: Preliminary results indicate a strong association between air pollution exposure and all-cause dementia and that $PM_{2.5}$ exposure may be particularly important in dementia with vascular features. Findings provide evidence that air pollution exposure reductions may be a key target for reducing the burden of dementia in older adults.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 22
Air Pollution and Brain/Cognitive Health in Adults
Chairs: Melinda Power, US & Sabah Quraishi, US

The Causal Effect of $PM_{2.5}$ Exposure on Hospital Admissions Among Medicare Enrollees with Chronic Debilitating Brain Disorders: A National Study.

Presenter: Maayan Yitshak Sade, Harvard School of Public Health, Boston, United States

Authors: M. Yitshak Sade[1], R. Nethery[1], J. Schwartz[1], F. Mealli[2], F. Dominici[1], Q. Di[3], Y. Abu Awad[4], G. Ifergane[5], A. Zanobetti[1];
[1]Harvard School of Public Health, Boston, MA, [2]University of Florence, Florence, ITALY, [3]Tsinghua University, Beijing, CHINA, [4]Concordia University, Montreal, QC, CANADA, [5]Soroka University Medical Center, Beer Sheva, ISRAEL.

Background: Although long-term exposure to particulate matter<2.5µm ($PM_{2.5}$) has been linked to chronic debilitating brain disorders (CDBD), the role of short-term exposure in health care demand, and increased susceptibility for $PM_{2.5}$ -related health conditions, among people with CDBD has received little attention. We used a causal modeling approach to assess the effect of short-term high $PM_{2.5}$ exposure on all-cause admissions, and prevalent cause-specific admissions among Medicare enrollees with CDBD (Parkinson's disease-PD and dementia).
Methods: We constructed daily zipcode counts of hospital admissions of Medicare beneficiaries older than 65 across the United-States (2000-2014). We obtained daily $PM_{2.5}$ estimates from a satellite-based model. A propensity score matching approach was applied to match high-pollution ($PM_{2.5}$ >17.4 µg/m3) to low-pollution zip code-days with similar background characteristics. Then, we estimated the percent change in admissions attributable to high pollution. We repeated the models restricting the analysis to zip code days with PM2.5 below 35 µg/m3.
Results: We observed significant increases in all-cause hospital admissions (2.53% (2.40%; 2.63%) in PD and 2.49% (2.38%; 2.60%) in dementia) attributable to high $PM_{2.5}$ exposure. The largest observed effect for common causes was for pneumonia and urinary tract infection. All the effects were larger in CDBD compared to the general Medicare population, and similarly strong at levels of exposure considered safe by the EPA.
ConclusionsWe found Medicare beneficiaries with CDBD to be at higher risk of being admitted to the hospital following acute exposure to $PM_{2.5}$ levels well below the National Ambient Air Quality Standard defined as safe by the EPA. CDBD is known to be associated with higher rates of hospital admissions for causes such as pneumonia, dehydration, or UTI. It is therefore important to find preventable exposures that are associated with risk for emergency admissions due to various causes, rather than restricting the analysis to CDBD-related admission codes.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 14
Regulating Pesticide Use in Africa to Address Emerging Health & Environmental Risks: Local & Int'l Perspective
Chairs: Mohamed Aqiel Dalvie,South Africa & Melissa Perry, US

Ethics of pesticide use in Africa

Presenter: Adetoun Mustapha, Nigerian Institute for Medical Research, Lagos, Nigeria

Authors: A. Mustapha;
Nigerian Institute for Medical Research, Lagos, NIGERIA.

Pesticides such as dichlorodiphenyltrichloroethane (DDT) are used for malaria prevention and organophosphates are used for pest control to boost crop yields in Africa. Pesticides widespread use has helped control insects and other pests, which has subsequently led to improvements in health. For example, Mauritius, spray DDT at their ports to prevent the disease from entering the country while insecticide sprays are routinely used in homes across Africa. The use of pesticides is generally poorly regulated resulting in continuing human exposure. Pesticides are inherently toxic. Many of them are endocrine disruptors and have been implicated in a range of chronic ailments. Unmitigated human exposure to pesticides have therefore created health problems of their own. Relatively few health effect studies (mainly among farmworkers) have directly examined the adverse effects associated with single or multiple pesticide use, the toxicologic consequences of interactions resulting from cumulative exposures to several pesticides in Africa. Large proportion of sprayed pesticides may reach a destination other than their target species, including non-target species, air, water and soil. This destroys ecosystems and can subsequently impact nutrition and food security. This presentation will discuss dilemma between pest control and release of contaminants into the food chain in LMICs and the obligation of stakeholders to ensure that the benefits are not outweighed by risks of pesticides use. It will discuss whether continued use of synthetic pesticides is ethically acceptable if its long lasting adverse effects has been demonstrated. It will also explore how research on pesticides can be used to influence public health policies and galvanize support for sustainable alternatives.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 14
Regulating Pesticide Use in Africa to Address Emerging Health & Environmental Risks: Local & Int'l Perspective
Chairs: Mohamed Aqiel Dalvie,South Africa & Melissa Perry, US

Serum Organochlorine Pesticides Level CYP1A1 Genetic Polymorphism &Risk of Prostate Cancer Cases Control Study

Presenter: Fatima Abubaker Hamad, Gezira University, Wad-Madani, Sudan

Authors: F. A. Hamad;
Gezira University, Wad-Madani, SUDAN.

Background: Agriculture is the backbone of the economic and social development in the Sudan. 80% of the population depends for their living on agriculture. Organochlorines (OC's) were the first to be used against cotton pests, and control termites in sugarcane. In cancer CYP1A1 have dealt primarily with the metabolic activation of pro-carcinogens including polycyclic aromatic hydrocarbons and estradiol. Aim: The aim of this study is to determine the serum Organochlorine pesticides and PCBs (OC's) level, Cytochrome (CYP) 1A1 genetic polymorphisms and risk for Sudanese prostate cancer patients together with control groups, attending the Wad-Madani teaching hospital, Gezira State- Central Sudan. Method: 100 prostatic cancer patients and 100 controls (over 50 years old) will be studied. A questionnaire will be designed and Clinical examination will be performed including weight and heights. From venous blood (2.5ml) Serum will be separated and store at -80 ^{o}C until analyses. The Organochlorine pesticides residues in serum will be measured by using a modified QuEChERS method by GC/MS. Soil, water and common food samples samples will be collected and storage until the analysis. For CYP1A1 genotyping examination, 2.5 ml of whole blood will be collected in 5 ml EDTA vacutainer tube. Buffy coat separate from plasma and store at -80 ^{o}C until DNA extraction. DNA extraction for blood will be done by QIAamp DNA Mini Kits. PCR Technique will be used for laboratory genetic analysis by using Genotypes Restriction Enzymes Length Polymorphisms (RFLP). Estrogen (E1) level will be analyzed by Elisa technique with Elisa Kits. The study will help to examine one of the most important risk factors for prostate cancer in Sudan (Organochlorine & PCBs pesticides). Find the mutations for Cytochrome P-450 CYP (1A1) genotypes and the relationship between Estrogen (E1) levels and other risk factors.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 14
Regulating Pesticide Use in Africa to Address Emerging Health & Environmental Risks: Local & Int'l Perspective
Chairs: Mohamed Aqiel Dalvie,South Africa & Melissa Perry, US

Relationship between urinary levels of organophosphate metabolites and pesticide exposures among rural school boys of the Western Cape

Presenter: Mohamed Aqiel Dalvie, University of Cape Town, Cape Town, South Africa

Authors: N. R. Molomo[1], M. Roosli[2], M. A. Dalvie[1];
[1]University of Cape Town, Cape Town, SOUTH AFRICA, [2]Swiss Tropical and Public Health Institute, Basil, SWITZERLAND.

Background: Current evidence on the relationship between demographic, socio-economic and pesticide exposure risk factors and urinary levels of organophosphate pesticide metabolites among children is generally incomplete and conflicting in some cases. This study investigated the relationship between socio-economic, demographic and reported pesticide exposure related behaviours and characteristics in relation to urinary levels dialkyl phosphate (DAP) metabolites among boys from rural Western Cape, South Africa. Methods: A cross-sectional study of 183 school boys from three agricultural intense areas was conducted. Measurements included a questionnaire on demographic, socio-economic and pesticide exposure risk and analysis of urinary DAP metabolites (diethyl (DEP), dimethyl (DMP) and dimethyl triphosphate (DMTP)). Results: DAP, DEP, DMP and DMTP were detected with median concentrations of 68.3 ng/ml, 5.5 ng/ml, 32.6 ng/ml and 16.7 ng/ml, respectively. Most of the boys (70%) lived on farms with a median age of 12 years (range: 5 -19.5 years). The sum of DAP levels decreased in a dose dependant manner with age. Children older than 14 years had less DAP levels (β =-68.1, p=0.05) than children 9 years and younger. DAP levels also varied significantly with area, with the levels highest in Grabouw, followed by Piketberg (β=-54.2, p=0.01). Other weaker and non-significant predictors of increased DAP levels were household income, member of household work with pesticides, living on farm, drinking water from an open water source and eating crops from the vineyard and /or garden. Conclusion: The study provide evidence that lower age and residential area are predictors of increased urinary DAP concentrations among boys. Additionally, pesticide exposure factors such as member of household work with pesticide, living on the farm, drinking water from an open water source and eating crops from vineyard also determines increased DAP levels. Further studies with larger sample sizes and longitudinal designs are recommended.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 14
Regulating Pesticide Use in Africa to Address Emerging Health & Environmental Risks: Local & Int'l Perspective
Chairs: Mohamed Aqiel Dalvie,South Africa & Melissa Perry, US

human and environmental exposure to pesticides in uganda: insights from water, food and human urine assessments

Presenter: Aggrey Atuhaire, UNACOH, Kampala, Uganda

Authors: A. Atuhaire;
UNACOH, Kampala, UGANDA.

Human and Environmental Exposure to pesticides in Uganda: Insights from water, food and human assessments
Author: Atuhaire Aggrey; atuagrey3@gmail.com Uganda National Association of Community and Occupational Health (UNACOH), Kampala, Uganda
Background In Uganda, there is limited data on human pesticide exposure and residue assessment. Between 2017 and 2019, Uganda National Association of Community and Occupational Health (UNACOH) in collaboration with its partners undertook different studies with an overall aim of assessing residue levels in community water sources, tomatoes, and exposure levels in farmers' urine. MethodologyTomato samples were collected from farms and markets were subjected to three pre-treatments of cold wash, warm wash, peeling and compared with the control. Water samples were gathered at the start and end of a cropping season. Farmers were assessed for Mancozeb exposure at two time points (588 samples) and a questionnaire-based exposure algorithm generated. Results94.2% of the water sources had detectable pesticide residues. 25 pesticides were detected, with the number increasing by 3.6 fold between the start and end of season. Glyphosate was detected in highest concentrations levels. 6/10 most concentrated pesticides were detected in proportions exceeding maximum limit of 0.1ppb in 53 water points.Eight pesticides were detected in the tomato samples. Mancozeb was detected in highest concentration levels. The different processing techniques reduced residue levels, peeling being the most effective. About 29% of unprocessed tomato samples exceeded the Codex MRL of 2ppm for Dithiocarbamates.98% of all samples measured above LOD of 0.08 ng/mL. Farmers who reported applying Mancozeb in the last one week registered a median of 14.6 (IQR 6.7-33.5) µg/g creatinine.ConclusionCommunity water pollution from conventional farming is a public health threat in Uganda. Mancozeb use poses a threat to Uganda's agricultural export market and public health.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 3
SYMPOSIUM 15
Health Effects of Per- and Polyfluoroalkyl Substances: What Have We Learned Since the C8 Health Project?
Chairs: Jonathan Hofmann, US & Kyle Steenland, US

Population studies of disease related to community PFAS exposure in Sweden from fire-fighting foam contamination

Presenter: Tony Fletcher, LSHTM, London, United Kingdom

Authors: T. Fletcher[1], E. Andersson[2], A. Glynn[3], K. Jakobsson[2];
[1]LSHTM, London, UNITED KINGDOM, [2]School of Public Health and Community Medicine, Institute of Medicine, University of Gothenburg, Gothenburg, SWEDEN, [3]Swedish University of Agricultural Sciences, Uppsala, SWEDEN.

Since the C8 Science Panel experiences, major community populations have been identified with PFAS exposure at comparable or, even higher levels. In Sweden in 2013 very high levels of PFOS and PFHxS, and to a lesser extent PFOA, were found in the drinking water from one of the two waterworks supplying the municipality of Ronneby. Community blood sampling confirmed the exposure with median serum levels of these PFAS for those living in the contaminated water district being 280, 257 and 15 ng/ml respectively. A wide number of health effects are being investigated with one priority to asses if the C8 “Probable Link” diseases are evident in this population. High cholesterol was found, but thyroid disease and ulcerative colitis were not associated with degree of PFAS exposure. Studies underway are addressing exposures during pregnancy, immune effects and cancers.
To address thyroid disease, a cohort was formed, including all individuals who had lived at least one year in Ronneby during the period 1980-2013 (n~63,000) and linked to registers providing diagnoses and prescriptions for hyper- and hypothyroidism. In total, 16,150 individuals had ever been exposed, from home addresses linked to the contaminated water works. The hazard ratios did not indicate any excess risk of hyperthyroidism among those with contaminated water. For hypothyroidism, there was some evidence of increased risk for the intermediate exposure group (for women but not men), but no evidence of risk in the highest exposure subgroup, compared to the non-exposed. Apart from chance, there are differences in exposure and design which might explain the differences with the C8 study: this population has some raised PFOA, but much higher co-exposure to PFOS and PFHxS; this study includes all the community linked to routine records, but the C8 study identified disease from interviewing subjects who volunteered to participate.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 3
SYMPOSIUM 15
Health Effects of Per- and Polyfluoroalkyl Substances: What Have We Learned Since the C8 Health Project?
Chairs: Jonathan Hofmann, US & Kyle Steenland, US

Exposures to Per- and Polyfluoroalkyl Substancesand Metabolic Consequences in Adult Populations

Presenter: Qi Sun, Harvard T.H. Chan School of Public Health, Boston, United States

Authors: Q. Sun;
Harvard T.H. Chan School of Public Health, Boston, MA.

Per- and polyfluoroalkyl substances (PFASs) are a group of highly-persistent, anthropogenic chemicals that have been widely used in many consumer products and industrial processes. Although animal experiments have suggested that these chemicals possess endocrine-disrupting properties and may lead to cardiometabolic abnormalities, prospective human data that can help to establish causal inference were scarce. To fill this knowledge gap, we conducted analyses in the POUNDS-Lost weight loss trial and Nurses' Health Study II (NHSII) cohort to evaluate prospective associations between circulating concentrations of PFASs and weight changes and type 2 diabetes (T2D) risk, respectively. In the POUNDS-Lost trial where we examined baseline plasma concentrations of PFASs in relation to weight loss and regain following weight-loss diets, we found that PFASs did not predict weight loss, although higher concentrations of PFASs were associated with faster weight regain, especially among women. In addition, PFASs concentrations were also associated with faster reduction in resting metabolic rate (RMR) during weight loss and slower regression of RMR during weight regain. In the NHSII that consists of women only, baseline plasma concentrations of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) were significantly associated with an elevated risk of developing incident T2D. In two recent analyses in the POUNDS-Lost trial, we also found associations between higher baseline PFAS concentrations and accelerated loss in bone mineral density in the hip and other areas, as well as higher concentrations of blood lipids and apolipoproteins that contain pro-atherosclerotic apoC-III. These associations were independent of potential and established metabolic risk factors. Collectively, these findings suggest that exposures to PFASs among adults who do not have a history of occupational exposures may disturb body weight regulation, boost the risk of developing diabetes, and interfere with other metabolic processes. Women may be particularly vulnerable to the detrimental effects of PFASs.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 3
SYMPOSIUM 15
Health Effects of Per- and Polyfluoroalkyl Substances: What Have We Learned Since the C8 Health Project?
Chairs: Jonathan Hofmann, US & Kyle Steenland, US

Serum concentrations of per- and polyfluoroalkyl substances and risk of renal cell carcinoma: A nested case-control study in the Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial

Presenter: Joseph Shearer, National Cancer Institute, Bethesda, United States

Authors: J. Shearer[1], C. Callahan[1], A. Calafat[2], W. Huang[1], R. Jones[1], V. Sabbisetti[3], N. Freedman[1], J. Sampson[1], D. Silverman[1], M. Purdue[1], J. Hofmann[1];
[1]National Cancer Institute, Bethesda, MD, [2]Centers for Disease Control and Prevention, Atlanta, GA, [3]Brigham and Women's Hospital, Boston, MA.

Background: Per- and polyfluoroalkyl substances (PFAS) are a diverse class of industrial chemicals used in non-stick cookware, firefighting foams, and textiles. Exposure to PFAS is widespread in the general population, with detectable serum levels in 98% of U.S. adults. The International Agency for Research on Cancer has classified perfluorooctanoic acid (PFOA) as a possible kidney carcinogen; other PFAS have not yet been evaluated. The purpose of this study was to assess whether pre-diagnostic serum concentrations of PFOA and seven additional PFAS are associated with risk of renal cell carcinoma (RCC) in a large population-based cohort. Methods: We conducted a nested case-control study within the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial that included 324 histologically-confirmed RCC cases and 324 individually matched controls. Serum concentrations of eight PFAS were quantified using on-line solid phase extraction liquid chromatography isotope dilution tandem mass spectrometry. Multivariable conditional logistic regression analysis was used to estimate RCC risk in relation to each individual PFAS modeled both continuously (Log2-transformed) and categorically. All models were implicitly conditioned on matching factors (e.g., age, sex, race, study center) and further adjusted for kidney function (i.e., estimated glomerular filtration rate) and other potential confounders. Results: In preliminary analyses, we observed positive exposure-response associations with RCC risk for several PFAS including PFOA, perfluorooctane sulfonic acid, and perfluorohexane sulfonic acid. However, only the association with PFOA remained apparent after adjustment for all three chemicals. Conclusions: This is, to our knowledge, the first study to investigate the associations between serum concentrations of individual PFAS and risk of RCC in a prospective cohort with PFAS concentrations comparable to the general population. Our findings may have important public health implications for the many individuals exposed to these ubiquitous and highly persistent chemicals.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 3
SYMPOSIUM 15
Health Effects of Per- and Polyfluoroalkyl Substances: What Have We Learned Since the C8 Health Project?
Chairs: Jonathan Hofmann, US & Kyle Steenland, US

Understanding exposures to new PFAS in the presence of legacy PFAS The GenX Exposure Study

Presenter: Jane Hoppin, NC State, Raleigh, United States

Authors: J. Hoppin, N. Kotlarz, D. Knappe;
NC State, Raleigh, NC.

Background: In the years since the C8 study reported its findings on the human health impacts of PFOA, many more community-exposed populations have been identified. Frequently these communities have more varied PFAS exposures and may include chemicals for which no health or toxicology data exist. The GenX Exposure Study represents two such communities in North Carolina (NC), USA. Methods: In NC, a fluorochemical manufacturer discharged PFAS generated as waste products through its manufacturing processes to the Cape Fear River, resulting in contamination of drinking water for Wilmington, NC. It is anticipated that PFAS wastewater discharges started in 1980 and stopped in June 2017. The GenX Exposure Study was designed to address community concerns about exposure and potential health effects. We collected blood samples from 344 Wilmington residents aged 6-86 years in November 2017 and May 2018. Samples were analyzed for an extensive suite of PFAS including legacy PFAS such as PFOA and PFOS as well as novel fluoroethers such as GenX and Nafion byproduct 2. Results: Five months after discharge of GenX and other novel fluoroethers ceased, we did not detect GenX in blood (MRL 2 ng/mL), but we did identify four new fluoroethers (Nafion byproduct 2, PFO4DOA, PFO5DOA, and Hydro-Eve) in most individuals. We also identified legacy PFAS, including PFOA, at concentrations that exceeded the 2017-2018 NHANES median values, suggesting potential upstream legacy PFAS sources in this drinking water exposed community. Conclusion: In our small sample size, we are unable to provide residents with information about how these chemicals may have impacted their health. Along with community members, we rely on the C8 study findings to suggest directions for future health evaluations of this complex exposure mixture. Future followup of our cohort will allow us to understand whether novel PFAS are associated with similar health outcomes as PFOA.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 3
SYMPOSIUM 15
Health Effects of Per- and Polyfluoroalkyl Substances: What Have We Learned Since the C8 Health Project?
Chairs: Jonathan Hofmann, US & Kyle Steenland, US

The associations between perfluoroalkyl substances and lipid profile in an exposed young adult population in the Veneto Region

Presenter: Cristina R Canova, Unit of Biostatistics, Epidemiology and Public Health, Department of Cardio-Thoraco-Vascular Sciences and Public Health, University of Padova, Padova, Italy

Authors: C. Canova[1], G. Barbieri[1], M. Zare Jeddi[1], F. Daprà[2], M. Gion[3], F. Russo[4], T. Fletcher[5], G. Pitter[6]; [1]Unit of Biostatistics, Epidemiology and Public Health, Department of Cardio-Thoraco-Vascular Sciences and Public Health, University of Padova, Padova, ITALY, [2]Laboratory Department-Regional Agency for Environmental Prevention and Protection-Veneto Region, Venice, ITALY, [3]Regional Center for Biomarkers, Department of Clinical Pathology, Azienda ULSS 3 Serenissima, Venice, ITALY, [4]Directorate of Prevention, Food Safety, and Veterinary Public Health-Veneto Region, Venice, ITALY, [5]London School of Hygiene and Tropical Medicine, London, UNITED KINGDOM, [6]Screening and Health Impact Assessment Unit, Azienda Zero-Veneto Region, Padova, ITALY.

Background Residents of a large area of the Veneto Region (North-Eastern Italy) were exposed for decades to drinking water contaminated by perfluoroalkyl substances (PFASs). PFASs have been consistently associated with raised serum lipids, mainly in cross-sectional studies and in background exposure contexts, but the shape of the dose-response relationships has been poorly investigated. The objectives of our study were to evaluate the association between serum PFASs and serum lipids and its dose-response shape in a large exposed population.
Methods A cross-sectional study was conducted in 16,224 individuals aged 20-39 years recruited in the Regional health surveillance program. 15,720 subjects were analysed after excluding pregnant women (n=327), participants reporting use of cholesterol lowering medications (n=67) or with missing information on the selected covariates (n=110). Twelve serum PFASs were measured by by HPLC-MS; three (PFOA, PFOS and PFHxS) were quantifiable in at least 50% of samples. Non-fasting serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides were measured by enzymatic assays in automated analysers and low-density lipoprotein cholesterol (LDL-C), non-HDL cholesterol and total/HDL cholesterol ratio were calculated. The associations between ln-transformed PFASs and lipids were assessed through generalized additive models using smoothing thin plate splines. Potential confounders of the lipid/PFAS association were selected through directed acyclic graph.
Results There were highly significant positive associations between the ln of PFOA, PFOS, and PFHxS and TC, HDL-C, and LDL-C. Significant but nonlinear association between ln PFOA and triglycerides was seen. Each ln-increase in PFOA was associated with an increase of 1.94 mg/dL (95% CI 1.48-2.41) in TC, with 4.99 mg/dL (CI 4.12-5.86) for PFOS and 2.02 mg/dL (CI 1.45-2.58) for PFHxS.
Conclusions Investigations of the shape of exposure-response associations using smoothing splines show a positive non-linear association with the largest increases in cholesterol levels occurring at the lowest range of PFAS concentrations.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 16
Increasing Knowledge about Health Effects of Wildfire Smoke: Summary of Multiagency Research for Public Health
Chairs: Maria Mirabelli, US & Ambarish Vaidyanathan, US

Air quality and aerosol predictions at National Oceanic and Atmospheric Administration (NOAA) and their applications

Presenter: Ivanka Stajner, NOAA, College Park, United States

Authors: I. Stajner[1], J. McQueen[1], J. Huang[1], H. Huang[1], L. Pan[1], P. Bhattacharjee[1], D. Koch[2], J. Tirado-Delgado[2], A. Stein[1], R. Saylor[3], P. Lee[1], Y. Tang[1], D. Tong[1], P. Campbell[1], B. Baker[1], J. Wilczak[4], I. Djalalova[4], G. Grell[4], L. Zhang[4], R. Ahmadov[4], G. Frost[4], S. McKeen[4], S. Kondragunta[1], A. Vaidyanathan[5], A. Rappold[6];
[1]NOAA, College Park, MD, [2]NOAA, Silver Spring, MD, [3]NOAA, Oak Ridge, TN, [4]NOAA, Boulder, CO, [5]CDC, Atlanta, GA, [6]EPA, Chapel Hill, NC.

Operational air quality predictions produced by NOAA/National Weather Service include predictions of ozone, fine particulate matter (PM2.5) and wildfire smoke for the United States and predictions of windblown dust for the contiguous 48 states. Prediction maps are distributed at https://airquality.weather.gov/ and as a web service at https://idpgis.ncep.noaa.gov/arcgis/rest/services/NWS_Forecasts_Guidance_Warnings. Community Multiscale Air Quality modeling system (CMAQ) used for ozone and PM2.5 predictions was most recently updated in December 2018, when a unified bias-correction procedure was introduced for ozone and PM2.5. Wildfire smoke dispersion is operationally predicted using the Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT). Wildfire smoke dispersion is included in version 4 of the Eulerian High Resolution Rapid Refresh (HRRR) model that is being evaluated for operational implementation. One of the largest uncertainties for prediction of air quality over the U.S. involves specification of wildfire smoke emissions. Different smoke emission approaches used in these systems will be discussed.
NOAA is testing ozone and PM2.5 predictions extended from 48 to 72 hours. Global aerosol predictions, which include biomass burning aerosols, are being tested for inclusion in one member of the Global Ensemble Forecast System (GEFS) to replace the current standalone global aerosol prediction system. An overview of this testing will be presented.
NOAA's operational air quality predictions contribute to protection of lives and health in the United States. These predictions are used by state and local air quality forecasters to issue official air quality forecasts for their respective areas. General public accesses NOAA's hourly predictions directly at https://airquality.weather.gov/. These predictions are also used in the applications about wildfire and health as well as in smoke vulnerability assessments lead by our partners at the U. S. Environmental Protection Agency (EPA) and Centers for Disease Control and Prevention (CDC).

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 16
Increasing Knowledge about Health Effects of Wildfire Smoke: Summary of Multiagency Research for Public Health
Chairs: Maria Mirabelli, US & Ambarish Vaidyanathan, US

Using NASA Earth Observations to Strengthen Air Quality Applied Research and Management

Presenter: John Haynes, NASA Headquarters, Washington, United States

Authors: J. Haynes;
NASA Headquarters, Washington, DC.

Ambient air pollution remains a significant global environmental health risk and cause of morbidity and mortality. In 2016, the World Health Organization reported that approximately 4.2 million deaths were attributed to ambient air pollution, causing increased risk of mortality from chronic obstructive pulmonary disease, ischemic heart disease and stroke, lung cancer, and respiratory infections. To address this global health burden, epidemiologic research designs and methods should integrate innovative data and technology to further examine associations between variables, analyze data trends, and monitor environmental health risks to human health. By using NASA remote sensing data, products, and applications, scientists and stakeholders can identify air pollution trends from natural (e.g. wildfires) and anthropogenic (e.g. emissions from combustion processes) sources that can inform and strengthen air quality applied research and management. This presentation will provide an overview of NASA remote sensing data products and capabilities to detect, analyze, and monitor air pollutants for exposure assessment and public health surveillance. It will also highlight the value of these innovative data as they are applied to examine emerging environmental health risks (e.g. wildfires) in selected NASA-supported projects. This discussion will offer insight on approaches that can strengthen scientific collaborations and partnerships in public health surveillance and practice as well as communication strategies with stakeholders.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 16
Increasing Knowledge about Health Effects of Wildfire Smoke: Summary of Multiagency Research for Public Health
Chairs: Maria Mirabelli, US & Ambarish Vaidyanathan, US

CDC's Translational Research Activities Addressing Public Health Impacts of Wildfire Smoke Exposure

Presenter: Ambarish Vaidyanathan, CDC, Atlanta, United States

Authors: A. Vaidyanathan, M. Mirabelli;
CDC, Atlanta, GA.

In recent years, residents of the United States have experienced longer wildfire seasons and increasingly common large and destructive wildfires. Wildfire smoke reduces air quality and affects the health of millions of adults and children, especially those with existing heart and lung conditions. At the U.S. Centers for Disease Control and Prevention's National Center for Environmental Health, wildfire-related public health activities include responding to needs of state, territorial, local, and tribal health authorities; improving communication and messaging before, during, and after wildfire events; and conducting translational research to improve our understanding of how wildfire smoke affects public health. For this presentation, we will summarize exposure assessment and epidemiologic research activities about the public health impacts of wildfire smoke currently underway at the National Center for Environmental Health. Ongoing analytic projects address data and knowledge gaps about adverse health effects associated with smoke exposure. For example, analyses of modeled smoke predictions indicate that approximately 90% of the counties in the Western U.S. had at least one smoke event in the past decade. Our analyses of concentration-response functions using data from the 2012 wildfires in Oregon estimated a 8.9% increase in the risk of asthma-related emergency room visits for each 10 $\mu g/m^3$ increase in fine particulate matter ($PM_{2.5}$) in wildfire smoke. We have also estimated concentration-response profiles for physician visits and medication fills for asthma and other less well-characterized outcomes. Analysis of quick-relief medication fills during the 2015 wildfire season in the western United States indicates that delayed effects of wildfire smoke $PM_{2.5}$ on medication fills lasted for six days after initial exposure. Taken together, results from analytic projects such as these indicate opportunities for public health action before, during, and after wildfire smoke events.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 16
Increasing Knowledge about Health Effects of Wildfire Smoke: Summary of Multiagency Research for Public Health
Chairs: Maria Mirabelli, US & Ambarish Vaidyanathan, US

US EPA Research Approaches to Better Understand Human Impacts from Wildfire Smoke Exposure

Presenter: Ana G Rappold, US EPA, Durham, United States

Authors: A. G. Rappold, C. Baghdikian, M. Hano;
US EPA, Durham, NC.

In recent years, wildland fire and the smoke from these fires has affected populations both near and far from the fire locations. The U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD) developed a Wildland Fire Research Framework 2019-2022 to outline a research agenda related to the public health impacts of wildland fire, in support of the Agency's mission to protect public health and the environment. The framework supports a breadth of research and outreach designed to help federal, state, local, and tribal organizations prepare and respond to impacts from wildland fire. This work is designed to fill gaps in scientific information related to air quality, water quantity and quality, public health, toxicology, emissions measurement and modeling, and social science. Further, this information is used to prevent and reduce the impact of wildland fire and smoke, and support translation of research and tools into action that reduces the public health burden of these events. This presentation highlights the following projects designed around wildland fire smoke and health: 1) clinical and epidemiological studies aimed to increase the understanding of the magnitude of risk, identify susceptible populations, and reduce health impacts during smoke episodes; 2) Smoke Sense: A crowdsourcing, citizen science research project with an objective to increase issue awareness and engagement in health protective behaviors related to smoke; and, 3) Smoke Ready Communities, a community capacity framework that fosters preparedness and response to wildfire smoke episodes and addresses the need for a model to help communities improve their response. The purpose of this presentation is to provide an overview of EPA's current public health related research efforts aligned to meet objectives of the framework.Disclaimer: The views expressed in this report are those of the authors and do not reflect the views or policies of the U.S. Environmental Protection Agency.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:00 / Parallel 5
EMS 8
One Health - Policy Implications and Applications
Chair: Ronnie Levin, US

How a One Health assessment of lead seasonality can improve our lives

Presenter: Ronnie Levin, Harvard School of Public Health, Newton, United States

Authors:

A One Health assessment of lead seasonality suggests that it is multifactorial within the natural world, including humans. This has important implications for environmental policy. For instance, to be sustainable, human lead remediation strategies must consider the total environment. Global warming and climate change events may increase lead exposures and toxicity to all species throughout the natural environment; again, environmental policies must see across geographic and species boundaries to mitigate environmental degradation.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:00 / Parallel 5
EMS 8
One Health - Policy Implications and Applications
Chair: Ronnie Levin, US

Lead Poisoning in Cattle and Food Chain Implications

Presenter: Karyn Bischoff, Cornell University, Lansing, United States

Authors:

Decades after the United States outlawed lead use in paint and gasoline, Pb poisoning remains the most commonly reported metal toxicosis in domestic animals, and cattle are the domestic species most commonly affected. Lead poisoning occurs most often on pasture due to the indiscriminate eating habits and natural curiosity of cattle, particularly calves, but Pb can also contaminate batches of feed for confined cattle. Lead poisoning in beef and dairy cattle directly causes economic losses due to mortality and treatment costs, but lead exposure in livestock is particularly problematic, since products from these animals enter the human food chain.

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ABSTRACT E-BOOK

August 26, 2020 / 10:00 - 11:00 / Parallel 5
EMS 8
One Health - Policy Implications and Applications
Chair: Ronnie Levin, US

A One Health Environmental Education Programs for Schools: Preventing and Mitigating Lead Poisoning in Schools and Communities

Presenter: Carolina Vieira, Harvard School of Public Health, Cambridge, United States

Authors:

The Environmental Education Program in Schools (EEP) is an action plan to instill a deep commitment to Earth citizenship, comprised of actions and attitudes in children and youth grounded in the principles of citizen science and environmental justice. Citizen science in EEP should operate with both theoretical and practical understanding of general and specific environmental challenges, creating acute awareness among schools, communities, and policymakers, and generating long-term political impacts. We are developing the EEP in Boston/Cambridge public schools with theoretical and experimental activities to improve the connection between science and communities, bringing together diverse groups to deal with urgent environmental issues and its solutions such as lead poisoning and adverse health impacts.

Proposed symposium abstract: One Health assessments consolidate the results of multidisciplinary investigations. The insights from those assessments often reveal either compounding or cascading effects or opportunities for synergistic improvements. For instance, a One Health investigation of lead contamination showed that human-focused lead disposal practices have actually increased environmental lead loadings; this suggests that changing our disposal policies to consider One Health can yield benefits across species. A One Health investigation of Antibiotic Resistant Bacteria in the US Food Supply showed that distance matters: retail meat that has traveled longer distances has a higher risk of multidrug resistant bacteria (MDRB) contamination. These results have important implications for both current environmental policy and future development.
We are also presenting an example of a One Health application: developing a curriculum to instill a deep commitment to Earth citizenship, comprised of actions and attitudes for children and youth grounded in the principles of citizen science and environmental justice.
How the symposium relates to the meeting theme of Advancing Environmental Health in a Changing World.
Environmental research can no longer afford the luxury of a silo orientation. For instance, a One Health assessment of lead contamination illustrates that the natural world, animal health, and human health constitute a continuum; environmental contamination with lead affects animal health, including livestock, which impacts human society, impacting the economy, social welfare, and health. Similarly, our educational curricula can be modified to instill a commitment to earth science through activities fostering the principles of citizen science and environmental justice. These implications and application can translate human environmental health science into action amid global changes in climate, geopolitics, and demographics.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 23
COVID-19 and the Environment: Early Lessons from the Americas and Europe
Chairs: Julian Marshall, US & Pallavi Pant, US

PM2.5 and ozone air pollution levels have not dropped consistently across the US following societal covid response

Presenter: Bujin Bekbulat, University of Washington, Seattle, United States

Authors: Bujin Bekbulat1, Joshua S. Apte2, Dylan B. Millet3, Allen L. Robinson4, Kelley C. Wells3, Julian D. Marshall1, *1 Department of Civil and Environmental Engineering, University of Washington, Seattle WA 2 Department of Civil, Architectural and Environmental Engineering, University of Texas at Austin 3 Department of Soil, Water, and Climate, University of Minnesota, St. Paul, MN 4 Department of Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA

Analysis of a large national dataset of fine particulate matter (PM2.5) and ozone air pollution from the US Environmental Protection Agency indicate opposing differences in average concentrations during the covid response period, relative to expected levels. These are the two most important pollutants in terms of public health impacts and non-attainment in the US. Post- covid response, average PM2.5 levels are modestly higher (~10%) than expected; average ozone levels are lower (~7%). However, the size of the post-response ozone anomaly is decreasing with time. In addition, no individual US state had lower-than-expected PM2.5 for all weeks post- covid response, and only one US state (California) met that criteria for ozone. Two non-covid factors, meteorology and regional transport, do not fully explain observed trends. These findings are unexpected given the large reduction in many household's activities associated with "stay at home" and other covid responses. We hypothesize that this result partly arises from the fact that ozone and the majority of PM2.5 are secondary pollutants formed in the atmosphere from emissions from many sources (i.e., not just traffic). Preliminary analysis of nitrogen dioxide (NO2) data in a few cities reveals substantially lower-than-expected (~31%) concentrations post-covid. NO2 is a primary pollutant and is much more strongly associated with traffic than PM2.5 or ozone.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 23
COVID-19 and the Environment: Early Lessons from the Americas and Europe
Chairs: Julian Marshall, US & Pallavi Pant, US

Air quality and health burden during COVID-19 response, leverage for future air quality management

Presenter: Zafar Fatmi, Aga Khan University, Karachi, Pakistan

Authors: Z. Fatmi;
Aga Khan University, Karachi, PAKISTAN.

Background: Elucidating the links between the coronavirus disease (COVID-19) response, improvement in local air quality and potential health burden may leverage future air quality management. Speculation about improvement in environmental pollution amid COVID-19 outbreak is widespread. Pakistan observed national lockdown since March 15th, 2020 to prevent the transmission of COVID-19. The objectives of this study was to determine the change in particulate matter <2.5 microns and consequent change in the associated attributable fraction of morbidity and mortality in four major cities of Pakistan: Karachi, Lahore, Peshawar and Islamabad. Methods: Particulate matter <2.5 microns ($PM_{2.5}$) levels before (from 01 Jan 2020 till 14th March, 2020) and during (15th March till 23rd April, 2020) the lockdown were obtained from fixed monitors from these cities. Pakistan's health related statistics (for 2019) were obtained from Global Burden of Disease Study of Institute of Health Metrics (IHME), US. We estimated the attributable fraction of morbidity and mortality (using AirQ+) for ischemic heart disease (IHD), stroke, chronic obstructive pulmonary disease (COPD) and lung cancer before and during the lockdown and the differences thereof. Results: The average concentration of $PM_{2.5}$ in four cities reduced from 155.18 µg/m^3 to 96.15 µg/m^3 (38.03% reduction). Consequently the average estimated reduction in morbidity and mortality in four cities were: IHD= ranged from 3.4% to 6.8%, higher for younger age group; stroke= ranged from 3.8% to 7.7%, higher for younger age group, higher for younger; COPD=8.3%; and lung cancer = 18.7%. Conclusions: The response to COVID-19 provides evidence for estimated reduction in morbidity and mortality of known cardiorespiratory diseases in four cities. Lockdown and social distancing provides an opportunity for environmental and health policymakers to delve into the social and economic activities that threatens the health of the humans. Smart interventions are needed to improve city environment and human health.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 23
COVID-19 and the Environment: Early Lessons from the Americas and Europe
Chairs: Julian Marshall, US & Pallavi Pant, US

Urban Air Pollution May Enhance COVID-19 Case-Fatality and Mortality Rates in the United States

Presenter: Donghai Liang, Emory University, Atlanta, United States

Authors: D. Liang[1], L. Shi[1], J. Zhao[2], P. Liu[3], J. Schwartz[4], S. Gao[5], J. A. Sarnat[1], Y. Liu[1], S. T. Ebelt[1], N. Scovronick[1], H. H. Chang[1];
[1]Emory University, Atlanta, GA, [2]American Cancer Society, Atlanta, GA, [3]Georgia Institute of Technology, Atlanta, GA, [4]Harvard University, Boston, MA, [5]University of Wisconsin–Madison, Madison, WI.

Background: The novel human coronavirus disease 2019 (COVID-19) pandemic has claimed more than 240,000 lives worldwide, causing tremendous public health, social, and economic damages. While the risk factors of COVID-19 are still under investigation, environmental factors, such as urban air pollution, may play an important role in increasing population susceptibility to COVID-19 pathogenesis. Methods: We conducted a cross-sectional nationwide study using zero-inflated negative binomial models to estimate the association between long-term (2010-2016) county-level exposures to NO_2, $PM_{2.5}$ and O_3 and county-level COVID-19 case-fatality and mortality rates in the US. We used both single and multipollutant models and controlled for spatial trends and a comprehensive set of potential confounders, including state-level test positive rate, county-level healthcare capacity, phase-of-epidemic, population mobility, sociodemographics, socioeconomic status, behavioral risk factors, and meteorology. Findings: 1,027,799 COVID-19 cases and 58,489 deaths were reported in 3,122 US counties from January 22 to April 29, 2020, with an overall observed case-fatality rate of 5·8%. County-level average NO_2 concentrations were positively associated with both COVID-19 case-fatality and mortality rates in single-, bi-, and tri-pollutant models (p-values<0·05). Per inter-quartile range (IQR) increase in NO_2 (4·6 ppb), COVID-19 case-fatality rate and mortality rate were associated with an increase of 7·1% (95% CI 1·2% to 13·4%) and 11·2% (95% CI 3·4% to 19·5%), respectively. We did not observe significant associations with long-term exposure to $PM_{2.5}$ or O_3. Interpretation: Long-term exposure to NO_2, which largely arises from urban combustion sources such as traffic, may enhance susceptibility to severe COVID-19 outcomes, independent of long-term $PM_{2.5}$ and O_3 exposure. The results support targeted public health actions to protect residents from COVID-19 in heavily polluted regions with historically high NO_2 levels. Continuation of current efforts to lower traffic emissions and ambient air pollution may be an important component of reducing population-level risk of COVID-19 case-fatality and mortality.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 23
COVID-19 and the Environment: Early Lessons from the Americas and Europe
Chairs: Julian Marshall, US & Pallavi Pant, US

Air Quality and COVID-19 mortality in the Chicago area

Presenter: Molly Scannell Bryan, University of Illinois at Chicago, Chicago, United States

Authors: M. Scannell Bryan[1], J. Jagai[1], R. Sargis[1], D. E. Horton[2], A. Montgomery[2], M. Argos[1];
[1]University of Illinois at Chicago, Chicago, IL, [2]Northwestern University, Chicago, IL.

Background:In the United States, deaths caused by COVID-19 have occurred disproportionately in racial and ethnic minority populations. As no medical cure or natural immunity exists, understanding the factors that place people at higher risk of dying of COVID-19 is crucial to reducing mortality. Prelminary ecological analyses suggest that poor air quality may increase the risk of COVID-19 mortality, but thus far, this association has not been evaluated in with fine-scale spatial exposure resolution in a homogenously urban area. We aimed to interrogate the relationship between air quality and COVID-19 mortality in residents of Cook County, an area with high levels of racial and ethnic residential seggregation.
Methods: High-resolution estimates of three air pollutants were developed for Cook County, Illinois (the Chicagoland area): particulate matter smaller than 2.5 microns ($PM_{2.5}$), ozone (O_3), and nitrogen dioxide (NO_2) utilizing a WRF-CMAQ model. The association of these air pollutants were associated with overall and race-specific COVID-19 death rates within each census tract controlling for tract-level confounders.
Results: Race and ethnicity were highly correlated with the air pollutants ($p<0.00001$). An increased risk of COVID-19 mortality was found in tracts with higher $PM_{2.5}$ ($RR=1.26$; $p=1.19\cdot10^{-5}$) and NO_2 ($RR=1.04$; $p=1.13\cdot10^{-2}$) when controlling for tract-level gender, age, and proxies for exposure to the virus (public transit use, population density, and occupants per residential room). This effect persisted when controlling for congregate living such as nursing homes and jails. This effect was attenuated when controlling for other tract-level measures of socioeconomic status, and such measures were often highly correlated with air pollution.
Conclusions: This analysis supports the hypothesis that air pollution may be associated with COVID-19 mortality. While individual-level analyses are needed, these findings support mitigation strategies that may reduce death rates in vulnerable population such as filtration and pollutant regulations.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 23
COVID-19 and the Environment: Early Lessons from the Americas and Europe
Chairs: Julian Marshall, US & Pallavi Pant, US

Impacts of the COVID-19 Lockdown on Cooking Fuel Use Patterns, Income and Food Security in an Informal Settlement in Nairobi, Kenya

Presenter: Matthew Shupler, University of Liverpool, Liverpool, United Kingdom

Authors: M. Shupler[1], J. Mwitari[2], A. Gohole[2], R. Anderson de Cuevas[1], E. Puzzolo[1], I. Cukic[1], E. Nix[1], D. Pope[1];
[1]University of Liverpool, Liverpool, UNITED KINGDOM, [2]Amref International University, Nairobi, KENYA.

Background: Approximately 2.5 billion individuals use solid fuels (e.g. wood, coal) for cooking, exposing them to health-damaging household air pollution (HAP). A COVID-19 lockdown may impact the cooking habits, earning power, food security and health of millions of the urban poor living in informal settlements in low-income countries, Methods: Nairobi went into COVID-19-related lockdown on April 7, 2020. A telephone-based survey was conducted from April 20-30 to document socioeconomic impacts and fuel use among consenting participants (N=196) in the informal settlement of Mukuru kwa Reuben in Nairobi, Kenya. Change in cooking habits was assessed through comparison with baseline survey data collected from a random sample of primary cooks (N=285) in Mukuru kwa Reuben from December 2019-March 2020. Results: Nearly all participants (>90%; 178) reported reduced (60%) or cessation (31%) of income and insufficient food (88%) as a result of the lockdown. A majority (52%) of participants reported cooking less frequently in response to the lockdown; most commonly (52%) in order to reduce household expenses and half (51%) had changed their diet (20% stopped consuming meat/fish). Half (n=38) of respondents using liquefied petroleum gas (LPG) for cooking had reduced (n=17; 23%) or stopped using LPG (n=21; 28%) as a clean primary fuel. Households switching primary fuels (n=29) commonly substituted LPG for wood (n=8; 28%) or kerosene (n=7; 24%); or kerosene for wood (n=9; 31%). Three-quarters of residents continuing to use LPG were paying a higher price since the lockdown; unavailability of LPG was not indicated as a major barrier. Conclusions: The COVID-19 lockdown has had a substantial impact on the livelihoods, fuel use and diets of families in peri-urban Kenya, including a likely increase in HAP exposures among families that stopped/reduced LPG fuel use for cooking. Increased exposure to HAP may have been compounded by being quarantined inside the home.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 23
COVID-19 and the Environment: Early Lessons from the Americas and Europe
Chairs: Julian Marshall, US & Pallavi Pant, US

Exposure to air pollution and COVID-19 mortality in the United States

Presenter: Xiao Wu, Harvard University, Boston, United States

Authors: X. Wu[1], R. C. Nethery[2], B. M. Sabath[2], D. Braun[2], F. Dominici[2];
[1]Harvard University, Boston, MA, [2]Harvard T.H. Chan School of Public Health, Boston, MA.

United States government scientists estimate that COVID-19 may kill tens of thousands of Americans. Many of the pre-existing conditions that increase the risk of death in those with COVID-19 are the same diseases that are affected by long-term exposure to air pollution. We investigated whether long-term average exposure to fine particulate matter ($PM_{2.5}$) is associated with an increased risk of COVID-19 death in the United States. We collected data for more than 3,000 counties in the United States (representing 98% of the population) up to April 22, 2020. We fit negative binomial mixed models using county-level COVID-19 deaths as the outcome and county-level long-term average of $PM_{2.5}$ as the exposure. In the main analysis, we adjusted by 20 potential confounding factors including population size, age distribution, population density, time since the beginning of the outbreak, time since state's issuance of stay-at-home order, hospital beds, number of individuals tested, weather, and socioeconomic and behavioral variables such as obesity and smoking. We included a random intercept by state to account for potential correlation in counties within the same state. We conducted more than 68 additional sensitivity analyses. We found that an increase of only 1 $\mu g/m^3$ in $PM_{2.5}$ is associated with an 8% increase in the COVID-19 death rate (95% confidence interval [CI]: 2%, 15%). The results were statistically significant and robust to secondary and sensitivity analyses. A small increase in long-term exposure to $PM_{2.5}$ leads to a large increase in the COVID-19 death rate. Despite the inherent limitations of the ecological study design, our results underscore the importance of continuing to enforce existing air pollution regulations to protect human health both during and after the COVID-19 crisis. The data and code are publicly available so our analyses can be updated routinely.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 24
Evolution of Omics': From Epigenomics to the Metabolome
Chairs: Andrea Baccarelli, US & Kelly Brunst, US

Common DNA methylation signatures of arsenic exposure and incident cardiovascular disease in the Strong Heart Study

Presenter: Arce Domingo-Relloso, Spanish National Center of Epidemiology, Madrid, Spain

Authors: A. Domingo-Relloso[1], M. Tellez-Plaza[1], A. Bozack[2], L. Gomez[3], M. Herreros[4], R. Devereux[5], A. Baccarelli[3], J. Umans[6], B. Howard[6], J. Zhao[7], W. Tang[8], K. Haack[9], D. Fallin[10], S. Cole[9], A. Navas-Acien[3]; [1]Spanish National Center of Epidemiology, Madrid, SPAIN, [2]Icahn School of Medicine at Mount Sinai, New York, NY, [3]Columbia University Mailman School of Public Health, New York, NY, [4]INCLIVA Biomedical Research Institute, Valencia, SPAIN, [5]Weill Cornell Medicine, New York, NY, [6]MedStar Health Research Institute, Hyattsville, MD, [7]University of Florida College of Public Health, Gainesville, FL, [8]Johns Hopkins University, Baltimore, MD, [9]Texas Biomedical Research Institute, San Antonio, TX, [10]Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.

Background: Arsenic (As) has been related to increased cardiovascular disease (CVD) risk in the Strong Heart Study (SHS), a population-based cohort in American Indian communities. Epigenetic dysregulations have been proposed as potential mechanisms for As-related CVD. We used a method that allows simultaneously modeling large numbers of CpGs to evaluate the association of As-related differentially methylated positions (DMPs) with incident CVD. Methods: 2325 American Indian men and women 45-74 years old in 1989-1991 were followed through 2017. Blood DNA methylation measured at baseline using the EPIC array was pre-processed and corrected for batch effects and cell heterogeneity. Medical ascertainment of clinical events included all CVD, coronary heart disease (CHD), congestive heart failure (CHF), and stroke. Arsenic exposure was measured as the sum of inorganic and methylated species in urine. We used GLMnet penalized regression (elastic-net) to identify DMPs associated with CVD, CHD, CHF, stroke and inorganic As in separate models.Results: A total of 1023 participants had CVD events. The median (IQR) of urinary As was 8.5 (5.2, 14.4) µg/g creatinine. The elastic net model selected 510 CpGs for all CVD, 635 for CHD, 1099 for CHF and 319 for stroke. For urinary As, 321 CpGs were selected. One CpG annotated to TXNIP, which encodes thioredoxin interacting protein, regulates cellular redox signaling, and protects against oxidative stress, was selected for the four CVD outcomes as well as for urinary As. Two CpGs annotated to ARHGAP22 and PRR4 were selected for As and CHD. Three CpGs (one annotated to SLC16A3 and two intergenic) were selected for As and CHF.
Conclusions: Common epigenetic signals were jointly associated with urinary As and all and specific CVD endpoints. As arsenic has been related to thioredoxin pathways in experimental models, the role of TXNIP on As-related CVD merits investigation.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 24
Evolution of Omics': From Epigenomics to the Metabolome
Chairs: Andrea Baccarelli, US & Kelly Brunst, US

Untargeted metabolomic profiles of air pollution exposure during pregnancy and postpartum depression risk: a pilot study

Presenter: Megan Niedzwiecki, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: M. M. Niedzwiecki[1], A. Joshi[1], A. C. Just[1], I. Kloog[1], E. Colicino[1], M. Solano González[2], S. Martínez-Medina[3], L. Schnaas[3], M. M. Téllez-Rojo[2], R. J. Wright[1], R. O. Wright[1], L. Petrick[1];
[1]Icahn School of Medicine at Mount Sinai, New York, NY, [2]National Institute of Public Health, Cuernavaca, MEXICO, [3]National Institute of Perinatology, Mexico City, MEXICO.

Background. Postpartum depression (PPD) impacts 18% of mothers globally, adversely affecting the health of mothers and children. Evidence from the Programming Research on Obesity, Growth, Environment, and Social Stress (PROGRESS) cohort in Mexico City suggests that exposure to air pollution, namely $PM_{2.5}$ (particulate matter < 2.5 μm in diameter), in pregnancy is associated with increased PPD risk. Untargeted metabolomics, in which hundreds to thousands of metabolites are identified without specifying these metabolites a priori, offers a data-driven approach to identify mechanisms linking $PM_{2.5}$ and PPD.
Aim. To characterize metabolomic profiles associated with $PM_{2.5}$ exposures and PPD in maternal serum collected during the second and third trimesters of pregnancy.
Methods. We randomly selected 100 mothers from PROGRESS in a pilot study, estimated $PM_{2.5}$ exposures during pregnancy using a satellite-based spatiotemporally-resolved prediction model, and measured maternal depression at 6 months postpartum using the Edinburgh Postnatal Depression Scale (EPDS). In maternal serum, we performed liquid chromatography-mass spectrometry (LC-MS)-based untargeted metabolomic profiling of polar, semi-polar, and non-polar metabolites.
Results. After filtering, 202 putatively-identified metabolites were analyzed in linear models adjusted for maternal age, education, BMI, and laboratory batch. Of these, 20 and 29 metabolites in the second and third trimesters, respectively, were associated ($p<0.05$) with average trimester $PM_{2.5}$ levels in the respective trimester. Two third trimester metabolites (itaconate and nervonate) passed multiple testing correction (FDR<0.05). Itaconate was also negatively associated with $PM_{2.5}$ in second trimester ($p=0.003$) and marginally associated with lower PPD risk (EPDS ≥ 13; $p=0.08$).
Conclusions. In maternal serum collected during pregnancy, we identified metabolites associated with $PM_{2.5}$ exposure. Itaconate, which was negatively associated with both $PM_{2.5}$ exposure and PPD, is a mitigator of inflammation and oxidative stress, consistent with processes known to be involved in both $PM_{2.5}$ exposure and depression.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 24
Evolution of Omics': From Epigenomics to the Metabolome
Chairs: Andrea Baccarelli, US & Kelly Brunst, US

Prenatal phthalate exposure is associated with changes to the placental transcriptome

Presenter: Alison Paquette, Seattle Children's Research Insitute, in the Center for Developmental Biology and Regenerative Medicine., Seattle, United States

Authors: A. G. Paquette[1], J. MacDonald[2], D. Day[3], T. Bammler[2], C. Loftus[2], D. Enquobahrie[2], N. Price[1], F. Tylavsky[4], N. Bush[5], K. Lewinn[5], C. Karr[2], S. Sathyanarayana[3];
[1]Seattle Children's Research Insitute, Seattle, WA, [2]University of Washington, Seattle, WA, [3]Seattle Children's Research Institute, Seattle, WA, [4]University of Tennessee Health Sciences Center, Memphis, TN, [5]University of California; San Francisco, San Francisco, CA.

Background: Phthalates disrupt processes involved in placental physiology and fetal development and are associated with a variety of adverse health outcomes in infants and children. The goal of this study was to identify associations between prenatal phthalate exposure and the placental transcriptome. Methods: Maternal urine was collected during the third trimester and placental tissue was collected at delivery from 404 women enrolled in the CANDLE study (Shelby County Tennessee, USA). Sample analyses were conducted by the ECHO PATHWAYS Consortium. 15 phthalate urinary metabolites were quantified using high-performance liquid chromatography-mass spectrometry. Placental transcriptomic data was generated using paired-end RNA sequencing. Linear models were fit using limma-voom to identify associations between each phthalate metabolite (independent variable) and each gene (dependent variable). We used models adjusted only for sequencing batch and models fully adjusted for confounders: maternal education; race and age; sequencing batch; fetal sex; and labor type. Genes were considered statistically significant at a Benjamini-Hochberg false discovery rate (FDR) <0.05. For pathway overrepresentation analysis, we included genes significantly associated with phthalates from minimally adjusted models at an FDR <0.15. Results: We identified 39 pathways associated with one or more of 5/15 phthalates. MMP MBZP, and MBP concentrations were associated with the highest number of genes and pathways. The RIG-1-like receptor signaling pathway, intestinal immune network for IgA production, and the complement and coagulation cascade pathways were enriched for genes associated with multiple phthalates. No genes were statistically significantly associated with urinary phthalate measurements in our fully adjusted model. Conclusion: In this first genome-wide assessment of the third-trimester placental transcriptome, we identified genes associated with phthalate exposure. These genes were related to xenobiotic metabolism, oxidative stress, PPAR signaling, and immune dysregulation, concurrent with phthalates known molecular mechanisms within the placenta. Ongoing work includes collecting additional data and identification of transcriptional regulators.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 24
Evolution of Omics': From Epigenomics to the Metabolome
Chairs: Andrea Baccarelli, US & Kelly Brunst, US

Selenium-associated decrease of mir-216a and mir-217 expression in placenta and their associations with neurobehavioral development at birth: a genome-wide study of two U.S. birth cohorts

Presenter: Fu-Ying Tian, Gangarosa Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, United States

Authors: F. Tian[1], E. M. Kennedy[1], T. M. Everson[1], B. Lester[2], T. Punshon[3], B. P. Jackson[4], K. Hao[5], J. Chen[6], M. R. Karagas[7], C. J. Marsit[1];
[1]Gangarosa Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, [2]Brown Center for the Study of Children at Risk, Women and Infants Hospital, Warren Alpert School of Medicine of Brown University, Providence, RI, [3]Department of Biological Sciences, Dartmouth College, Hanover, NH, [4]Department of Earth Sciences, Dartmouth College, Hanover, NH, [5]Department of Genetics and Genome Sciences, Icahn School of Medicine at Mount Sinai, New York, NY, [6]Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, NY, [7]Department of Epidemiology, Geisel School of Medicine, Dartmouth College, Hanover, NH.

Background: As an essential micronutrient, selenium plays a vital role in fetal development. MicroRNA expression modification is a potential mechanism linking dietary exposures and fetal neurobehavioral development; however, very few studies have sought to elucidate whether microRNA expression is responsive to selenium in humans. We aimed to investigate the associations between selenium concentration in the placenta, a critical developmental organ, and microRNA expression, and to assess the association between selenium-associated microRNAs and newborns' neurobehavior. Methods: Our study included 394 newborns (280 from New Hampshire Birth Cohort Study, 114 from Rhode Island Child Health Study). Placental selenium concentrations were quantified using inductively coupled plasma mass spectrometry, and genome-wide microRNA and mRNA transcripts were measured using RNA-seq. Newborn neurobehavioral development was assessed by the NICU Network Neurobehavioral Scales. We fitted generalized additive models with smoothing splines for selenium and microRNAs in the pooled data of the two cohorts, adjusting for covariates. We fitted multiple linear regression and ordinal logistic regression for microRNAs and newborn NNNS summary scores, adjusting for covariates. Results: We identified a reverse J-shaped association between selenium concentration and the expression of mir216a/mir217 cluster (edf = 2, FDR-adjusted p-value = 4.14×10^{-5}) in placenta, and we observed that a doubling in mir216a/mir217 expression was associated with a 0.13 and 0.19 decrease in self-regulation score of newborns (p-value = 0.03 and 0.08). Moreover, self-regulation was positively associated with the expression of mir216a/mir217-targeted TXNRD2, a selenoprotein coding gene ($\beta = 0.83$, p-value = 0.04). Conclusions: The selenium-associated modification of mir216a/mir217 expression in the placenta might provide a partial mechanism for neurobehavioral developmental effects of prenatal selenium exposure in offspring.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 24
Evolution of Omics': From Epigenomics to the Metabolome
Chairs: Andrea Baccarelli, US & Kelly Brunst, US

Linking biomarkersof environmental chemical exposure and endometriosis: integrating the exposome and metabolome in the ENDOXOMICS-b Study

Presenter: Komodo Matta, LABERCA, Oniris, INRAe, Nantes, France

Authors: K. Matta[1], T. Lefebvre[2], Y. Guitton[1], P. Marchand[1], B. Le Bizec[1], S. Ploteau[3], J. Antignac[1], G. Cano-Sancho[1];
[1]LABERCA, Oniris, INRAe, Nantes, FRANCE, [2]Reproductive Biology Service, CHU Nantes, Nantes, FRANCE, [3]Gynaecology-Obstetrics Department, CHU Nantes, Nantes, FRANCE.

Background/Aim Endometriosis is a gynaecological disease impacting a staggering 5-15% of women with dramatic socio-economic impacts, aggravated by long diagnostic delays of 8-10 years between symptom onset and surgical confirmation. Previous studies suggest a relationship between exposure to some persistent organic pollutants (POPs) and endometriosis, but its aetiology remains uncertain. In this study, we developed a comprehensive analytical framework based in mass spectrometry (MS) and advanced computational approaches to characterise exposure and metabolic profiles to identify potential biomarkers of exposure and effect related to endometriosis. Methods The ENDOXOMICS-β study comprises women seeking obstetric intervention for endometriosis, infertility, and other gynaecologic issues at University Hospital of Nantes. Endometriosis phenotype was determined histologically. 140 serum samples (92 cases, 48 controls) were analysed for POPs using ultra-trace methods based on liquid and gas chromatography coupled to high-resolution MS (LC- and GC-HRMS). Lipid and metabolite profiling was performed using the Biocrates MxP® Quant 500 Kit and targeted flow injection analysis (FIA-MS/MS) and LC-MS/MS. Data analyses included a battery of algorithms for single-block (elastic-net, neural networks, support vector machine) and multiblock (partial-least-square) variable selection. Multivariate logistic regression (MLR) was used to validate the associations, adjusting for covariates. Results Preliminary targeted metabolomics analyses quantified over 600 metabolites, including a number of functional/structural families (acylcarnitines, ceramides, glycerophospolipids, phosphatidylcholines, sphingolipids). 80 lipids were found associated with endometriosis ($p<0.05$) with elevated adjusted odds-ratios. Several organochlorine pesticides, polychlorobiphenyls and perfluoroalkyl substances were also identified. Multiblock models appear a powerful approach to integrate highly correlated, multidimensional data to identify potential exposure and effect biomarkers. Conclusion To our knowledge, this is the first application of quantitative MS-based metabolomics and exposomics in serum to identify potential biomarkers associated with endometriosis. Integrative multiblock methods offer promising potential for the discovery of biomarkers of exposure and effect with large applications in etiological and clinical research.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 25
Heavy Metals, Trace Elements, and Population Health
Chairs: Marco Vinceti, Italy & Lauren Wise, US

Prenatal Metal Mixtures and Birth Weight for Gestational Age in A Lower Income Predominately Hispanic Pregnancy Cohort

Presenter: Caitlin Howe, University of Southern California, Los Angeles, United States

Authors: C. G. Howe[1], B. Claus Henn[2], S. P. Eckel[1], S. F. Farzan[1], B. H. Grubbs[1], T. A. Chavez[1], T. H. Hodes[1], J. Fernandez[3], J. D. Meeker[3], T. M. Bastain[1], C. V. Breton[1];
[1]University of Southern California, Los Angeles, CA, [2]Boston University School of Public Health, Boston, MA, [3]University of Michigan School of Public Health, Ann Arbor, MI.

Background/Aim: Reduced fetal growth increases risk for adverse health outcomes. Growing evidence indicates that metal exposures contribute to reduced fetal growth, but little is known about the impacts of complex metal mixtures. The objective of this study was to investigate the impact of prenatal exposure to a complex mixture of metals on birth weight for gestational age (BW for GA) in the MADRES study, a predominately lower income Hispanic pregnancy cohort in Los Angeles, California. Methods: Cadmium, cobalt, mercury, nickel, lead, and thallium were measured by ICP-MS in urine samples collected in early pregnancy (median: 13.1 weeks gestation). Speciated urinary arsenic (inorganic+monomethyl+dimethyl) was measured by HPLC coupled to ICP-MS. The impact of these seven elements on BW for GA z-scores was evaluated using covariate-adjusted Bayesian Kernel Machine Regression (N=262). A novel method (Bayesian semiparametric regression and sparsity inducing priors) was also used to formally investigate pairwise interactions between elements.
Results: Among the seven elements evaluated, mercury and nickel ranked most highly in importance for predicting BW for GA. Setting other metals to their median, an interquartile increase in mercury was associated with a -0.021 (95% CI: -0.027, -0.015) standard deviation difference in BW for GA. A non-linear association was observed for nickel, where a positive association was seen at low-to-moderate, but not high levels of this element. There was also evidence of an interaction between mercury and nickel, such that the positive association between nickel and BW for GA was attenuated in a dose-dependent manner at higher levels of mercury. This interaction was confirmed using Bayesian semiparametric regression and sparsity inducing priors.
Conclusions: In a mostly lower income Hispanic pregnancy cohort in Los Angeles, we identified a possible antagonism between mercury and nickel, which suggests that at low-to-moderate levels nickel may promote fetal growth while mercury may counteract this effect.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 25
Heavy Metals, Trace Elements, and Population Health
Chairs: Marco Vinceti, Italy & Lauren Wise, US

Association of childhood multiple essential and toxic trace elements with longitudinal cardiometabolic risk factors

Presenter: Katerina Margetaki, University of Southern California, Los Angeles, United States

Authors: K. Margetaki[1], N. Stratakis[1], M. Vafeiadi[2], T. Roumeliotaki[2], M. Vahter[3], M. Kogevinas[4], M. Kippler[3], L. Chatzi[1];
[1]University of Southern California, Los Angeles, CA, [2]University of Crete, Heraklion, GREECE, [3]Karolinska Institutet, Stockholm, SWEDEN, [4]ISGlobal, Barcelona, SPAIN.

Background/Aim: Trace elements concentrations have been implicated in cardiometabolic risk in children. Previously, studies have largely focused on individual elements, however, more akin to the real word, children are simultaneously exposed to multiple elements. We aimed to evaluate the longitudinal association of childhood exposure to mixtures of trace elements with levels of serum lipids and blood pressure in 300 children from the RHEA pregnancy cohort in Crete, Greece.Methods: Concentrations of 5 essential (Mg, Mo, Co, Cu, Se,) and 4 toxic trace elements (As, Cd, Hg, Pb) were determined in whole blood at the age of 4 years. Blood pressure and serum lipids (total cholesterol, triglycerides, LDL and HDL cholesterol) were measured repeatedly at the ages of 4, 6 and 11 years. We used linear mixed models for single element associations and hierarchical Bayesian Kernel Machine Regression (BKMR) to assess mixtures. All models were adjusted for relevant covariates. Results: In linear mixed models, higher total cholesterol levels (mg/dl) were observed per each doubling of magnesium (beta 3.3, 95% CI: 0.6, 6.0), selenium (beta 4.3, 95% CI: 1.6, 7.0), molybdenum (beta 3.3, 95% CI: 0.7, 6.0) and arsenic (beta 3.1, 95% CI: 0.4, 5.9) concentrations. Similar associations were observed for LDL. Higher levels of arsenic were also associated with increased systolic blood pressure (beta 0.9 mmHg, 95% CI: 0.0, 1.8 mmHg). The BKMR for essential elements showed that increased levels of all essential elements were associated with higher cholesterol levels with selenium being the main driver of the mixture effect. No association was observed between trace elements mixture and blood pressure. The observed associations were similar among boys and girls. Conclusions: Exposure to trace elements in childhood and especially selenium might play a role in later cardiometabolic risk.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 25
Heavy Metals, Trace Elements, and Population Health
Chairs: Marco Vinceti, Italy & Lauren Wise, US

Low-level exposure to multiple metals associated with spirometry-defined lung disease in American Indians: Evidence from the Strong Heart Study

Presenter: Marisa Sobel, Department of Environmental Health Sciences, Columbia University Mailman School of Public Health, New York, United States

Authors: M. Sobel[1], A. Navas-Acien[1], M. Powers[2], M. Grau-Perez[3], W. Goessler[4], L. G. Best[5], J. Umans[6], E. C. Oelsner[7], A. Podalanczuk[8], T. R. Sanchez[1];
[1]Department of Environmental Health Sciences, Columbia University Mailman School of Public Health, New York, NY, [2]Department of Sociology and Anthropology, Northeastern University, Boston, MA, [3]Biomedical Research Institute of Valencia (INCLIVA), Valencia, SPAIN, [4]Institute of Chemistry, Uni-Graz, Graz, AUSTRIA, [5]Missouri Breaks Industries Research, Eagle Butte, SD, [6]Division of Nephrology and Hypertension, Department of Medicine, Georgetown University Medical Center, Washington, DC, [7]Division of General Medicine, Department of Medicine, Columbia University Irving Medical Center, New York, NY, [8]Division of Pulmonary, Allergy, and Critical Care Medicine, Department of Medicine, Columbia University Irving Medical Center, New York, NY.

Background/Aim: American Indians have a higher burden of chronic lung disease compared to the national average. Several metals are known to induce chronic lung disease at high levels of exposure; however, less is known on the role of low- to moderate-level metal exposure in chronic lung disease. We investigated respiratory effects of environmental exposure to metals and metal-mixtures in American Indians who participated in the Strong Heart Study.
Methods: We included participants with data on 6 metals measured from baseline urine samples (1989-1991) and who underwent spirometry testing at visit 2 (1993-1995). We used generalized linear regression to asses associations between metals with spirometry-defined measures of airflow limitation and restrictive ventilatory pattern, and continuous spirometry. In sensitivity analyses, we further adjusted for other metals, accounted for multiple comparisons, and stratified by smoking status. We will use Bayesian Kernel Machine Regression to investigate the joint effects of metal mixtures on lung function and disease.
Results: Of the 2,077 participants included, 40% were male, median age was 55 years, 21% had spirometry-defined airflow limitation, and 14% had a restrictive ventilatory pattern. After adjustment for smoking and sociodemographic variables, arsenic, molybdenum, selenium, tungsten, and zinc were associated with increased odds of restrictive ventilatory pattern [OR (95% CI) per interquartile increase: arsenic, 1.31 (1.09, 1.58); molybdenum, 1.51 (1.24, 1.83); selenium, 1.34 (1.05, 1.71); tungsten, 1.22 (1.01, 1.47); zinc, 1.59 (1.25, 1.94)]. Arsenic, cadmium, and zinc were associated with increased odds of airflow limitation, OR (95% CI): 1.31 (1.09, 1.58); 1.19 (0.99, 1.42); 1.14 (0.98, 1.33), respectively. Results stratified by smoking status and further adjusted for other metals were consistent.
Conclusions: Low-moderate level exposure to several metals is associated with higher odds of spirometry-defined lung disease in an American Indian population. Environmental exposure to metals may have an under-recognized adverse role on the respiratory system.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 25
Heavy Metals, Trace Elements, and Population Health
Chairs: Marco Vinceti, Italy & Lauren Wise, US

Mixed metal exposures measured from toenail in relation to mini-mental state examination scores in the Normative Aging Study

Presenter: Aaron Specht, Harvard T.H. Chan School of Public Health, Boston, United States

Authors: A. J. Specht, V. T. Nguyen, A. Bellavia, A. S. Dickerson, R. S. Rotem, D. Sparrow, J. Schwartz, M. G. Weisskopf;
Harvard T.H. Chan School of Public Health, Boston, MA.

Background:The epidemiologic evidence between environmental exposures and cognition has focused primarily on the increased risk of singular offenders and, until recently, statistical approaches to adequately assess the potential synergies or competitive effects of multiple exposures, which could have a significant impact on the drastically increasing aging population in the world, were lacking. Methods:In this study, we used biomarkers of mixed metal exposures including lead (Pb), manganese (Mn), mercury (Hg), arsenic (As), and cadmium (Cd) in toenails to determine the association with cognition as measured via the mini-mental state examination (MMSE) in a group of 560 elderly men participating in the Normative Aging Study. We analyzed the association between the metals and MMSE using individual linear regression, multiple regression without interactions, and Bayesian Kernel Machine Regression (BKMR). BKMR was used to identify the potential for synergisms and interactions within the mixture in relation to MMSE. We adjusted our analyses for how many times a participant had taken the MMSE, alcohol consumption, age, education years, smoking, and fish consumption. MMSE was negative transformed, so a positive beta value was reflective of worse cognition. Results:Among the men (73±7) in our population log toenail Pb (Beta: 0.16 95% CI:0.11,0.21) and log toenail Hg (Beta: -0.24 95% CI:-0.33,-0.16) showed significant first order associations with MMSE after adjustment. In our BKMR analysis, we identified overall negative trends between MMSE and the Pb, Mn, Cd, and As mixture with Hg showing positive effects on MMSE, and with positive interactions occurring between Mn and Hg, Cd and Hg, and As and Mn. Discussion:These results, using a mixture approach, suggest that potential interactions may be operating in the relationships between correlated environmental toxicants and cognition. Interactions should be further evaluated to determine the exacerbated effects of mixed exposures and better design potential interventions.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 25
Heavy Metals, Trace Elements, and Population Health
Chairs: Marco Vinceti, Italy & Lauren Wise, US

Association between menstrual bleeding and blood cadmium concentrations

Presenter: Kristen Upson, Department of Epidemiology and Biostatistics, College of Human Medicine, Michigan State University, East Lansing, United States

Authors: K. Upson[1], Q. E. Harmon[2], L. A. Wise[3], G. Wegienka[4], J. E. Hall[5], E. J. Tokar[6], D. D. Baird[2]; [1]Department of Epidemiology and Biostatistics, College of Human Medicine, Michigan State University, East Lansing, MI, [2]Epidemiology Branch, National Institute of Environmental Health Sciences, NIH, Research Triangle Park, NC, [3]Department of Epidemiology, Boston University School of Public Health, Boston, MA, [4]Department of Public Health Sciences, Henry Ford Health System, Detroit, MI, [5]Clinical Research Branch, National Institute of Environmental Health Sciences, NIH, Research Triangle Park, NC, [6]National Toxicology Program Laboratory, National Institute of Environmental Health Sciences, NIH, Research Triangle Park, NC.

Background/Aim: Menstrual blood loss is a substantial contributor to body iron deficiency. When body iron stores are low, metal ion transporters in the gut are upregulated to increase intestinal absorption of iron. However, metal transporters are not specific and bind to other metals, including cadmium. Methods: We investigated the association between menstrual bleeding and blood cadmium concentrations using enrollment data (years 2010-2012) from the Study of Environment, Lifestyle & Fibroids, a cohort of 1693 African American women ages 23-35 who reside in the Detroit, Michigan area. Data collected by interview and questionnaire allowed for the estimation of bleeding heaviness at last menstrual period (LMP), usual cycle length, and impact of menstrual bleeding on quality of life during the prior year. Cadmium concentrations were measured in whole blood from 1548 participants. Among never smokers (n=1137), we used linear regression to estimate the percent difference in blood cadmium concentrations across menstrual bleeding categories, adjusting for age, education, and passive-smoke exposure. Results: Women with medium and heavy bleeding at LMP had blood cadmium concentrations that were 5% higher (95% CI: -3%, 14%) and 16% higher (95% CI: 5%, 27%), respectively, than those with light bleeding. Substantial interference of daily activities by menstrual bleeding (versus no interference) was associated with 20% higher blood cadmium concentrations (95% CI: 0%, 42%). Women with irregular cycles had 16% lower blood cadmium concentrations (95% CI: -30%, 0%) compared with women reporting cycles 27-34 days in length. Among women whose usual cycle length was ≤34 days (n=919), those who had heavy bleeding at LMP and cycle length ≤26 days had blood cadmium concentrations that were 27% higher (95% CI: 7%, 50%) than those who had light/medium bleeding and a cycle length of 27-34 days. Conclusions: Our results suggest that women with frequent, heavy menstrual bleeding have increased cadmium absorption.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 25
Heavy Metals, Trace Elements, and Population Health
Chairs: Marco Vinceti, Italy & Lauren Wise, US

Urinary Metals and Incident Diabetes in Midlife Women: Study of Women's Health Across the Nation (SWAN)

Presenter: Xin Wang, University of Michigan School of Public Health, Ann Arbor, United States

Authors: X. Wang[1], C. Karvonen-Gutierrez[1], W. Herman[2], B. Mukherjee[1], S. Harlow[1], S. K. Park[1];
[1]University of Michigan School of Public Health, Ann Arbor, MI, [2]University of Michigan Medical School, Ann Arbor, MI.

Background: Environmental exposure to metals may play a role in the pathogenesis of diabetes, however, evidence from human studies is limited. We prospectively evaluated the associations of 20 urinary metal concentrations and their mixtures with incident diabetes in the Study of Women's Health Across the Nation, a multi-site, multi-ethnic cohort study of midlife women. Methods: The sample included 1,226 white, black, Chinese and Japanese-American women, aged 45-56 years, free of diabetes at baseline (1999-2000) who were followed through 2016. Concentrations of 20 metals (arsenic, barium, beryllium, cadmium, cobalt, chromium, cesium, copper, mercury, manganese, molybdenum, nickel, lead, antimony, tin, thallium, uranium, vanadium, tungsten and zinc) were measured in urine specimens using high-resolution inductively coupled plasma-mass spectrometry at baseline. Incident diabetes was identified annually. Exposure to metal mixtures were captured using k-means clustering. Results: After multivariable adjustment, the hazard ratios (HR) (95% CI) of diabetes associated with each doubling increase in urinary metal concentrations were 1.13 (1.04, 1.23) for arsenic and 1.22 (1.09, 1.37) for lead, in Cox proportional hazards models after controlling for multiple comparison. A doubling in urinary excretion of zinc was associated with higher diabetes risk (adjusted HR 1.47, 95% CI: 1.27, 1.70). Two distinct exposure patterns to metal mixtures- "high" vs. "low"-were identified. Adjusted HR of diabetes associated with "high" exposure pattern compared with "low" was 1.38 (1.09, 1.75). Conclusions: Exposure to arsenic and lead, an increase urinary excretion of zinc, as well as a high overall exposure to metal mixtures were associated with elevated diabetes risks. Future studies should further investigate the underlying mechanisms by which metals may influence diabetes.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 17
Setting Global Priorities in Environment, Climate and Health
Chairs: Manolis Kogevinas, Spain & Beate Ritz, US & Annette Peters, Germany / Discussion Moderator: Roel Vermeulen, Netherlands

Introduction to the symposium and presentation of the European Union HERA project on research priorities

Presenter: Manolis Kogevinas, Barcelona Institute for Global Health, ISGlobal, Barcelona, Spain

Authors:

Background: Environmental degradation and pollution, climate change and disruption of ecosystems services damage health and quality of life, and differentially affect socially disadvantaged and vulnerable population groups. The HERA project, funded by the EU Horizon2020 research framework programme, set priorities for an environment and health research agenda in the EU for 2020-2030, closely connected to policy needs.
Methods. HERA consists of 24 partners from environment, climate and health centres. Following a review of evidence and policies, a methodology was devised to identify and consult scientific communities and relevant stakeholder groups (policy makers, local authorities, NGOs, industry and others) across Europe to identify the knowledge gaps in environment, climate and health research. Web-based surveys were carried out along with online and face-to-face consultation meetings.
Results. Research priorities relate to environmental exposures, sector-based and holistic approaches, methodologies and infrastructures, and higher-level transformational research. The consultation resulted in 6 main Research Goals and within each goal specific objectives: (i) Reduce the effects of climate change and ecological degradation on health; (ii) Eliminate environmental exposures harmful to health; (iii) Promote healthy lives in sustainable and inclusive societies; (iv) Improve health impact assessment of environmental factors and promote intervention research; (v) Develop infrastructures, technologies and human resources for sustainable research on environmental and health; (vi) Support transformational change approaches in environment and health research. A separate section refers to research priorities in relation to Covid-19 and the environment. Research goals are closely linked to several SDGS.
Conclusion. This large systematic initiative involved hundreds of researchers and stakeholders to set priorities for environmental health research for policies in Europe. The inclusion of both researchers and community stakeholders significantly enriched the procedure. Methodologies for defining priorities need to be further developed. Further work will adapt the report to capture research needs at a global scale.
Keywords:
Research Needs, Environment, Climate Change, Europe, Planetary Health, COVID-19

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 17
Setting Global Priorities in Environment, Climate and Health
Chairs: Manolis Kogevinas, Spain & Beate Ritz, US & Annette Peters, Germany / Discussion Moderator: Roel Vermeulen, Netherlands

Setting the European environment and health research agenda - Research gaps

Presenter: Anke Huss, Utrecht University, Utrecht, Netherlands

Authors: A. Huss[1], F. Matthies-Wiesler[2], R. Vermeulen[1], A. Peters[2];
[1]Utrecht University, Utrecht, NETHERLANDS, [2]Helmholtz Zentrum, München, GERMANY.

Background: Aim of the HERA project is to set priorities for the European environment and health research agenda. A survey was developed to assess research gaps from the perspective of the scientific community. Methods: Research gaps were elicited for 21 predefined areas: classical environment and health paradigm (e.g. chemical, physical exposures and health); problem or sector based approaches (e.g. urbanisation, occupational changes) and holistic approaches (e.g. one health, planetary health). Nearly 500 researchers/organisations across Europe were invited to fill in the survey and were asked to snowball it to others in the field. Reported research gaps were evaluated by expert groups with criteria pertaining to novelty, importance to people, importance to the environment, impact (on policies and practices) and potential to promote innovation within the sustainable development goals. The expert groups then developed summaries per area adding gaps in the gaps. Results: Between May-July 2019, 318 respondents from 38 countries reported 624 research gaps. The number of reported gaps differed widely per area: over 100 were reported for chemical and urban exposures and health each, while others like biodiversity loss and health or energy transition and health only had 1-2 reported gaps. Subsequent evaluations showed a large variation in scorings of relevance criteria. Conclusions: Strong representation of some research gaps likely reflects the number of scientists engaged in the respective area rather than the relevance of a specific topic. The survey also highlighted gaps in the gaps as well as areas for which hardly any research was proposed. Evaluation of individual gaps turned out to be challenging in part reflecting individual normative values. The HERA project developed an interim report that brings together identified research gaps and knowledge needs reported from stakeholders. In a next step, results will be prioritised for a future environment and health research agenda in Europe.

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 17
Setting Global Priorities in Environment, Climate and Health
Chairs: Manolis Kogevinas, Spain & Beate Ritz, US & Annette Peters, Germany / Discussion Moderator: Roel Vermeulen, Netherlands

Setting the European environment and health research agenda – Research gaps

Presenter: Annette Peters, Munich, Germany

Authors: Anke Huss, Universiteit Utrecht, Utrecht, Netherlands
Franziska Matthies-Wiesler, Helmholtz Zentrum, Munich, Germany
Roel Vemeulen, Universiteit Utrecht, Utrecht, Netherlands
Annette Peters, Helmholtz Zentrum, Munich, Germany

Background: Aim of the HERA project is to set priorities for the European environment and health research agenda. A survey was developed to assess research gaps from the perspective of the scientific community.
Methods: Research gaps were elicited for 21 predefined areas: classical environment and health paradigm (e.g. chemical, physical exposures and health); problem or sector based approaches (e.g. urbanisation, occupational changes) and holistic approaches (e.g. one health, planetary health). Nearly 500 researchers/organisations across Europe were invited to fill in the survey and were asked to snowball it to others in the field. Reported research gaps were evaluated by expert groups with criteria pertaining to novelty, importance to people, importance to the environment, impact (on policies and practices) and potential to promote innovation within the sustainable development goals. The expert groups then developed summaries per area adding gaps in the gaps.
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Conclusions: Strong representation of some research gaps likely reflects the number of scientists engaged in the respective area rather than the relevance of a specific topic. The survey also highlighted gaps in the gaps as well as areas for which hardly any research was proposed. Evaluation of individual gaps turned out to be challenging in part reflecting individual normative values. The HERA project developed an interim report that brings together identified research gaps and knowledge needs reported from stakeholders. In a next step, results will be prioritised for a future environment and health research agenda in Europe.
Keywords:
Research Needs, Environment, Climate Change, Europe, Planetary Health

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ABSTRACT E-BOOK

August 26, 2020 / 12:00 - 13:30 / Parallel 4
SYMPOSIUM 17
Setting Global Priorities in Environment, Climate and Health
Chairs: Manolis Kogevinas, Spain & Beate Ritz, US & Annette Peters, Germany / Discussion Moderator: Roel Vermeulen, Netherlands

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Improving and Expanding Estimates of the Global Burden of Disease Due to Environmental Health Risk Factors

Presenter: Rachel Shaffer, UW Seattle, Seattle, United States

Authors: Rachel Shaffer, University of Washington, Seattle Seattle, WA, USA

The Global Burden of Disease (GBD) study, coordinated by the Institute for Health Metrics and Evaluation (IHME), produces influential, data-driven estimates of the burden of disease and premature death due to major risk factors. Expanded quantification of disease due to environmental health (EH) risk factors, including climate change, will enhance accuracy of GBD estimates, which will contribute to developing cost-effective policies that promote prevention and achieving Sustainable Development Goals.
We review key aspects of the GBD and introduce the Global Burden of Disease–Pollution and Health Initiative (GBD-PHI), which aims to work with IHME and the GBD study to improve estimates of disease burden attributable to EH risk factors and to develop an innovative approach to estimating climate-related disease burden—both current and projected.
We discuss strategies for improving GBD quantification of specific EH risk factors, including air pollution, lead, and climate change. We highlight key methodological challenges, including new EH risk factors, notably evidence rating and global exposure assessment.
A number of issues present challenges to the scope and accuracy of current GBD estimates for EH risk factors. For air pollution, minimal data exist on the exposure–risk relationships associated with high levels of pollution; epidemiological studies in high pollution regions should be a research priority. For lead, the GBD's current methods do not fully account for lead's impact on neurodevelopment; innovative methods to account for subclinical effects are needed. Decisions on inclusion of additional EH risk–outcome pairs need to be guided by findings of systematic reviews, the size of exposed populations, feasibility of global exposure estimates, and predicted trends in exposures and diseases. Neurotoxicants, endocrine-disrupting chemicals, and climate-related factors should be high priorities for incorporation into upcoming iterations of the GBD study. Enhancing the scope and methods will improve the GBD's estimates and better guide prevention policy.

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ABSTRACT E-BOOK

August 26, 2020 / 17:00 - 18:30 / Parallel 1
SYMPOSIUM 18
New Frontiers in Biomarkers of Environmental Exposures for Reproductive and Perinatal Epidemiologic Research
Chairs: Keewan Kim, US & Alexandra Purdue-Smithe, US

Placental epigenetic clocks: relations with in-utero exposures, ancestry, and fetal growth

Presenter: Fasil Tekola-Ayele, NICHD, Bethesda, United States

Authors: F. Tekola-Ayele;
NICHD, Bethesda, MD.

Placental aging is a normal physiologic phenomenon during pregnancy. However, premature aging of the placenta can lead to decreased functional capacity of the placenta and obstetric complications including preeclampsia, pre-term birth, still birth and fetal growth restriction. Routine methods used in aging studies such as histopathological examination of the placenta and telomerase homeostasis markers may not detect aging alterations that are subtle and caused by senescence-independent DNA damage. The field of biological aging has recently been revolutionized by molecular methods that estimate the “biological clock” of a tissue with high accuracy using DNA methylation markers. This talk will introduce ongoing work based on the concept of epigenetic age acceleration in placenta, demonstrating its relationship with genetic ancestry, maternal cardiometabolic risk factors, and in-utero exposures. In addition, data will be presented illustrating the potential that epigenetic aging of the placenta may be one of the mechanisms underlying sexually-biased fetal growth responses to adverse exposures. Lastly, the talk will outline potential research directions for facilitating the utility of placental epigenetic clocks for gaining novel insights on placental origins of pregnancy outcomes and childhood diseases, and for the discovery of biomarkers as indicators of high-risk pregnancy.

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ABSTRACT E-BOOK

August 26, 2020 / 17:00 - 18:30 / Parallel 1
SYMPOSIUM 18
New Frontiers in Biomarkers of Environmental Exposures for Reproductive and Perinatal Epidemiologic Research
Chairs: Keewan Kim, US & Alexandra Purdue-Smithe, US

Preconception telomere length and pregnancy outcomes: a new marker of reproductive aging?

Presenter: Alexandra Purdue-Smithe, NICHD, Bethesda, United States

Authors: A. Purdue-Smithe, K. Kim, L. Sjaarda, N. Perkins, E. Schisterman, R. Silver, S. Mumford; NICHD, Bethesda, MD.

Background: Telomere length is influenced by a variety of endogenous and exogenous factors, including environmental chemicals, inflammation, and oxidative stress, and is therefore considered a marker of cumulative cellular aging or biologic age. Longer telomere length has been associated with higher levels of circulating reproductive hormones, greater parity, and reduced risk of polycystic ovary syndrome, suggesting a role of telomere length in human reproduction. However, the relationship between telomere length, as a marker of biologic age, and fecundability and fertility is unknown. Methods: We evaluated associations of preconception leukocyte telomere length with fecundability, live birth, and pregnancy loss among 1,228 participants of the EAGeR trial, which included women aged 18-40 years who were attempting to conceive. Preconception leukocyte telomere length was measured at baseline using polymerase chain reaction and reported as a ratio (T/S) in relation to population-specific standard reference DNA. The T/S ratio for each participant was then converted to base-pairs using the following formula: Base-pairs = 3274 + 2413(T/S ratio). We estimated associations of telomere length with fecundability, live birth, and pregnancy loss using Cox proportional hazards models and log-binomial models adjusted for age, body mass index, smoking, and other factors. Results: In both unadjusted and adjusted models, preconception telomere length was not associated with fecundability (adjusted fecundability odds ratio (FOR) per 1,000 base-pairs = 1.03; 95% CI = 0.85, 1.26), live birth (adjusted relative risk (RR) per 1,000 base-pairs = 1.13; 95% CI = 0.80, 1.60), or pregnancy loss (adjusted RR per 1,000 base-pairs = 1.14; 95% CI = 0.81, 1.60). Conclusions: These findings suggest that leukocyte telomere length, as a marker of biologic age, is not importantly related to fecundability or fertility among healthy reproductive-age women.

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ABSTRACT E-BOOK

August 26, 2020 / 17:00 - 18:30 / Parallel 1
SYMPOSIUM 18
New Frontiers in Biomarkers of Environmental Exposures for Reproductive and Perinatal Epidemiologic Research
Chairs: Keewan Kim, US & Alexandra Purdue-Smithe, US

Ovarian follicular fluid: an innovative approach to assess internal dose for reproductive epidemiology

Presenter: Michael S. Bloom, University at Albany, SUNY, Rensselaer, United States

Authors: M. S. Bloom[1], C. D. Butts[1], A. McGough[2], N. Lenhart[2], R. Wong[2], E. Mok-Lin[2], P. J. Parsons[3], A. L. Galusha[3], R. M. Yucel[1], R. W. Browne[4], V. Y. Fujimoto[2];
[1]University at Albany, SUNY, Rensselaer, NY, [2]University of California, San Francisco, San Francisco, CA, [3]Wadsworth Center, New York State Department of Health, Albany, NY, [4]University at Buffalo, SUNY, Buffalo, NY.

Ovarian follicular fluid serves as a biological window revealing metabolic processes in the microenvironment of a maturing oocyte, and so may offer a more accurate biomarker of biologically effective dose than more traditional compartments, such as blood and urine. Investigators have measured myriad environmental pollutants in ovarian follicular fluid (FF), including toxic trace elements. As a plasma ultrafiltrate, FF content reflects both blood concentrations and in situ physiology. Evidence suggests substantial follicle-to-follicle variability in the concentrations of some analytes, necessitating a “one follicle-one oocyte” approach for investigating associations between exposure and reproductive endpoints. We collected individual FF specimens from up to four follicles, two from each ovary, among 56 women undergoing in vitro fertilization (IVF) with fresh embryo transfer. We determined toxic trace element concentrations using inductively coupled plasma with tandem mass spectrometry (ICP-MS/MS) and linked individual oocytes and embryos to the corresponding FF specimen. We used linear mixed regression models to evaluate associations between natural log transformed FF As, Cd, Pb, and Hg as predictors of IVF outcomes, adjusted for other toxic trace elements, age, race, smoking, and seafood consumption. Median FF As (0.34 µg/L), Cd (27.3 ng/L), Pb (0.06 µg/L), and Hg (0.34 µg/L) concentrations were similar to or lower than those reported previously. Greater FF Cd was associated with a lower probability for a symmetric embryo per 1 ng/L (RR=0.36, 95%CI: 0.17-0.76). Greater FF Pb (1 µg/L) was associated with lower probabilities for a fertilized oocyte per 1 µg/L (RR=0.56, 95%CI=0.25-1.24), although the association was non-linear, and with live birth per 1 µg/L (RR=0.72, 95%CI: 0.53-0.99). Greater Hg was associated with a lower probability of implantation per 1 µg/L (RR=0.31, 95%CI: 0.09-1.06), although the association was non-linear. Our results suggest that FF toxic trace elements may affect IVF outcomes, including live birth, even at comparatively low doses.

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ABSTRACT E-BOOK

August 26, 2020 / 17:00 - 18:30 / Parallel 1
SYMPOSIUM 18
New Frontiers in Biomarkers of Environmental Exposures for Reproductive and Perinatal Epidemiologic Research
Chairs: Keewan Kim, US & Alexandra Purdue-Smithe, US

Associations of breast milk extracellular vesicle microRNAs with perfluoroalkyl substances in a mother-infant cohort from the Faroe Islands

Presenter: Allison Kupsco, Columbia University Mailman School of Public Health, New York, United States

Authors: A. Kupsco[1], D. Prada[1], D. Valvi[2], L. Hu[1], M. Skaalum Petersen[3], B. Coull[4], P. Grandjean[4], P. Weihe[3], A. A. Baccarelli[1];
[1]Columbia University Mailman School of Public Health, New York, NY, [2]Icahn School of Medicine at Mount Sinai, New York, NY, [3]University of the Faroe Islands and Department of Occupational Medicine and Public Health, The Faroese Hospital System, Tórshavn, FAROE ISLANDS, [4]Harvard T.H. Chan School of Public Health, Boston, MA.

Background/Aims: Early life exposures to perfluoroalkyl substances (PFASs) can adversely impact child health. Breast milk (BM) contains extracellular vesicles (EVs) that can transport biologically relevant cargo from mother to infant, including microRNAs (miRNAs), and may mediate in part the effect of PFAS on child health outcomes. However, the effect of PFASs on miRNA expression in BMEVS is unexplored. We therefore examined the associations between prenatal PFAS exposures and BMEV miRNA expression. Methods: We isolated EV RNA from 347 BM samples collected at two weeks post anticipated term from a Faroese birth cohort born in 1997-2000, and sequenced 2,083 miRNAs with the HTG Molecular Whole miRNA Transcriptome Assay. Major PFASs (perfluorooctanesulfonic acid [PFOS], perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, and perfluorohexanesulfonate) were measured in maternal serum at 34 weeks gestation with HPLC-MS. We ran robust negative binomial regression models to estimate associations between individual PFASs and 420 reliably expressed miRNAs. We examined effect modification by maternal pre-pregnancy overweight (i.e. a body mass index [BMI] ≥ 25 kg/m^2). Models were adjusted for maternal education, age, parity, smoking during pregnancy and technical batch. Results: We identified no associations between PFASs and miRNA expression after correction for false discovery rate (FDR), however, we observed nominal associations between PFASs and 92 different miRNAs, 18 of which were associated with multiple PFASs. We observed effect modification by maternal overweight on associations between PFOS and 10 miRNAs (miR-1225-5p, miR-324-5p, miR-4534, miR-6126, miR-658, miR-6771-5p, miR-6780b-5p, miR-6800-5p, miR-6845-5p, and miR-6851-5p) (FDR <0.20). Nine of 10 miRNAs were inversely associated with PFOS in mothers with normal BMI and positively associated with PFOS in overweight mothers. Conclusions: Our findings underscore the utility of BMEV-miRNAs as promising environmental biomarkers, particularly in subpopulations of overweight individuals. Future studies are needed to elucidate the role of BMEV-miRNAs in child health following pollutant exposure.

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ABSTRACT E-BOOK

August 26, 2020 / 17:00 - 18:30 / Parallel 1
SYMPOSIUM 18
New Frontiers in Biomarkers of Environmental Exposures for Reproductive and Perinatal Epidemiologic Research
Chairs: Keewan Kim, US & Alexandra Purdue-Smithe, US

What a drop can do? Measurements using newborn dried blood spots in child health research.

Presenter: Akhgar Ghassabian, New York University School of Medicine, New York, United States

Authors: A. Ghassabian;
New York University School of Medicine, New York, NY.

Collaborative efforts such as the Environmental influences of Child Health Outcomes (ECHO) program in the United States have provided a tremendous opportunity to address important questions on environmental determinants of growth and development in children. Nonetheless, a majority of pediatric cohorts recruit children and their families after birth, which would limit their access to maternal or neonatal biospecimens for evaluation of perinatal exposures. Newborn screening programs have revolutionized early diagnosis of childhood diseases worldwide by using dried blood spots (DBS) obtained shortly after birth. Residual DBS are commonly archived for a variable period of time and can be used to measure biomarkers of exposures to environmental factors. We share our experience from two pediatric cohorts in New York State (NYS), which used archived newborn DBS to measure an arrays of organic contaminants, immune markers, and other proteins. The Upstate KIDS cohort (recruitment: 2008-2010, NYS) and the Starting Early Program (StEP) randomized controlled trial (recruitment: 2012-2014, New York City) obtained consent from parents to access their newborns' archived DBS for secondary analysis of chemicals and biomarkers for research purposes. Both studies reported good-to-excellent consent rates among those contacted, confirming the feasibility of this resource for population-based research. We reliably quantified concentrations of organic contaminants (i.e., organochlorine pesticides, polybrominated diphenyl ethers, and perfluoroalkyl substances), immune markers (i.e., cytokines and chemokines), and other proteins (brain-derived neurotrophic factor and adipokines) in archived DBS. We reported associations with indicators of growth and development in children. Findings regarding neonatal concentrations of perfluoroalkyl substances varied between cohorts despite identical methodology of measurement, partly explained by differences in levels of exposure and sociodemographic characteristic of participants.Archived DBS can be a valuable resource in population-based studies and in low resource settings to address important questions on the diversity of environmental exposure and their implications for child health.

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ABSTRACT E-BOOK

August 26, 2020 / 17:00 - 18:00 / Parallel 2
EMS 3
Assessing Exposure to Tropical Cyclones for Epidemiological Research: Existing Resources and Future Needs
Chair: Brooke Anderson, US

Assessing exposure to tropical cyclones for epidemiological research: Existing resources and future needs

Presenter: Brooke Anderson, Colorado State University, Fort Collins, United States

Authors:

Tropical cyclones can cause severe health impacts in US communities, and recent storms like Hurricanes Maria, Harvey, and Sandy have demonstrated the potential for health impacts from a wide variety of causes. While there is growing interest among environmental epidemiologists in studying health risks associated with these storms, exposure assessment is complicated. Tropical cyclones combine multiple hazards, including severe winds, heavy rain, storm surge, and flooding. Further, while extensive data are collected on tropical cyclones, they are often not in a format optimal for integrating with human health datasets.
This workshop will begin with a short presentation outlining several key approaches used in previous epidemiological research for tropical cyclone exposure assessment. The workshop will continue with a roundtable discussion among participants that will outline the successes, limitations, and challenges in exposure assessment that they are facing in ongoing research projects on tropical cyclone epidemiology. To complement this discussion, the workshop will include remote participants from other fields (engineering, economics, atmospheric science) studying tropical cyclones and their human impacts. The main goal of this workshop will be to generate a prioritized list of key needs for tropical cyclone exposure assessment methods and data for future epidemiological research and to connect environmental epidemiologists who are currently conducting research on tropical cyclones.

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 1
SYMPOSIUM 19
How the Changing Climate Affects the Health of Children Worldwide
Chair: Nsedu Obot Witherspoon, US

Flooding and Child Health

Presenter: Perry Sheffield, Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, United States

Authors:

The changing climate brings rising sea level, greater extremes of precipitation, more high-intensity storms and associated storm surge – all of which translate to increased risk of flooding for coastal and low lying communities. Children are at risk from both direct injury and indirect consequences of exposures related to flooding that are associated with increased risk of infectious diseases, allergy and immunologic effects, as well as neurocognitive and mental health impacts. This presentation will discuss the projections of flooding risk for children in the U.S. states and territories; our understanding of health risks posed by flooding for children and their families; resources specific to post-disaster activities to mitigate harm; and collaborative research opportunities between entities such as the Pediatric Environmental Health Specialty Unit network and Children's Environmental Health Network.

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 1
SYMPOSIUM 19
How the Changing Climate Affects the Health of Children Worldwide
Chair: Nsedu Obot Witherspoon, US

Health Disparities in Children for ISEE August 2020

Presenter: Leslie Rubin, Morehouse School of Medicine
Department of Pediatrics, Emory University School of Medicine
Southeast Pediatric Environmental Health Specialty Unit, Emory University School of Medicine
Break the Cycle of Health Disparities, Inc.
The Rubin Center for Autism, Atlanta, United States

Authors:

Children who grow up in an environment of social and economic disadvantage are at greater risk for exposure to toxins like lead, air pollution and other chemicals. They are also impacted by the age and quality of the houses and neighborhoods in which they live, as well as the schools they attend, the often degraded infrastructure of the communities in which they live, with the risks of violence that they may experience, and the associated emotional stress that they face on a day to day basis. The vulnerability of these children is therefore greater not only by virtue of their increased risks for exposure, but further magnified by limitations in support for optimal education, access to quality health care, infrastructure, risks of adverse childhood experiences and limited social capital. These factors predispose the children to adverse health outcomes, and, with the likelihood of cumulative risks, the impact manifests in significant health disparities.
This presentation will provide a framework for understanding the ecology of children's environmental health disparities and will offer strategies to reduce health disparities and promote health equity for all children.

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 1
SYMPOSIUM 19
How the Changing Climate Affects the Health of Children Worldwide
Chair: Nsedu Obot Witherspoon, US

Wildfires and Children's Environmental Health

Presenter: Mark Miller, Departments of Pediatrics and Internal Medicine (Division of Occupational and Environmental Health) at the University of California San Francisco (UCSF). Co-Director of the Western States Pediatric Environmental Health Specialty Unit (WSPEHSU). Director o, Chico, United States

Authors:

The combination of global warming and aging infrastructure is making wildfires one of the greatest threats to human health in recent years. Of California's ten most destructive wildfires ever recorded, seven have occurred in the last five years. In addition to the threat of mortality and the catastrophic effects of evacuations and loss of personal property, wildfire smoke can reach large populations of children at their homes, their schools and where they play. As such, there is increasing attention to how best to protect children from the effects of wildfire smoke. The Western States PEHSU, California EPA, US EPA and others have been working to bring together experts in this field to reach consensus on the messaging regarding wildfires and children's health. This presentation will briefly review the known health effects from wildfire smoke and touch on three main topics in regard to protecting children from wildfire smoke including; 1) the use of N95 respirators by children 2) current practices regarding school decision-making during wildfire and extreme air events 3) the state of guidance on when to adapt school activities and when to consider school closures. Environmental justice, equity, ethical issues will be considered.

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 26
Air Pollution Impacts in Susceptible Populations
Chairs: Michelle Bell, US & Antonella Zanobetti, US

Disparities in Premature Deaths Attributable to Fine Particulate Matter (PM2.5) Exposure between Immigrants to and those born in the United States

Presenter: Kelvin Fong, Yale University, New Haven, United States

Authors: K. C. Fong, M. L. Bell;
Yale University, New Haven, CT.

Background: Immigrants to the United States (US) experience different health risks compared to those born in the US. It is unknown if different levels of environmental exposures such as ambient fine particulate matter ($PM_{2.5}$) contribute to immigrant health disparities.
Methods: We compiled counts of immigrants (i.e., foreign-born) and US-born living in each Census tract in 2000 and 2010 from the Census Bureau. With ground-level ambient $PM_{2.5}$ exposure surfaces from a validated spatiotemporal model, we then calculated the average annual $PM_{2.5}$ exposure for the US-born, immigrants, and immigrant subgroups by country of origin. Among these population subgroups, we estimated disparities in $PM_{2.5}$ exposure and premature deaths attributable to $PM_{2.5}$ exposure.
Results: In 2000, the total number of immigrants living in the US was 30.86 million compared to 248.72 million US-born while in 2010, there were 38.39 million immigrants and 263.55 million US-born. On average, in 2000 immigrants were exposed to $PM_{2.5}$ levels 1.25 $\mu g/m^3$ higher than those of the US-born and 0.36 $\mu g/m^3$ higher $PM_{2.5}$ in 2010. The disparity of premature deaths attributable to $PM_{2.5}$ exposure in immigrants compared to the US-born was +7.06 (95% CI: 5.58, 8.56) deaths/100,000 people in 2000 and +1.71 (95% CI: 0.84, 2.58) deaths/100,000 people in 2010. We found heterogeneity spatially and by immigrants' country of origin, with higher premature deaths attributable to $PM_{2.5}$ among immigrants from Africa, Asia, and Latin America compared to immigrants from elsewhere.
Conclusions: Overall, immigrants were higher-exposed and thus more susceptible to premature mortality attributable to $PM_{2.5}$ compared to the US-born. This magnitude of the mortality disparity is greater than the number of premature deaths each year from a foodborne illness such as E.coli. Heterogeneity by country of origin suggests that environmental exposures such as $PM_{2.5}$ may contribute to health disparities among immigrants (i.e. by country of origin).

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 26
Air Pollution Impacts in Susceptible Populations
Chairs: Michelle Bell, US & Antonella Zanobetti, US

US Air Pollution Policy Changes Under the Trump Administration and Their Impact on Public Health Disparities

Presenter: Gretchen T. Goldman, Union of Concerned Scientists, WASHINGTON, United States

Authors: G. T. Goldman, G. Reed, J. M. Carter, A. Desikan, C. Kalman;
Union of Concerned Scientists, WASHINGTON, DC.

For decades, the US federal government has relied on science-based processes to set national air pollution policies to protect public health, from the ambient air quality standards to air toxics emissions control to clean vehicle standards. Because of the evolving and complex relationships between air pollutants and health outcomes, scientific advice has long played a crucial role in ensuring the best available scientific information informs policy decisions at the US Environmental Protection Agency (EPA). While these policy protections are insufficient to adequately address disparities by race and income in air pollution exposure, science-based policy processes play a crucial role in lifting the regulatory floor, driving innovation in control technology, and enhancing control implementation. Under the Trump administration, however, the EPA has experienced many proposed and implemented process changes that threaten to diminish the role of science and scientists in agency air quality decisions and weaken public health protections. These policy actions will exacerbate pollution exposure in communities already facing disproportionate cumulative air pollution exposure. This presentation will survey recent changes to air quality-related decisionmaking at the EPA, their expected impacts, and the response of the broader scientific community. Solutions will be proposed for strengthening the role of science in protecting public health from air pollution and reducing exposure disparities.

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 26
Air Pollution Impacts in Susceptible Populations
Chairs: Michelle Bell, US & Antonella Zanobetti, US

Health effects of short-term exposure to particulate matter in people with disabilities: at the intersection of disability, socioeconomic status, and co-morbid conditions

Presenter: Sera Kim, BK21PLUS Program in 'Embodiment: Health-Society Interaction', Department of Public Health Sciences, Graduate School, Korea University, Seoul, Korea, Republic of

Authors: S. Kim[1], H. Kim[2], G. Byun[1], Y. Choi[1], S. Kim[2], E. Eo[1], J. Lee[3];
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Background / AimPeople with disabilities are at greater risk of being deprived, engaging in health-risk behaviors, and having comorbidities than the non-disabled population, which may impose an additional burden of disease from air pollution. However, no studies have specifically explored the effects of ambient particulate matter in people with disabilities. This study aims to investigate the association between short-term exposure to PM and hospital admissions by the existence of a disability, disability types, socioeconomic status, and comorbidities.
MethodsThe study subject is from the Korean National Health Insurance Services –National Sample Cohort. We identified 17,839 hospital admissions for cardiovascular disease from the disabled population and 43,020 from the non-disabled population who resided in seven metropolitan cities from 2006 to 2013. A time-stratified case-crossover analysis using conditional logistic regression was used to investigate the association between PM10 and hospital admissions for CVD. The models were adjusted for daily temperature, relative humidity, and national holidays. We further explored effect modifications by the existence of a disability, disability types (physical, visual, hearing, intellectual disability/disability of brain lesion/mental disorder/kidney dysfunction), SES, and comorbidities.
ResultsThe association between 10ug/m3 increase in PM10 and CVD admissions was similar between people with any disability (1.1%, 95% Confidence Interval: 0.1%, 2.2%) and people without disability (0.9%, 95% CI: 0.2%, 1.6%). When stratifying by disability types, however, the effects of PM10 substantially differ among the disabled, from -3.1% (95% CI: -9.4%, 3.7%) in people with visual disability to 2.3% (95% CI: 0.5%, 4.3%) in people with physical disability. In addition, in the disabled population, the associations were stronger in people aged 19-64 years, with low SES, and with diabetes as comorbidity compared to their non-disabled counterparts.
ConclusionsSubgroups of people with disabilities may experience additional health disparities at the intersection of their specific disability, SES, and comorbidities.

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ABSTRACT E-BOOK

August 26, 2020 / 18:30 - 20:00 / Parallel 2
ORAL SESSION 26
Air Pollution Impacts in Susceptible Populations
Chairs: Michelle Bell, US & Antonella Zanobetti, US

Prenatal Exposure to Particulate Air Pollution and Gestational Age at delivery in Massachusetts Neonates 2001-2015 - a Perspective of Causal Modeling and Health Disparities

Presenter: Xinye Qiu, Harvard T.H. Chan School of Public Health, Boston, United States

Authors: X. Qiu[1], K. Fong[2], L. Shi[3], Q. Di[4], S. Papatheodorou[1], A. Kosheleva[1], C. Messerlian[1], J. Schwartz[1]; [1]Harvard T.H. Chan School of Public Health, Boston, MA, [2]School of Forestry & Environmental Studies, Yale University, New Haven, CT, [3]Rollins School of Public Health, Emory University, Atlanta, GA, [4]School of Medicine, Tsinghua University, Beijing, CHINA.

Background/Aim: Causal evidence of the effects of air pollution on gestational age (GA) at delivery is limited. We aim to estimate the effect of increased trimester-specific $PM_{2.5}$ levels in neonatal GA at delivery applying causal modeling and identify potential health disparities.
Methods: Study population was all Massachusetts live singleton neonates born with a vaginal delivery from 2001 to 2015. Trimester-specific ambient $PM_{2.5}$ levels at maternal residential address were estimated using a validated ensemble-based model integrating satellite remote sensing, land used data, and meteorology, etc. Outcome of interest was GA at delivery calculated using last menstrual period (LMP). Inverse probability weighted (IPW) quantile regression was applied to derive the causal marginal population-level effect estimates for each GA distribution percentile. Stratified analyses were conducted comparing male vs. female neonates, neonates of younger vs. older mothers, and neonates of African American vs. Caucasian mothers. Low-exposure analyses were conducted by restricting analyses to areas with levels of $PM_{2.5}$ that met US EPA annual standard of less than 12 $\mu g/m^3$.
Results: For neonates with 0.025, 0.05, 0.10, 0.25, 0.50, 0.75 and 0.975 percentiles of GA at delivery, we estimated adjusted GA reductions of 4.21 days (d) (SE: 0.40), 2.76 d (SE: 0.25), 1.85 d (SE: 0.15), 1.19 d (SE: 0.10), 0.82 d (SE: 0.05), 0.74 d (SE: 0.10) and 0.54 d (SE: 0.20) respectively for each 5 $\mu g/m^3$ increase of average $PM_{2.5}$ level in the third trimester. Male neonates and neonates of younger and African American mothers were more vulnerable. Effect estimates were consistently higher at lower percentiles, indicating larger effects for preterm and early-term births. Low-exposure analyses yielded similar results.
Conclusions: Prenatal exposure to $PM_{2.5}$ during third-trimester, even below regulatory standard, reduced GA at delivery among Massachusetts neonates, especially among preterm/early-term births, male neonates, and neonates of younger and African American mothers.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 1
KEYNOTE SESSION 4

The Exposome and Child Health – What Have We Learned?

Keynote Speaker: Martine Vrijheid, Barcelona Institute for Global Health, ISGlobal, Childhood & Environment, Barcelona, Spain

The exposome (totality of environmental exposures over a lifetime) has been proposed as a framework to advance our understanding of the environmental component in disease etiology, which has so far mostly been tackled through one-exposure-one-disease approaches. The early life period is vulnerable to environmental hazards and important for lifelong disease prevention, making it a relevant starting point for exposome studies. First exposome-wide discovery approaches have pioneered the simultaneous assessment of associations between many environmental risk factors and child health outcomes. They have made progress in understanding how multiple exposures in early life correlate and vary geographically and temporally, which social and dietary factors determine parts of the early-life exposome, how we may explore associations between multiple exposures and child health, and how we may agnostically search for early perturbation in the biological pathways leading to disease. In this keynote we will review these achievements and discuss the challenges highlighted by the first early-life exposome studies, including temporal exposure variability, differential measurement errors (i.e. different errors for different exposures), mixture effects, cross-sectional designs, false-positive and false-negative findings, statistical power, and absence of causal structure in untargeted analyses. Future perspectives will be discussed.

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"ISEE John Goldsmith Award Lecture"
Global Drinking Water: Infections, Chemicals or Nothing

Keynote Speaker: Manolis Kogevinas, Barcelona Institute for Global Health, ISGlobal, Barcelona, 08003, Spain

Three in 10 of the world's population lack safe drinking water. This is a shockingly high number of persons in a world that has enough resources to secure clean water for everyone. Although water disinfection is a public health triumph, infectious agents are still an important public health challenge in many parts of the world. In addition, water scarcity and chemical pollution are emerging major global issues. Technological solutions to water scarcity exist in high-income countries, but are not available everywhere. In particular, Northern Africa and Western Asia are areas at high risk of water scarcity. With a few exceptions, global exposure to chemicals in water has been poorly examined and appears to be increasing. There is a multitude of potentially toxic chemicals present in drinking water such as industrial pollutants and disinfection by-products that have not been adequately investigated. I will provide an overview on global drinking water and health and also discuss the difficulties in epidemiological research in this area, including the fact that many of these exposures are experienced at protracted low-levels, and often occur as mixtures. New "exposome" studies may provide solutions to some of these issues. I will finally refer to public health interventions in countries at different stages of economic development.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 27
Role of Environmental Toxins on Obesity and Cardiometabolic Diseases
Chairs: Sudha Ramalingam, India & Pi-I Debby Lin, US

Association between Blood Lead Levels and Metabolic Syndrome Considering the Effect of Thyroid Stimulating Hormones based on the 2013 Korea National Health and Nutrition Examination Survey: Does the Thyroid Stimulating Hormone Act as an Intermediate Facto

Presenter: Ji Yoon Choi, Department of Health and Safety Convergence Science, Korea University, Seoul, Korea, Republic of

Authors: J. Choi[1], D. Huh[2], J. Lee[1], K. Moon[1];
[1]Department of Health and Safety Convergence Science, Korea University, Seoul, KOREA, REPUBLIC OF,
[2]Department of Health Science, Korea University, Seoul, KOREA, REPUBLIC OF.

Background Thyroid stimulating hormones (TSH) are associated with metabolic syndrome (MetS) and share a common pathway with lead in the causation of MetS. Many studies have reported the association of lead exposure and MetS but no study considered the possibility of TSHs working as an intermediate factor in between those two variables. In this study, we examined the role of TSHs as a partial mediator between lead and MetS. Methods A sample of 1,688 adults (≥19 years of age) who participated in the Korea National Health and Nutrition Examination Survey in 2013 was analysed. After adjusting for various demographic and clinical parameters thought of as confounders, the associations between blood lead levels, serum TSH levels and MetS were determined by odds ratios (ORs) obtained from multiple logistic regression models. Results In this study, the prevalence of MetS in the Korean population was 21.9% and the geometric mean of blood lead and serum TSH levels were 1.96 μg/dL and 2.17 μIU/mL respectively. Blood lead was positively associated with high TSH levels (upper 25%) with an OR (95% Confidence Interval (CI)) of 1.79 (1.24, 2.58) per doubling of lead. The increase of blood lead and serum TSH levels both positively increased the odds for the prevalence of MetS. The OR of MetS per doubling of blood lead was 1.53 (1.00, 2.35) and further adjustment for TSHs did not significantly attenuate the OR [1.52 (0.98, 2.34)]. Conclusions These findings suggest that higher levels of blood lead are associated with elevated serum TSH levels and higher risks of MetS. Moreover, by exploring the role of TSH as a partial mediator in the association between lead and MetS, we verified that TSH does not mediate the effect of lead on MetS, therefore confirming that lead has an independent effect on causing MetS.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 27
Role of Environmental Toxins on Obesity and Cardiometabolic Diseases
Chairs: Sudha Ramalingam, India & Pi-I Debby Lin, US

Effect of prenatal bisphenol A exposure on child obesity through epigenetic influence on the insulin-like growth factor 2 receptor(IGF2R)gene

Presenter: Yoon-Jung Choi, Department of Preventive Medicine, Seoul National University College of Medicine, Seoul, Korea, Republic of

Authors: Y. Choi[1], Y. Lee[2], Y. Hong[1], J. Cho[3], K. Lee[1], C. Shin[2], B. Kim[4], J. I. Kim[5], S. Park[6], H. Bisgaard[7], K. Bønnelykke[7], Y. Lim[8];
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BACKGROUND: Epigenetic mechanisms have been suggested to play a role in the link between in utero exposure to bisphenol A (BPA) and pediatric obesity; however, there is little evidence regarding this in humans. OBJECTIVES: We identified differentially methylated CpG sites among 594-targeted obesity-related CpG sites (reported from previous epigenome-wide association studies) in children aged 2 and 6 years, depending on prenatal BPA exposure at second trimester. We then evaluated the relationship between the CpG methylation status and body mass index (BMI) in a prospective children's cohort at ages 2, 4, 6, and 8 years. METHODS: Longitudinal blood samples of 59 children, aged 2 and 6 years, from the Environment and Development in Children cohort were used for methylation analysis using the Infinium Human Methylation BeadChip 450K, and compared between low and high prenatal BPA exposure groups based on the 80th percentile of maternal BPA levels. RESULTS: The unimodal CpG site, cg19196862(IGF2R), and bimodal CpG sites, cg09196346 and cg27596172, at the age of 2 years were significantly different depending on prenatal BPA exposure. There was significant increase in the methylation levels of cg19196862(IGF2R) in the high BPA group at age 2 years ($p = 0.00030$, false discovery rate corrected $p < 0.05$) but not at 6 years. With one standard deviation increase of methylation at cg19196862(IGF2R) at age 2 years, the BMI Z-score at ages 2, 4, 6, and 8 years increased significantly by 0.25 (95% confidence interval (CI); 0.05, 0.46), 0.240 (95% CI; 0.03, 0.45), 0.23 (95% CI; 0.02, 0.44), and 0.31 (95% CI; 0.02, 0.60), respectively. When stratified by sex, this positive association was significant in girls, but not in boys. CONCLUSION: Prenatal exposure to BPA may influence differential methylation of IGF2R at age 2 years, which could persistently affect the BMI Z-scores in early childhood.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 27
Role of Environmental Toxins on Obesity and Cardiometabolic Diseases
Chairs: Sudha Ramalingam, India & Pi-I Debby Lin, US

Short- and long-term effects of ambient $PM_{2.5}$ exposure on hypertension and diabetes in an Indian cardiometabolic surveillance cohort over seven years.

Presenter: Siddhartha Mandal, Centre for Chronic Disease Control, New Delhi, India

Authors: D. Prabhakaran[1], S. Mandal[1], B. Krishna[2], M. Magsumbol[3], S. Jaganathan[1], D. Kondal[1], N. Tandon[4], K. Reddy[3], J. D. Schwartz[5], K. Narayan[6];
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Aim: High levels of ambient air pollution has been implicated as a major risk factor for morbidities and premature mortality in India. In this work, we assessed the effects of long- and short-term exposures to ambient PM2.5 on several cardiovascular and cardiometabolic markers as well as incident hypertension and diabetes in an Indian cardiometabolic surveillance cohort.
Methods: We analyzed the association between long- and short-term $PM_{2.5}$ averages and longitudinally measured blood pressure (systolic and diastolic), fasting plasma glucose (fpg) and HbA1c in 5342 participants from urban Delhi, India. In addition, we analyzed the association of long term exposures with incident hypertension in the cohort over a followup period of seven years.
Results: Median annual exposure to $PM_{2.5}$ ranged from 92.1 $\mu g/m^3$ (Interquartile range, IQR: 87.6, 95.7) at baseline to 121.74 $\mu g/m^3$ (IQR: 117.90, 124.90) at the last follow-up. We observed a higher average SBP (1.92 mmHg (95% CI: 1.06, 2.77) and 2.98 mmHg (95% CI: 0.75, 5.21)) per IQR differences in monthly and annual exposures, respectively, after adjusting for confounders. Additionally, IQR differences in long term exposures of 1 year, 1.5 years and 2 years increased the risk of incident hypertension by 1.53 times (95% CI: 1.19, 1.96), 1.59 times (95% CI: 1.31, 1.92) and 1.16 times (95% CI: 0.95, 1.43), respectively. Observed effects were larger in individuals with high waist-hip ratio compared to individuals with lower waist-hip ratios. Further, IQR increases in monthly average and annual average $PM_{2.5}$ concentrations were associated with 0.39 mg/dL and 1.1 mg/dL increase in fpg respectively while HbA1c levels in the same participants indicate significant associations with three monthly and annual average exposure with increases of 0.02% and 0.05% respectively.
Conclusion: These findings from Delhi indicate potential multi-pronged chronic effects of PM2.5 exposures in the India at the higher spectrums of exposure.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 27
Role of Environmental Toxins on Obesity and Cardiometabolic Diseases
Chairs: Sudha Ramalingam, India & Pi-I Debby Lin, US

Does habitual physical activity exacerbate air pollution risk on the development of diabetes: a longitudinal cohort study

Presenter: Hsiao Ting Yang, JC School of Public Health and Primary Care, Faculty of Medicine, the Chinese University of Hong Kong, Hong Kong, China

Authors: H. Yang[1], C. Guo[1], G. Hoek[2], X. Lao[1];
[1]JC School of Public Health and Primary Care, Faculty of Medicine, the Chinese University of Hong Kong, Hong Kong, CHINA, [2]Institute for Risk Assessment Sciences, Utrecht University, Utrecht, NETHERLANDS.

BackgroundHabitual physical activity (PA) is recommended as a preventive measure against the development of Type 2 diabetes (T2DM). However, the intake of air pollutants may increase during exercise, which may result in an increased risk of T2DM development. We therefore investigated the combined effects of long-term exposure to PM2.5 and habitual PA on incidence of T2DM. MethodsWe selected 156,314 adults (≥18 years old) without T2DM at baseline from a large Taiwanese cohort between 2001 and 2016. All the participants received a series of medical examinations and were followed up at least 2 years. T2DM incident was defined as having either a fasting plasma glucose level ≥7 mmol/l or a self-reported physician diagnosis. The 2-year PM2.5 ground concentration was estimated by a spatial-temporal model. Time-varying Cox regression was applied to analyze the relationship among exposure to PM2.5, habitual PA and incidence of T2DM adjusting for a wide range of covariates. ResultsEach 10 μg/m^3 increase in $PM_{2.5}$ was associated with an increased risk of 124% in T2DM development [hazard ratio (HR) (95% confidence interval (CI)): 2.24 (2.06-2.44)], while each increase in habitual PA by 10 metabolic equivalence values-hour (MET-h) was associated with a decreased risk of 9% in T2DM development [HR (95%CI): 0.91 (0.89-0.93)]. There was no significant interaction effect of PM2.5 and habitual PA on T2DM development [HR (95%CI): 0.98 (0.95-1.01)]. PA benefits remain stable in each tertile of PM2.5 (i.e. each 10 MET-h increase in PA was associated with a decrease risk of 3%, 15% and 5% in T2DM development among the participants with exposure to the 1st, 2nd and 3rd tertiles of PM2.5, respectively). ConclusionHabitual PA and long-term exposure to PM2.5 affected T2DM development independently. Habitual PA is still recommended for T2DM prevention even for people who reside in relatively air-polluted regions.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 2
ORAL SESSION 27
Role of Environmental Toxins on Obesity and Cardiometabolic Diseases
Chairs: Sudha Ramalingam, India & Pi-I Debby Lin, US

Pregnancy endocrine disruption and obesity-related outcomes in the third generation

Presenter: Gyeyoon Yim, Harvard T.H. Chan School of Public Health, Boston, United States

Authors: G. Yim, A. Roberts, M. Weisskopf;
Harvard T.H. Chan School of Public Health, Boston, MA.

Background/Aims Childhood obesity has become a global epidemic, with 1 in 3 children in the United States affected. The etiology of obesity is multifactorial, including genetic, perinatal, dietary, psychosocial, and environmental factors. One of the potential modifiable environmental risk factors for childhood obesity is endocrine disrupting chemicals. Diethylstilbestrol (DES) is a synthetic estrogen that was prescribed to pregnant women to prevent pregnancy loss between the 1940s and 1970s, but banned for its unexpected adverse health effects. Previous research has linked in utero exposure to DES with increased risk for obesity among those exposed prenatally, but whether such effects extend to the third generation—independently from any effect on the second generation—are not known despite emerging evidence of multigenerational effects of DES on other outcomes.
Methods We investigated the association between DES use during pregnancy and risk of both overweight (BMI>25 kg/m^2) and diagnosis of high cholesterol (2011) in the grandchildren by linking the data from three interconnected cohort studies (Nurses' Health Study II (NHS II), Nurses' Mothers' Cohort Study (NMCS), and Growing Up Today Study (GUTS)). Grandmothers reported their use of DES and other potential confounding factors in the NMCS and anthropometric data were provided by participants in both NHS II and GUTS. Data were analyzed using cluster-weighted generalized estimating equations.
Results Among 3,837 grandmother (G0)-mother (G1) pairs the prevalence of G0 use of DES during pregnancy was 2.6%. Among 5,431 children (G2), 1,749 (32.2%) were overweight or obese, and 135 (2.5%) had high cholesterol. Grandmother (G0) use of DES during pregnancy was associated with an increased risk of having a diagnosis of high cholesterol (adjusted odds ratio [aOR]=2.82; 95% CI: 1.37-5.78), but not with overweight/obesity among grandchildren (G2).
Conclusion DES use during pregnancy is associated with an elevated risk of grandchildren being diagnosed with high cholesterol.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 20
The Evolving Science of Fluoride Exposure and Neurocognitive Effects: Does Timing of Exposure and Sex Matter?
Chair: Christine Till, Canada

Systematic Review of Fluoride Exposure and Neurodevelopmental and Cognitive Health Effects

Presenter: Kyla Taylor, NIEHS NIH, Durham, United States

Authors: Kyla Taylor, Division of the National Toxicology Program, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, USA
Andrew Rooney, Division of the National Toxicology Program, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, USA
John Bucher, Division of the National Toxicology Program, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, USA

Background: People of all ages are exposed to fluoride from a variety of sources including dental products, drinking water, food, beverages and pharmaceuticals. In some developed countries, fluoride is added to municipal water systems to prevent tooth decay.
Methods: The National Toxicology Program (NTP) conducted a systematic review of the human, experimental animal, and mechanistic literature to evaluate the evidence and develop hazard conclusions about whether fluoride exposure is associated with neurodevelopmental and cognitive effects.
Results: The literature search and screening process identified 185 published human studies, 339 published experimental animal studies, and 60 in vitro/mechanistic studies.
Conclusion: Although draft conclusions were reached by integrating evidence from human and animal studies with consideration of relevant mechanistic data, the conclusions are based primarily on the human evidence. The body of human evidence provides a consistent pattern of findings, across several different populations, that high fluoride exposure is associated with lower intelligence quotient (IQ) in children. These consistent findings are based primarily on studies with higher levels of fluoride exposure (i.e., >1.5 ppm in drinking water). When focusing on findings from studies with exposures in ranges typically found in the United States (approximately 0.03 to 1.5 ppm in drinking water) that can be evaluated for dose response, effects on cognitive neurodevelopment are inconsistent, and therefore unclear. There is inadequate evidence to determine whether fluoride exposure lowers IQ or impairs cognitive function in adults. The evidence from animal studies is inadequate to inform conclusions on cognitive effects, and the mechanisms underlying fluoride-associated cognitive neurodevelopmental effects are not well characterized. The NTP will develop hazard conclusions for children and adults on a 4-level scale for hazard classification (“known”, “presumed”, “suspected”, “not classifiable”).
Keywords:
Fluoride, exposure, systematic review, epidemiology.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 20
The Evolving Science of Fluoride Exposure and Neurocognitive Effects: Does Timing of Exposure and Sex Matter?
Chair: Christine Till, Canada

Urinary fluoride patterns among children in Mexico and Canada

Presenter: Rivka Green, York University, Toronto, Canada

Authors: R. Green[1], C. Till[1], A. Cantoral[2], B. Lanphear[3], E. A. Martinez-Mier[4], P. Ayotte[5], R. J. Wright[6], R. O. Wright[6], M. Tellez-Rojo[2], M. Arora[6], A. Malin[6];
[1]York University, Toronto, ON, CANADA, [2]Instituto Nacional de Salud Pública, Cuernavaca, MEXICO, [3]Simon Fraser University, Vancouver, BC, CANADA, [4]Indiana University, Indianapolis, IN, [5]Laval University, Quebec City, QC, CANADA, [6]Icahn School of Medicine at Mount Sinai, New York, NY.

Background: New research suggesting fluoride is a developmental neurotoxicant highlights the importance of characterizing fluoride exposure in children. Fluoride is added to salt in Mexico and to drinking water in Canada to prevent dental caries. We examined the association of childhood urinary fluoride (CUF) with food and water fluoride levels in Mexico and Canada, respectively.
Methods: We included 551 children (ages 4-6) from the Programming Research in Obesity, Growth, Environment and Social Stress (PROGRESS) cohort in Mexico City, and 522 children (ages 2-6) from the Maternal-Infant Research on Environmental Chemicals (MIREC) cohort in Canada. We applied Spearman correlations, T-tests or covariate adjusted linear regression to examine associations of CUF (mg/L; adjusted for specific gravity) with demographics and food or water fluoride concentrations. We used equivalence testing to compare cohort means.
Results: Median (IQR) CUF concentrations were 0.67 (0.36) in PROGRESS, 0.56 (0.76) in fluoridated Canadian communities, and 0.35 (0.53) in non-fluoridated Canadian communities. Mean+/-SD CUF was equivalent in PROGRESS (0.74+/-0.42) and fluoridated Canadian communities (0.79+/-0.71), but lower in non-fluoridated Canadian communities (0.55+/-0.60, t (276)=-6.02, p≤.001). CUF tended to increase with age in PROGRESS (ρ=.10, p=.02) and MIREC (ρ=.17, p≤.001). In MIREC, CUF was higher in males (0.79+/-0.74) than females (0.54+/-0.58, p<.001); however, no sex differences were observed in PROGRESS (p=.97). In MIREC, water fluoride concentrations (median=0.2 mg/L) were significantly associated with CUF after covariate adjustment for age and sex (B=0.36, 95%CI: 0.11, 0.61, p=.005). Daily food and beverage fluoride intake (median=624.41 mcg/day) was not associated with CUF in PROGRESS (p=.89).
Conclusion: Our findings suggest that the magnitude of fluoride exposure is comparable among children in Mexico City and fluoridated Canadian communities, despite different sources of exposure. Further studies are needed to clarify whether higher CUF among older children reflects different exposure patterns, sources of exposure or age-related toxicokinetics.
Keywords:
Fluoride, exposure, intake, development, epidemiology.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 20
The Evolving Science of Fluoride Exposure and Neurocognitive Effects: Does Timing of Exposure and Sex Matter?
Chair: Christine Till, Canada

Identifying Critical Periods of Neurotoxicity to Fluoride Exposure in Canadian Children

Presenter: Linda Farmus, York University, Toronto, Canada

Authors: L. Farmus[1], R. Green[1], C. Till[1], R. Hornung[2], E. Martinez Mier[3], B. Lanphear[4], D. Flora[1];
[1]-York University, -Toronto, ON, CANADA, [2]University of Cincinnati, Cincinatti, OH, [3]Indiana University School of Dentistry, Indianapolis, IN, [4]Simon Fraser University, Burnaby, BC, CANADA.

Background: Fluoride is associated with IQ deficits during early brain development, but the period in which children are most vulnerable has not been established. We assessed sex-specific effects of fluoride on IQ across prenatal, infancy, and early childhood windows.
Methods: Repeated exposures from 596 mother-child pairs in the Maternal-Infant Research on Environmental Chemicals cohort were analyzed using GEE to explore associations between fluoride exposures and IQ after adjustment for covariates and multiple comparisons. Fluoride was measured in urine spot samples collected during pregnancy trimesters and when children were between 1.9 and 4.4 years. Infant fluoride exposure was estimated from water fluoride concentration and duration of formula-feeding over the first year of life. The Wechsler Preschool and Primary Scale of Intelligence-III was administered at 3 to 4 years.
Results: Among boys and girls, the association between fluoride and performance IQ (PIQ) significantly differed across exposure windows (p = .01). Among boys, prenatal exposure to fluoride was most strongly associated with adverse deficits on PIQ, B = -8.45 (95% CI: -12.90, -3.99), followed by infancy, B = -2.81 (95% CI: -6.59, 0.98), but not childhood, B = 0.20 (95% CI: -2.58, 2.99), respectively. Among girls, infancy exposure to fluoride was most strongly associated with adverse deficits on PIQ, B= -5.19 (95% CI: -8.84, -1.53), followed by prenatal and childhood exposures, B = -3.50 (95% CI: -9.51, 2.51), B = -2.05 (95% CI: -2.58, 2.99), respectively. Estimates for full-scale IQ were weaker but showed strongest effects for boys in the prenatal exposure period. Effects across all windows were nonsignificant among girls. We found no significant sex-specific associations between fluoride and verbal IQ.
Conclusion: Adverse associations between fluoride exposures and cognitive outcomes may depend on timing and biological sex, with the prenatal window potentially critical for boys, while infancy is potentially critical for girls.
Keywords:
Fluoride, critical windows, water quality, children's neuropsychology, epidemiology, toxicology.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 3
SYMPOSIUM 20
The Evolving Science of Fluoride Exposure and Neurocognitive Effects: Does Timing of Exposure and Sex Matter?
Chair: Christine Till, Canada

Fluoride Exposure and neurodevelopmental outcomes among children in the United States: A pilot study

Presenter: Ashley Malin †, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: A. J. Malin †[1], E. De Water †[2], E. Rechtman[1], E. Navarro[1], J. Nu[1], M. Lun[1], C. Tang[1], M. K. Horton[1];
[1]Icahn School of Medicine at Mount Sinai, New York, NY, [2]University of Minnesota, Minneapolis, MN.

Background/Aim: Developmental neurotoxicity of fluoride has been demonstrated in animal studies. Additionally, fluoride exposure during prenatal development, infancy, middle-to-late childhood and adolescence has been associated with poorer neurodevelopmental outcomes among children in Mexico and/or Canada. However, potential impacts of chronic low-level fluoride exposure in early childhood on brain structure and neurodevelopment remain relatively unexamined. We conducted the first United States (US) study to examine associations of early childhood urinary fluoride levels with measures of attention and executive function, as well as changes in white matter (WM) microstructure in the brain.Methods: This community-based sample included 31 children ages 4-6-years recruited from New York City. Executive function was assessed with the Behavior Rating Inventory of Executive Function (BRIEF) and attention and behavior were assessed with the Child Behavior Checklist (CBCL). We assessed whole brain WM microstructure integrity using diffusion tensor imaging (DTI). We applied linear regression to examine associations of urine fluoride with measures of attention, behavior and executive functioning, as well as fractional anisotropy (FA), a common DTI measurement of WM integrity. Urine fluoride concentrations were adjusted for specific gravity to correct for dilution (UF_{SG}). Regression models were adjusted for a priori covariates including age, sex and race. Results: The median (IQR) urine fluoride level was 0.72 (0.49) mg/L. Most children scored within the normal and non-clinical range on measures of attention, behavior and executive function. We did not observe significant associations between UF_{SG} and any of the behavioral outcomes assessed; however, higher UF_{SG} was significantly associated with decreased FA in the dorsolateral prefrontal cortex ($p<0.05$ fdr adjusted for multiple comparisons, cluster size = 56 voxels).Conclusions: Early childhood fluoride exposure may contribute to subclinical changes in brain regions implicated in executive functioning. Future prospective studies are needed to examine behavioral consequences of these neurological changes.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 21
Leveraging OMICS in Environmental Epidemiological Studies to Understand Human Health Risks of Chemical Exposures
Chairs: Elizabeth Radke-Farabaugh, US & Stephanie Kim, US

Statistical challenges in the analysis of blood-derived DNA methylation data from environmental epidemiology studies

Presenter: Devin Koestler, University of Kansas Medical Center, Kansas City, United States

Authors: D. Koestler;
University of Kansas Medical Center, Kansas City, KS.

Title: Statistical challenges in the analysis of blood-derived DNA methylation data from environmental epidemiology studies

Abstract: One of the foremost challenges in the analysis and interpretation of epigenomic data is the issue of cellular heterogeneity and its potential confounding effects on studies that aim to understand the relationship between DNA methylation and some phenotype or exposure. This is especially true of whole blood, which represents one of the most commonly used tissue types for environmental epigenomic studies due to its relatively easy accessibility, and because of a heightened interest in the immonomethylomic effects of environmental insults. Whole blood is a heterogenous and complex mixture of many different cell types each with distinct functions and roles. The cellular landscape of whole blood may be sensitive to certain environmental insults and such insults may impact patterns of DNA methylation in a cell-specific manner. Thus, in addition to the well-recognized potential for confounding, environmental exposures may elicit cell-specific effects, the detection of which represents a major challenge in the analysis whole-blood methylation signatures. The identification of cell-specific effects of methylation based on bulk-tissue methylation signatures is an ongoing area of research with important implications for environmental epidemiology studies of DNA methylation. This talk will orient the audience to the above challenges and will include a discussion of recent work that aims to address these challenges. Insight into the application of such methods for environmental epidemiology studies of DNA methylation will be given.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 21
Leveraging OMICS in Environmental Epidemiological Studies to Understand Human Health Risks of Chemical Exposures
Chairs: Elizabeth Radke-Farabaugh, US & Stephanie Kim, US

High-resolution mass spectrometry; where chemistry meets biology

Presenter: Roel Vermeulen, Utrecht University, Utrecht, Netherlands

Authors: R. Vermeulen[1], D. Walker[2], T. Hankemeier[3];
[1]Utrecht University, Utrecht, NETHERLANDS, [2]Icahn School of Medicine at Mount Sinai, New York, NY, [3]Leiden Univdersity, Leiden, NETHERLANDS.

Background: Genomics has realized major breakthroughs in precision medicine. Yet its limitations have become clear: despite large-scale genomic studies, genetic contributions can only explain an estimated 30% of the chronic disease burden. The other 70% needs to be explained by environmental factors. The environment hence has a major impact on public health as a major risk factor for common non-communicable diseases. However, until recently the scientific community lacked the tools to adequately identify on an OMIC-scale the (mechanistic) relations between disease and exposure to these environmental factors. In turn, this hampers effective intervention strategies.
Methods: Untargeted high-resolution mass spectrometry (HRMS) provides a key platform for robust and comprehensive mapping of molecular snapshots of exposures and associated biological effects. Different technologies exist but the combined use of both gas-chromatography (Exposome scan) and liquid chromatography (Metabolome scan) provides opportunities for the broad exploration of environmental disease associations.
Results: In the last year, we have implemented HRMS in several exposure and health studies. In combination with advancements in computational technologies this has resulted in proof-of-principle (PoP) studies on specific exposure circumstances, including occupational (e.g. trichloroethylene, benzene, diesel and environmental (e.g. plastics, air pollution), as well as disease phenotypes (cardiovascular disease, lung health, Parkinson's disease). These studies have demonstrated the opportunities and limitations in how HRMS can support an important role in suspect and agnostic screening of chemical exposures, and in elucidating the mechanistic relations between disease and exposure.
Conclusion: HRMS can be a powerful tool in environmental risk assessment. However, to fully harness the promise of HRMS, technical and computational advancements need to be made to increase the sensitivity of the analytical methods, to improve annotation of chemicals and metabolites, to better interface observational and experimental HRMS studies, and to increase global standardization of HRMS.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 21
Leveraging OMICS in Environmental Epidemiological Studies to Understand Human Health Risks of Chemical Exposures
Chairs: Elizabeth Radke-Farabaugh, US & Stephanie Kim, US

The potential application of transcriptomics and methylomics in environmental epidemiological studies for chemical assessments

Presenter: Stephanie Kim, U.S. Environmental Protection Agency, New York, United States

Authors: S. Kim;
U.S. Environmental Protection Agency, New York, NY.

'Omics technologies can provide comprehensive information on molecular changes in cells and tissues in a cost-effective and efficient manner, and these technologies have the potential to improve chemical assessments through informing hazard identification and informing dose response. There are a growing number of environmental epidemiological studies that have examined chemical exposures and applied ‘omics analyses with the cohort’s biological samples. These environmental epidemiological studies can take the advantage of high-throughput ‘omics technology with classical epidemiology to examine associations with molecular responses. Therefore, this symposium presentation will primarily focus on the broad applications and potential of transcriptomic and methylomic data from environmental epidemiological studies to inform human mechanistic evidence for chemical assessments. This presentation will delve into a novel and complementary case study describing the integration of transcriptomic and methylomic data from environmental epidemiological studies examining chemical exposures. The altered expression of a single gene or methylated region may or may not be biologically relevant, yet a complementary examination of altered genes and regions mapping onto perturbed pathways can contribute to more informed biological plausibility. The presentation will discuss how patterns of DNA methylation and gene expression can complement each other in identifying molecular effects through differential enrichment of biological pathways. Analytical methods will also be discussed on the following: a) identifying differentially-expressed genes; b) using appropriate cellular deconvolution methods to derive differential methylation regions; c) performing gene-set enrichment analysis (GSEA) on the differential genes derived from transcriptomic and methylomic analyses; and d) benchmark dose modeling to characterize the dose ranges responsible for driving the enrichment of biologically-relevant gene expression changes.

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ABSTRACT E-BOOK

August 27, 2020 / 08:00 - 09:30 / Parallel 4
SYMPOSIUM 21
Leveraging OMICS in Environmental Epidemiological Studies to Understand Human Health Risks of Chemical Exposures
Chairs: Elizabeth Radke-Farabaugh, US & Stephanie Kim, US

Applications and integration of multiplatform omics data in environmental epidemiology

Presenter: Karl Kelsey, Brown University, Providence, United States

Authors: K. Kelsey;
Brown University, Providence, RI.

The epidemiologic application of high-density data approaches for evaluating the molecular consequences of environmental/occupational chemical exposures is rapidly expanding as a result of technical advances. Single cell sequencing using fluidic platforms, novel large-scale cytometry approaches and epigenomic platforms that now target both DNA methylation and histones are simple examples of tools that are primed for potential population application. As a result, the time is ripe to expand the 'biomarker' paradigms to include mechanism-driven designs that highlight the utility of 'omics data derived from different tissues as well as different exposures. We will discuss the advantages and disadvantages of numerous platforms, highlighting how integrating them could be done to enhance the overall interpretability of data of this type. Current examples primarily target the study of blood leukocytes and we will highlight the potential of these platforms to elucidate the epidemiology of the immune system. Personalized medicine is rapidly adapting many of these tools and these approaches can also serve as pilot examples for environmental epidemiologic application.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 28
Health Impacts of Extreme Temperature in Urban Environments
Chairs: Amruta Nori-Sarma, US & Kate Weinberger, Canada

Housing characteristics that increase risk of summer excess mortality due to hot weather in New York City

Presenter: Sarah Johnson, New York City Department of Health, New York, United States

Authors: S. Johnson, K. Ito;
New York City Department of Health, New York, NY.

Background: Excess mortality due to heat waves is well documented in New York City (NYC), and the neighborhoods with the highest risk are those that suffer from other health outcomes associated with structural racism and historical disinvestment. The dense population, income disparities, and variability in housing allow analyses for modifiable risk factors for heat and potential points of intervention. Methods: We used a case-crossover analysis to test for modifiers of the association between the highest decile of ambient daily citywide mean temperature over lag 0 through 3 days (82 ^{o}F+) and non-external cause and cardiac deaths for June-August 1997-2015, geocoded to residential address. The modifiers tested included tax-lot-level building type, number of floors and public vs private ownership, place of death (inpatient vs out-of-hospital), and quintiles of neighborhood air conditioning (AC) prevalence. Results: The only significant modifier of the association between high mean temperatures and non-external cause mortality or cardiac death was neighborhood-level AC prevalence, with higher effect size for out-of-hospital deaths. Neighborhoods with over 94% of households reporting AC use (the highest quintile) did not exhibit increased risk of out-of-hospital non-external cause death during the hottest summer weather. Odds ratios (OR) for out-of-hospital deaths showed a clear trend of decreased risk with increased neighborhood AC coverage (OR[95% confidence intervals, CI]: &lt80% AC: 1.28[1.21, 1.36]; 80-85% AC: 1.22[1.15,1.29]; 86-89% AC: 1.10[1.04,1.17]; 90-94% AC: 1.05[0.99,1.10]; &gt94%: AC 1.00[0.94, 1.07]) Conclusions: Lack of AC poses a serious health risk under current and projected summer temperatures in NYC. AC access is dramatically lower among under-privileged populations in NYC. Expanding access to AC is a clear step to reducing risk now and in the future.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 28
Health Impacts of Extreme Temperature in Urban Environments
Chairs: Amruta Nori-Sarma, US & Kate Weinberger, Canada

Scenarios of urban temperature related mortality for Oslo, Norway

Presenter: Shilpa Rao-Skirbekk, Norwegian Institute of Public Health, Oslo, Norway

Authors: S. Rao-Skirbekk[1], F. Di Ruscio[1], L. Vazquez Fernandez[1], A. Diz-Lois Palomares[1], A. Gasparrini[2], F. Sera[2], A. Vicedo-Carbera[3];
[1]Norwegian Institute of Public Health, Oslo, NORWAY, [2]London School of Hygiene and Tropical Medicine, London, UNITED KINGDOM, [3]Institute of Social and Preventive Medicine, Bern, SWITZERLAND.

Background/Aim: Global studies indicate that future changes in temperatures in urban areas can have significant implications for health, particularly in the elderly. This study estimates for the city of Oslo, changes in mortality by age and cause over the century under composite climate and socio-economic scenarios. Methods: We use a historical dataset (1996-2018) of daily mortality and temperature for Oslo in a time series analysis. We apply a distributed non-linear model using cubic splines to model both the exposure-response function and the lagged-response dimensions, accounting for 21 days of lag. We project temperature related mortality based on the representative climate pathways (RCPs)- the high climate RCP8.5 and low climate RCP2.6 scenarios, under a range of available population scenarios for Oslo. Results: For a median population scenario, with RCP 8.5: we estimate for Oslo, compared to 2010, a 7-fold increase in the fraction of deaths associated with heat and a 4-fold decrease in the fraction of deaths associated with cold in 2100. With a RCP 2.6 climate scenario, the attributable fraction (AF) of deaths due to temperature remains constant over time- around 11% for cold-related deaths, and 0.4%, for heat-associated deaths. The AF under the RCP 2.6 and 8.5 climate scenarios for temperature related all-cause mortality is 3% higher in the age group 75-84 than the 0-74 group. In the age group over 85, the AF for pulmonary mortality shows the steepest increase from 1% in 2010 to 7% in 2100. Conclusion: Significant temperature related health burdens can be expected in Oslo over the century as a result of climate change. Cold related burdens dominate over the near-term with heat related impacts gaining significance in the longer term. Mortalities are higher in older age groups and for pulmonary causes, indicating a need for climate adaptation policies targeted at the elderly.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 28
Health Impacts of Extreme Temperature in Urban Environments
Chairs: Amruta Nori-Sarma, US & Kate Weinberger, Canada

Assessment of climate trends and diarrheal diseases risks in three coastal medium-sized cities of Senegal

Presenter: Sokhna Thiam, Institute for Health Research, Epidemiological Surveillance and Training, Dakar, Senegal

Authors: S. Thiam[1], G. Cissé[2];
[1]Institute for Health Research, Epidemiological Surveillance and Training, Dakar, SENEGAL, [2]Swiss Tropical and Public Health Institute, Basel, SWITZERLAND.

Senegal is one of the most urbanizing countries vulnerable to climate variability and change in West Africa. The country has experienced weather events, particularly sea-level rise, drought and reduction in quality and availability of drinkable water, mostly in coastal areas. This study was undertaken to investigate temporal trends in annual rainfall and temperature and to assess diarrheal disease risk in three coastal cities of Senegal: Saint-Louis, Kaolack, and Mbour. Trend analysis to understand changes in the local climate has been carried out using data for 58-years period (1960-2018) for rainfall and temperature. Mann-Kendall non-parametric test and Sen's slope estimate test were applied to identify the existing trend direction and to detect the magnitude of change over time. Analysis indicated a significant increasing trend for temperature for both tests in all of the three selected cities. These trends were more pronounced for average and minimum temperatures. Contrary to temperature, rainfall showed a decreasing trend in all cities. The findings of the present research indicated that there is a change in temperature and rainfall patterns due to global environmental change in Senegal. These changes observed may have significant impacts on diarrhoeal diseases, which are the leading causes of mortality and morbidity in children in these cities. Findings from the negative binomial regression model revealed that monthly count of diarrheal cases increased by 2% per 1 °C increase in minimum and average temperature (RR: 1.02; 95% CI: 1.01-1.03 and RR: 1.02; 95% CI: 1.01-1.04 respectively) above the monthly average recorded within that month. Similarly, rainfall was found to have a significant effect on the monthly diarrheal cases. The findings of this study may inform the conceptualization and design of early warning systems for the prediction and control of childhood diarrhea, based upon the observed patternS of climate change in Senegal.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 1
ORAL SESSION 28
Health Impacts of Extreme Temperature in Urban Environments
Chairs: Amruta Nori-Sarma, US & Kate Weinberger, Canada

Temperature modifies the association between air pollution and cardiovascular disease hospital admissions in the Vaal Triangle Air Pollution Priority Area, South Africa

Presenter: Janine Wichmann, University of Pretoria, Pretoria, South Africa

Authors: J. Shirinde, J. Wichmann;
University of Pretoria, Pretoria, SOUTH AFRICA.

Background: Very few studies in Africa investigated effect modification by a temperature indicator (e.g. apparent temperature, Tapp) on the human health effects of air pollution. Due to climate change, an increase of 3-4°C in ambient temperature is projected along the South African coast and 6-7°C inland during the next 80 years. Methods: Cardiovascular disease (CVD) hospital admission data (ICD10 I00-I99) were obtained from a private hospital group; after ethics approval. The study period was 1 January 2011 to 31 October 2016. NO_2, SO_2, $PM_{2.5}$, PM_{10}, temperature and relative humidity data were obtained from the Department of Environmental Affairs. A case-crossover epidemiological study design was applied. The present study focused on lag0-1; as most other studies. Models were adjusted for public holidays and Tapp. Days with Tapp below and above/equal the 25th (9.6°C) and 75th percentiles (20.1°C) were classified as cold and warm days, respectively. Results: Of the 15 237 admissions, 45.9% were from women and 39.0% from 15-65 year olds. The daily NO_2, SO_2, $PM_{2.5}$ and PM_{10} levels were 30.3, 17.1, 35.4 and 60.8 $\mu m/m^3$, respectively, and exceeded the WHO guidelines between 25% to 50% of the days. None of the air pollutants had significant associations with CVD admissions on cold or warm days. The elderly appeared to be more at risk to PM_{10} on normal days compared to all groups combined, e.g. RR 1.037 95%CI 1.009-1.065 per 10 $\mu m/m^3$ increase compared to the unstratified analyses RR 1.017 95%CI 1.001-1.035. The same was observed for males RR 1.026 95%CI 1.003-1.050. $PM_{2.5}$ had a stronger association than PM_{10} among the elderly on normal days: RR 1.068 95%CI 1.008-1.133. Conclusions: These results indicate that the risk of CVD admissions due to ambient air pollution exposure is different on cold, normal and warm days in Cape Town.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 22
Methodological Challenges in Epidemiological Studies of Water Quality: Lessons Learned
Chairs: Jyotsna S. Jagai, US & Alison Krajewski, US

Lessons Learned for Obtaining Water Data at the State Level and Linkage to Health Outcomes Data

Presenter: Alison Krajewski, Oak Ridge Institute for Science and Education (ORISE) Postdoctoral Fellow at United States Environmental Protection Agency (US EPA), Research Triangle Park, United States

Authors: Alison K. Krajewski, Oak Ridge Institute for Science and Education (ORISE) Postdoctoral Fellow at United States Environmental Protection Agency (US EPA), Research Triangle Park, NC, USA
Monica P. Jimenez, Oak Ridge Associated Universities (ORAU) Student Services Contractor at US EPA, Research Triangle Park, NC, USA
Danelle T. Lobdell, US EPA, Office of Research and Development, Center for Public Health & Environmental Assessment, Research Triangle Park, NC, USA
Jyotsna S. Jagai, University of Illinois at Chicago, School of Public Health, Division of Environmental and Occupational Health Sciences, Chicago, IL, USA

Water quality remains an ongoing public health issue. Contaminants such as lead and arsenic are enduring water quality contaminants that threaten public health, but emerging contaminants also add to the growing health concerns of water quality. Water quality data is critical to understanding the health impacts and identifying additional contaminants resulting in adverse health outcomes. However, challenges remain in identifying and obtaining water data in the United States (US). No national, standardized database exists for water data in the US. Local public water systems are required to report regulatory violations to the state who then reports to these violations to federal regulators. Reporting violations may meet the regulatory requirements, but limitations are encountered in the utility of these data for environmental epidemiological research. As only violations are required to be reported, contaminant concentrations are only available at the state-level which requires laborious, time-consuming processes to obtain these data and/or costs associated with obtaining the data. In some cases, the states are unable or unwilling to release the data, which results in gaps for developing a national profile of water quality. If water quality data is obtained, there are issues in how to relate the information to health outcomes, as it typically is on a different geographical scale than health outcome data. Alas, even given these limitations of data availability, these data are often the only consistent water data available for epidemiological analyses at a national level. Therefore, it is critical to find methods to utilize these water quality data for health analyses. We will present several examples of the water data available at the different levels – local, state, and federal – as well as the challenges and strategies for linking these data to health outcomes data, including individual and county-level outcomes. This abstract does not reflect EPA policy.
Keywords:
Water, water quality, big data, environmental epidemiology

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 22
Methodological Challenges in Epidemiological Studies of Water Quality: Lessons Learned
Chairs: Jyotsna S. Jagai, US & Alison Krajewski, US

Estimating Water Quality and Exposure Assessment Among Private Well-Owners

Presenter: Kristen Malecki, University Of Wisconsin Madison, Madison, United States

Authors: Kristen Malecki, University of Wisconsin, Madison, WI, USA

Background: Among drinking water supplies, private well owners are often the most vulnerable to changing water quality due to limited well stewardship, including regular testing and appropriate use of home water filtration. Private well ownership and testing varies by region and state in the United States. In Wisconsin, approximately one-third of drinking water supplies come from surface water and the remaining two-thirds are private wells. Among these, approximately one-half are private well owners. As agricultural trends and practices have shifted, private well owners remain responsible for private well testing, thus increasing potential vulnerability to adverse exposure to environmental chemicals as well as altered gut microbial composition.
Methods: Working with a collaborative set of stakeholders, and building from the Survey of the Health of Wisconsin project cohort, we conducted a private well survey aimed at better understanding differences in private well testing, and barriers to testing among a randomly selected rural population in the state. In another ancillary study, we examined differences in alpha and beta diversity by drinking water source.
Results: Among private well-owners, less than 10% reported testing their wells within the last year. Water treatment strategies included water softeners and barriers to testing included costs and environmental literacy. Significant differences in host microbiome were observed between private and municipal well-owners
Discussion: Protecting private well owners remains a significant public health challenge. Result suggest efforts to improve environmental health literacy and reducing financial barriers are important to improve stewardship. The microbiome seems to be sensitive to drinking water source and provides a novel biomarker for future drinking water research.
Keywords:
Water, water quality, microbiome, environmental epidemiology

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 22
Methodological Challenges in Epidemiological Studies of Water Quality: Lessons Learned
Chairs: Jyotsna S. Jagai, US & Alison Krajewski, US

Exposure Misclassification: Temporal and Spatial Variability in Estimates of Individual Species and Mixtures of Disinfection Byproducts

Presenter: J. Michael Wright, US Environmental Protection Agency, Cinncinati, United States

Authors: J. Michael Wright, US Environmental Protection Agency, Cincinnati, OH, USA

Disinfection of drinking water is a public health advance, but the potential risk of unintended consequences of disinfection byproduct (DBP) formation remains unclear. Over 600 DBPs have been identified to date, although most have not been analytically quantified in disinfected drinking water. Some DBP exposures occur through multiple routes which can complicate exposure assessment in epidemiological studies especially based on aggregate data derived from routinely-collected monitoring data. Therefore it is important to quantify the spatiotemporal variability in occurrence to minimize measurement error and exposure misclassification. In the absence of biomonitoring data, concentration-based exposure scores based on routinely-collected monitoring data can be spatial water system averages or location-specific estimates. However, intra-water system variation in DBP concentrations results from formation and degradation processes occurring over space and residence time. Temporal variability can also occur from diurnal variation to longer-term trends such as seasonality noted for trihalomethanes (THMs) and haloacetic acids (HAAs). Temporally averaged data may estimate lifetime exposure for cancer outcomes or trimester-specific windows for developmental effects, but they ill fully account for the potential impact of peak exposures. Although the DBP surrogacy issue is beyond the scope here, data availability limitations may preclude examination and delineation of potential risk for individual DBPs or DBP mixtures especially when the measurement error structures can vary due to use of aggregate exposure estimates. With few DBPs regulated or routinely measured, this review will characterize strengths and limitations of existing approaches based on HAAs and THMs and will offer evidence from simulations and sensitivity analyses and offer recommendations to help address the aforementioned challenges.
Disclaimer: The views expressed in this abstract are those of the author and do not necessarily reflect the views or policies of the U.S. EPA.
Keywords:
Water, water quality, disinfection byproducts, environmental epidemiology

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 22
Methodological Challenges in Epidemiological Studies of Water Quality: Lessons Learned
Chairs: Jyotsna S. Jagai, US & Alison Krajewski, US

Epidemiology of drinking water contaminants: inferring exposure through population biomarkers

Presenter: Tony Fletcher, London School of Tropical Medicine and Hygiene, London, United Kingdom

Authors: Tony Fletcher, London School of Tropical Medicine and Hygiene, London, UK

Background: In using drinking water contamination as an exposure indicator for environmental epidemiology, it is important to know how important an exposure route is drinking water. If the water concentrations contribute a low proportion of total intake, they are of little value in etiological studies of that contaminant. But can nevertheless be of use if the goal of the study is the estimate the effect of the drinking water component specifically, for example to underpin setting drinking water standards. The main focus of this talk is a study of perfluoro-octanoic acid (PFOA) exposure where drinking water is the overwhelming route of exposure.
Methods: In the Mid-Ohio Valley approximately 80,000 people were exposed to PFOA contaminated drinking water for many years and many health effects were studied in these “C8 studies”. Most of the exposure came from 6 district water supplies with varying degrees of contamination. Within each district the water distribution led to fairly uniform concentrations but these varied over time. Over 60,000 people provided blood samples and PFOA measures in serum provided another metric for assessing exposure by water distribution area which integrated intake for each community. Water concentrations and serum concentrations were both collected in these communities
Results: Geometric mean serum concentrations for PFOA ranged from 10 to 200 ng/ml by district, reflecting differences in water concentration, and these mean values have been used to assess the evidence of associations with several outcomes including cholesterol and thyroid hormones.
Discussion: PFOA has the advantage of a very long half life in serum, about 3 years. Food related intake is significant as an exposure route in most communities. Where the water concentrations are high enough to dominate exposure, biomonitoring offers an efficient alternative to water measurements to assess exposure, integrating intake over recent years.
Keywords:
Water, water quality, biomarkers, perfluoro-octanoic acid, environmental epidemiology

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 22
Methodological Challenges in Epidemiological Studies of Water Quality: Lessons Learned
Chairs: Jyotsna S. Jagai, US & Alison Krajewski, US

The Contribution of Groundwater Arsenic to Public Water Arsenic Concentrations in the United States, 2006-2011

Presenter: Maya Spaur, Department of Environmental Health Sciences, Columbia University, New York City, United States

Authors: Maya Spaur, Department of Environmental Health Sciences, Columbia University, NY, NY, USA
A.E. Nigra, Department of Environmental Health Sciences, Columbia University, NY, NY, USA
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J. Ayotte, U.S. Geological Survey Pembroke, NH, USA
A. Navas-Acien, Department of Environmental Health Sciences, Columbia University, NY, NY, USA

Background: Although many aquifers in the US contain elevated concentrations of naturally occurring arsenic and groundwater is a major water source for many community water systems (CWSs), the contribution of groundwater to CWS arsenic concentrations has not been systematically studied. We evaluated the contribution of domestic well arsenic concentrations to CWS arsenic concentrations over time and by region for conterminous US at the county-level from 2006-2011. We hypothesized domestic well arsenic would be more strongly associated with CWS arsenic concentrations in the Southwestern US and during 2006-2008 versus 2009-2011, reflecting the 2006 implementation of EPA's 10µg/L MCL.
Methods: County-level 90th percentile probability of domestic well water arsenic exceeding 10µg/L was estimated by US Geological Survey (USGS) using boosted regression tree models. County-level CWS arsenic was estimated using EPA's 2006-2011 Six Year Review of Contaminant Occurrence Database. We used linear regression to assess associations between domestic well arsenic, a proxy for groundwater arsenic, and CWS arsenic, stratified by CWS monitoring period (2006-2008 vs. 2009-2011) and region for 2,231 counties across conterminous U.S.
Results: From 2006-2011 nationwide, the relationship between the 90th percentile probability of domestic well arsenic exceeding 10µg/L and CWS arsenic decreased by 1.14 (95% CI: -1.54, -0.73)µg/L between 2006-2008 and 2009-2011. A declining relationship was observed in all regions, except the Central Midwest and Pacific Northwest.
Discussion: The probability of high arsenic in domestic well water, a proxy for groundwater, is relevant contributor to CWS arsenic nationwide. This contribution was weaker in 2009-2011, possibly reflecting implementation of the 2006 MCL and uncertainty in modeled probability estimates. Declines in contribution of domestic well arsenic to CWS arsenic varied regionally, suggesting that interventions to implement the MCL were more successful in some regions (Southeast, Southwest) than others (Central Midwest, Pacific Northwest), or that aquifers used for domestic wells and CWSs differ regionally.
Keywords:
Water, water quality, biomarkers, arsenic, environmental epidemiology

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 2
SYMPOSIUM 22
Methodological Challenges in Epidemiological Studies of Water Quality: Lessons Learned
Chairs: Jyotsna S. Jagai, US & Alison Krajewski, US

Challenges of Assessing Multiple Simultaneous Water Exposures

Presenter: Jyotsna S. Jagai, University of Illinois at Chicago, School of Public Health, Division of Environmental and Occupational Health Sciences, Chicago, United States

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Environmental exposures occur simultaneously and therefore methods and metrics need to be considered to assess these simultaneous exposes. One method, at the ecological level, is to develop indices which consider multiple exposures. The Environmental Quality Index (EQI) was constructed as one such metric which considers multiple environmental exposures from various environmental domains. The EQI estimates overall county-level environmental quality for the entire United States (U.S.). National data was compiled to represent cumulative environmental quality across five domains: air, water, land, sociodemographic, and built environments. The county-level EQI has been developed for two time periods, 2000-2005 and 2006-2010. Specifically, the water domain of the EQI consists of variables spanning overall water quality to recreational water quality to drought. With limited national data to assess water quality, we utilized the available county-level data to construct a water domain. Additionally, between the two time periods, the construction of the water domain has changed due to the availability of data. This presentation will focus on the challenges, both spatial and temporal, of obtaining national data to represent water quality at the county level. Additionally, the EQI is being developed for the census tract level and we will discuss challenges and methods used to consider the smaller geographic scale. Despite the data limitations, we have been able to utilize the EQI and the water domain in epidemiological analyses to explore associations with a variety of health outcomes. This abstract does not reflect EPA policy.
Keywords:
Water, water quality, big data, environmental epidemiology

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 29
Occupational Heat Exposure, Kidney Disease, and Productivity
Chairs: David Richardson, US & Kate Applebaum, US

Dysuria and medical events related to heat stress and muscle injury among male Nicaraguan sugar cane workers

Presenter: Katie Applebaum, George Washington University, Milken Institute School of Public Health, Department of Environmental and Occupational Health, Washington, United States

Authors: T. L. Stallings[1], A. Riefkohl Lisci[2], N. McCray[1], D. E. Weiner[3], J. S. Kaufman[4], A. Aschengrau[2], Y. Ma[5], M. P. LaValley[6], O. Ramírez-Rubio[2], J. Amador Velazquez[2], D. López-Pilarte[2], R. L. Laws[7], M. Winter[8], V. McSorley[9], D. R. Brooks[2], K. M. Applebaum[1];
[1]George Washington University, Milken Institute School of Public Health, Department of Environmental and Occupational Health, Washington, DC, [2]Boston University School of Public Health, Department of Epidemiology, Boston, MA, [3]Tufts Medical Center, Nephrology, Boston, MA, [4]VA New York Harbor Healthcare System and New York School of Medicine, Division of Nephrology, New York, NY, [5]George Washington University, Milken Institute School of Public Health, Department of Biostatistics and Bioinformatics, Washington, DC, [6]Boston University School of Public Health, Department of Biostatistics, Boston, MA, [7]Boston University School of Public Health, Department of Environmental Health, Boston, MA, [8]Boston University School of Public Health, Biostatistics and Epidemiology Data Analytics Center, Boston, MA, [9]University of Chicago, Department of Public Health Services, Chicago, IL.

Background. Nicaraguan sugar cane workers have an elevated prevalence of chronic kidney disease of unknown origin (CKDu). CKDu pathogenesis may involve environmental heat exposure along with generation of mechanical heat, providing an opportunity for recurrent heat stress and muscle injury with subsequent kidney injury. A common urinary symptom among at-risk workers is dysuria. Compared with other job types, cane cutters may be at elevated risk of these potential intermediate events, though longitudinal studies are limited.
Methods. Using employment data for male workers at a Nicaraguan sugar cane company, we classified active work months as cane cutting or non-cane cutting for each month of follow-up, July 1993 through June 2010. Based on medical records, we determined occurrence of: dysuria, heat-related events, and muscle-related events during follow-up. Dysuria was defined as pain upon urination without other explanatory cause. Heat-related events included heat stress or experiencing >=2 heat symptoms. Muscle-related events were defined to identify potential rhabdomyolysis. Associations between cane cutting and each outcome were analyzed using logistic regression based on generalized estimating equations for repeated events, controlling for age.
Results. The 242 workers contributed 13,530 active work months, with 22.4% of person-months classified as time worked in cane cutting. There were 376 dysuria events, 35 heat-related events, and 32 muscle-related events. Cane cutting months exhibited a higher odds of dysuria and heat-related events [dysuria: OR=1.67 (95% CI: 1.18-2.37); heat: 1.97 (0.92-4.22)] compared with non-cane cutting months. The associations with cane cutting strengthened after subjects had worked >=60 months [dysuria: OR=2.70 (95% CI: 1.72-4.24); heat: 3.05 (1.22-7.61)]. No association was observed for muscle-related events.
Conclusions. Working in cane cutting compared with working in a different job was associated with increased dysuria and heat-related events, supporting the hypothesis that cane cutters are at increased risk of events suspected of inducing or presaging CKD.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 29
Occupational Heat Exposure, Kidney Disease, and Productivity
Chairs: David Richardson, US & Kate Applebaum, US

Heat exposure and kidney health of Costa Rican rice workers

Presenter: Jennifer Crowe, National University of Costa Rica, Heredia, Costa Rica

Authors: J. Crowe, M. Rojas-Garbanzo, D. Rojas-Valverde, R. Gutierrez-Vargas, J. Ugalde-Ramírez, B. van Wendel de Joode;
National University of Costa Rica, Heredia, COSTA RICA.

Background/Aim: Chronic kidney disease of unknown etiology (CKDu) affects populations along the Pacific coast of Mesoamerica including the Guanacaste province of Costa Rica. Although the etiology of CKDu is unclear, it is known to be associated with heavy labor in hot environments. The aim of this longitudinal study was to describe heat exposure and renal health of Costa Rican rice workers over three months of production. Methods: We collected pre-shift urine and blood samples from 72 workers with different jobs in a rice company at baseline and three months later. Metabolic and ambient heat loads were measured for each job using the WBGT index (wet bulb globe temperature) and NIOSH guidelines. Serum creatinine (S-Cr, mg/dl) was used to estimate glomerular filtration rate (eGFR) as the main outcome. Results: Participants were 20-62 years old (41.2±10.3) and educational levels ranged from zero to university (mean 7 years). Most participants (90%) were dehydrated (USG≥1.025) in at least one of the two pre-shift measurements while 35% of all workers were dehydrated in both samples. At baseline mean S-Cr was 1.22 mg/dL in field workers and 1.12 mg/dL in non-field workers (p=0.083) and three months later levels were 1.35 mg/dL and 1.12 mg/dL respectively (p=0.008). The only predictor of low eGFR identified using multiple logistic regression analysis was being a field worker. Low eGFR was seen in 18.5% of field workers and 4.3% of non-field workers at baseline. Three months later, when workloads were higher, 25.6% of field workers (n=7) and 6.7% of non-field workers (n=4) had low eGFR (p=0.034). Conclusions: Dehydration was quite common in this study. Low eGFR was particularly prevalent in field workers in heat stress conditions. There is an urgent need to continue to improve efforts to provide adequate water, rest and shade for heat-exposed workers in accordance with national regulations.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 29
Occupational Heat Exposure, Kidney Disease, and Productivity
Chairs: David Richardson, US & Kate Applebaum, US

Evaluation of heat exposure on dehydration and kidney function among sea salt workers in Thailand

Presenter: Titaporn Luangwilai, College of Public Health Sciences Chulalongkorn University, Bangkok, Thailand

Authors: T. Luangwilai[1], W. Siriwong[1], M. Gregory Robson[2];
[1]College of Public Health Sciences Chulalongkorn University, Bangkok, THAILAND, [2]School of Environmental and Biological Sciences, New Brunswick, NJ.

Background: Global warming impacts a number of agricultural workers and their health. Chronic kidney disease with non-common cause has been a concern among agricultural workers. Heat exposure and dehydration seem to reduce kidney function. Sea salt workers are expose to outdoor direct sunlight without any shade and high intense workload. This primary objective of the present study was to investigate whether heat exposure predicts dehydration and kidney function. Methods: The study randomly selected 48 sea salt workers aged between 18-60 during the beginning of harvest season. Sea salt workers who had medical record of hypertension, diabetes and kidney disease were excluded. The wet bulb globe temperature meter (WBGT) model 3M quest temp 32 ^{o}C was used to determining the heat index during working hour. Workload were recorded individually while they were working. Skin temperature was assessed by using forehead infrared thermometer. Working information was determined by validated questionnaires. Blood and urine were collected immediately after work for renal biomarker and hydration status.Results: The sample contained 58.3% males and 41.7% females with average age of 46.73 years old. The mean heat index was 29.83 ^{o}C in sea salt farms. The maximum working hours was 10 hours xxx. Water intake was on average 1.51L and 31.3% reported taking energy drinks. Mean of urine osmolarity were 795.15 mOsm/kg. Mean of estimated glomerular filtration rate were 87.52 mL/min/1.73 m^2. The finding showed the relationship of urine osmolarity with eGFR (r=0.298, p=0.04) and WBGT with eGFR (r=-0.307, p=0.034). The factors that significantly predicted the outcome eGFR were age (β=-0.267, p=0.047), working hour (β=-0.432, p=0.032), WBGT (β=-0.652, p=0.001), and urine osmolarity (β=0.317, p=0.021).Conclusion: The result showed the relationships of urine osmolarity and WBGT with estimated glomerular filtration rate. Longtime working in sea salt farm with heat exposure may affect to hydration status and may lead to kidney health.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 29
Occupational Heat Exposure, Kidney Disease, and Productivity
Chairs: David Richardson, US & Kate Applebaum, US

Environmental risk factors for acute kidney injury in female agricultural workers in Spain

Presenter: Cristina O'Callaghan-Gordo, Universitat Oberta de Catalunya, Barcelona, Spain

Authors: S. Torres[1], J. Gomez Salgado[2], A. Espinosa[3], B. Caplin[4], R. García[5], L. Arjona[3], F. Brocal[5], J. García-Iglesias[2], S. Camacho-Martín[6], N. Pearce[7], M. Kogevinas[1], C. Ruíz[2], C. O'Callaghan-Gordo[8]; [1]ISGlobal, Barcelona, SPAIN, [2]Preventive Medicine and Public Health Unit Sociology, Social Work and Public Health Department Labour Sciences School. University of Huelva, Huelva, SPAIN, [3]Consortium for Biomedical Research in Epidemiology and Public Health (CIBER Epidemiología y Salud Pública-CIBERESP), Madrid, SPAIN, [4]Centre for Nephrology, University College London Medical School, London, UNITED KINGDOM, [5]Universidad de Alicante, Alicante, SPAIN, [6]Fundación Andaluza Beturia para la Investigación en Salud. University Hospital Juan Ramón Jiménez, Huelva, SPAIN, [7]Department of Medical Statistics, London School of Hygiene and Tropical Medicine, London, UNITED KINGDOM, [8]Universitat Oberta de Catalunya, Barcelona, SPAIN.

Background: A high burden of kidney diseases, including acute kidney injury (AKI), has been reported among agricultural workers, mainly male workers in tropical areas. Dehydration caused by strenuous work at high temperatures and other related working conditions have been associated with AKI. The aim on this study was to estimate the incidence of AKI and study related risk factors among female agricultural workers in south of Spain working in crops under plastic, where temperatures can be similar to those observed in tropical latitudes.
Methods: A hundred female agricultural workers were enrolled in south Spain (Huelva) during the summer months. For each participant we estimated (i) cross-shift incidence of AKI based on serum creatinine values according to the KDIGO definition; and (ii) presence of heat stress during work shift based on external temperature, activities conducted and clothing, according to international standard ISO 7933:2005. We also collected information on other occupational risk factors, clinical history, life-style factors and anthropometric measurements. We used logistic regression models to assess if heat stress is a risk factors for AKI among this population and explore other potential risk factors.
Results and conclusions: Seven per cent of participants presented cross-shift AKI. Heat stress was not associated with AKI incidence [OR (95%CI) =0.37 (0.04,3.19)]. The only risk factor associated with AKI was lower mean estimated glomerular filtration rate (eGFR) prior to work-shift [(104.7 (16.3) versus 102.2 (20.2)], suggesting that previous kidney conditions were the main risk factor for AKI. These results are being validated with additional measurements of kidney function and injury such as cystatin C and neutrophil gelatinase-associated lipocalin (NGAL) urine levels (results will be available before the conference). Results suggest that previous kidney conditions were the main risk factor for AKI in this population of female agricultural workers.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 29
Occupational Heat Exposure, Kidney Disease, and Productivity
Chairs: David Richardson, US & Kate Applebaum, US

Wet bulb globe temperatures and risk of acute kidney injury among Central American workers

Presenter: Zoe Petropoulos, Boston University School of Public Health, Boston, United States

Authors: Z. E. Petropoulos[1], S. A. Keogh[1], E. Jarquín[2], J. Amador[1], R. García-Trabanino[3], D. López-Pilarte[1], I. S. Delgado[1], J. H. Leibler[1], D. R. Brooks[1], M. D. McClean[1], M. K. Scammell[1];
[1]Boston University School of Public Health, Boston, MA, [2]Agencia para el Desarrollo y la Salud Agropecuaria, San Salvador, EL SALVADOR, [3]Centro de Hemodiálisis, San Salvador, EL SALVADOR.

Background/Aim: There is an epidemic in Central America of chronic kidney disease of unknown etiology (CKDu), also referred to as Mesoamerican Nephropathy (MeN). MeN prevalence is high among agricultural workers and other occupations involving physical labor in hot working environments, such as brickmaking. Chronic heat stress and volume depletion are hypothesized to be important risk factors. Methods: The MesoAmerican Nephropathy Occupational Study (MANOS) is a prospective cohort study of 569 Salvadoran and Nicaraguan workers designed to investigate environmental and occupational risk factors for MeN. MANOS participants represent five industries: sugarcane, corn, plantain, brick manufacturing, and construction. At baseline, workers were monitored for three consecutive work days. Wet bulb globe temperature (WBGT) was collected every minute during these work shifts using wet bulb globe thermometers. Participants provided serum samples pre- and post-shift on the third day of baseline monitoring. Results: At baseline, the mean estimated glomerular filtration rate (eGFR) of MANOS participants was 106.7 mL/min/1.73 m^2. Fifty three (9.3%) had an eGFR < 60 mL/min/1.73 m^2. Fourteen participants met serum creatinine-based criteria for cross-shift acute kidney injury (AKI) during baseline monitoring. The mean percent increase in serum creatinine across work shifts was 5.3%. In El Salvador, WBGT was measured on forty-six separate days of workplace monitoring. On these days, an average of 54.7% of the work shift temperatures monitored after 6am were above 28°C, the American Conference of Governmental Industrial Hygienists Threshold Limit Value for moderate work at a continuous work rate. In unadjusted analyses, mean WBGT temperature on the third day of monitoring was positively associated with percent increase in serum creatinine (1.3% increase per 1°C) among Salvadoran workers. Conclusions: MANOS participants experience workplace temperatures that regularly exceed health-protective guidelines. Exposures to these high temperatures may increase the risk of AKI among these workers.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 3
ORAL SESSION 29
Occupational Heat Exposure, Kidney Disease, and Productivity
Chairs: David Richardson, US & Kate Applebaum, US

Occupational heat stress and heavy workload induce 'productivity losses'- Epidemiological evidence from a large cross-sectional study in Indian occupational settings.

Presenter: Vidhya Venugopal, SRIHER, Chennai, India

Authors: V. Venugopal, L. P.K, R. S, N. S;
SRIHER, Chennai, INDIA.

Background: Climate change is expected to exacerbate heat stress at the workplace in tropical settings. The health impacts of heat stress have been well documented in India and elsewhere. But Productivity Losses (PL) due to heat stress among workers has received less attention in Indian work settings and therefore vital to study the current status of heat impacts on the worker's health and productivity, so that appropriate control intervention can be implemented to avert present and future economic losses. Methods: We used a mixed-method approach to assess the perceived PL among~2892 workers from 25 occupational sectors in India. We conducted seasonal WBGT exposures, measured standard heat-strain indicators and captured self-reported productivity losses through questionnaires and observations.Results: WBGT heat exposures exceeded the Threshold Limit Values for moderate/heavy work for 74% workers (29.1°C±3.1°C). 16.1% of workers reported PL that was significantly associated with WBGT exposures (OR: 1.3; 95% CI: 1.03-1.66; p=0.0001), and heavy workload (OR: 1.5; 95% CI: 1.28 - 1.94; p=0.0001). Quantified heat-strain indicators such as a rise in Core Body Temperature, Sweat Rates, and Urine Specific Gravity were significantly associated with WBGT exposures. Though there was no significant difference in PL between informal and formal sectors, outdoor workers with exposures above TLV had 1.5 times higher risk of PL compared to indoor workers (95% CI: 1.27-2.00; p=0.0001). The impact of the season was significant on the PL with summer having 1.8 times higher PL compared to the cooler season (95% CI: 1.44-2.40; p=0.0001). Conclusions: Productivity losses due to workplace heat stress are evidenced in the study and are expected to increase in the rising temperature scenario. Intervention, adaptation and prevention strategies with a focus on workers' and a concerted effort must be made to promote workers' adaptive capacity and inform policy decisions in the imminent hotter world.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 23
Exposure to Heavy Metals and Its Detrimental Health Effects in Asia and Pacific Region
Chair: Shu-Li Wang, Taiwan

Metals as endocrine disruptors and the related health effects

Presenter: Shu Li Julie Wang, National Health Research Institutes, Zhunan Town, Miaoli County, Taiwan

Authors: S. J. Wang, T. Tsai;
National Health Research Institutes, Zhunan Town, Miaoli County, TAIWAN.

Quite a few metals, both synthetic and naturally occurring, may disrupt hormonal homeostasis and/or developmental processes. These include bio-accumulated ones such as cadmium (Cd), lead (Pb), methyl-mercury (MeHg), and abandoned organotin, which may stay in human bodies for months to years; others such as inorganic arsenic (iAs), manganese (Mn), chromium (Cr), and copper (Cu) have half-lives of hours to several days. People exposed to these metals mainly through ingestions of contaminated drinking water and food (i.e. grains, fish), and inhalation of polluted air. The disturbed systems might consist of endocrine (i.e. iAs inducing type 2 diabetes, Pb affecting on reproductive health), neurological (Pb, MeHg and their neurocognitive and behavioral effects, Mn on peripheral neurological disorder), and maybe immune (allergy). Increased risk of some cancers was suggested such as gynecological ones at endometrium, ovary, etc. Certain metals such as Pb and MeHg have been proved to cross the placenta and/or brain barriers and affect the next generations' health through the organ dysfunction and/or epigenetic changes. Exposure to Pb and iAs was found associated with spontaneous abortion, stillbirth and neonatal deaths; while maternal exposure to arsenic was associated with impaired glucose tolerance. Human survey for MeHg exposure was found higher than in the US and Europe, but similar to in Asia such as Japan. We reported MeHg was associated with type 2 diabetes with an odds ratio (OR) of 1.64. From our 15-year and 6-wave follow-up analyses, prenatal exposure to iAs was found to significantly associate with an increased risk of asthma (OR = 4.28, for greater than the median level); children's exposure was associated with an increased risk of allergic rhinitis (OR = 2.26). More investigations are warranted particularly with considerations of co-exposure to prevalent organic EDCs (i.e. phthalate, persistent organic pollutants) at various doses.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 23
Exposure to Heavy Metals and Its Detrimental Health Effects in Asia and Pacific Region
Chair: Shu-Li Wang, Taiwan

Joint effects of blood arsenic, lead, and selenium on blood pressure outcomes in a Bangladeshi cohort: A generalized weighted quantile sum approach

Presenter: Juwel Rana, Department of Public Health, School of Health & Life Sciences, North South University, Dhaka, Bangladesh

Authors: J. Rana[1], Y. Oulhote[2], S. E. Haque[3], H. Ahsan[4];
[1]Department of Public Health, School of Health & Life Sciences, North South University, Dhaka, BANGLADESH, [2]Department of Biostatistics and Epidemiology, University of Massachusetts, Amherst, MA, [3]Research Training and New Program Development, UChicago Research, Dhaka, BANGLADESH, [4]Department of Health Studies, The University of Chicago, Chicago, IL.

Background: Exposure to heavy metals is frequent in Bangladesh. Previous studies have observed adverse health outcomes of a single environmental exposure using conventional statistical methods that suffer from collinearity and variance inflation due to high dimensionality and multicollinearity among heavy metals. We, thus, examined the joint effects of blood arsenic, lead, and selenium on blood pressure outcomes and the extent to which these associations vary by gender using a novel approach. Methods: We evaluated joint effects of blood arsenic, lead, and selenium on blood pressure outcomes in prospectively followed 7,000 participants in the Bangladesh vitamin E and selenium Trial (BEST) in Bangladesh. Blood arsenic, lead, and selenium in blood were measured at baseline; blood pressure was measured at baseline and three biennial follow-up examinations. Generalized weighted quantile sum regression (gWQS) models were used to estimate the joint effects of blood arsenic, lead, and selenium on systolic, diastolic, and pulse pressure taken at third follow up. Results: Overall, gWQS suggested negative joint effects of three heavy metals (arsenic, lead, and selenium) exposure on blood pressure outcomes after adjusting for age, gender, years of education, occupation, cigarette smoking, and ownership of land. The WQS index was negative and significantly associated with systolic (β=-1.320, SE: 0.375, p<0.0001) and diastolic (β=- -0.874, SE: 0.219, p<0.0001) blood pressure. gWQS showed negative but non-significant joint associations of blood arsenic, lead, and selenium with pulse pressure. However, none of these associations were modified by gender. Blood arsenic has the most prominent effect (highest weighted chemical among three) on systolic, diastolic, and pulse pressure. Dose-response relationships seem linear for most of the outcomes. Conclusion: These findings may explain the chemical mixture effects on cardiovascular diseases.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 23
Exposure to Heavy Metals and Its Detrimental Health Effects in Asia and Pacific Region
Chair: Shu-Li Wang, Taiwan

Mercury levels in pregnant women in Japanese general population and child birth size

Presenter: Atsuko Araki, Hokkaido University, Sapporo, Japan

Authors: A. Araki, C. Miyashita, S. Kobayashi, R. Kishi;
Hokkaido University, Sapporo, JAPAN.

In Japan, approximately 80-90% of human mercury (Hg) exposure is derived from fish consumption. In Japan, a methyl-Hg (MeHg) poisoning due to intake of contaminated fish, Minamata Disease occurred in 1956. Since then, Japanese government established environmental standards and emission reduction and guidelines to maintain fish intake. Consequence, MeHg intake remained unchanged since 1994, as mean levels of 8.4 μg/person/day among Japanese general population. In this presentation, we introduce birth cohort studies conducted in Japan, and discuss their association to children's birth size.We have conducted the Hokkaido study on Environment and Children's Health: Sapporo cohort. Pregnant women were enrolled in 2002 to 2005, with total 514 agreement. The maternal hair Hg levels of 1.41 μg/g at delivery. Prenatal exposure to MeHg has no association with newborn anthropometric measurements, although the incidence of babies born small-for gestational age by weight may reduce with higher concentrations of Hg in hair. Fish is the main exposure source of Hg but also of long-chain polyunsaturated fatty acids. High frequency of fish consumption may mask the adverse effects of MeHg on birth size with the beneficial effect of essential nutrition. Other studies in Japan are 1. Tohoku region of Japan with 486 infants in 2001-2003. Median total Hg in whole cold blood is 10.1 ng/g and found no association with a reduction of birth weight among all infant. 2. Japan Environment and Children's Study with approximately 100,000 mothers enrolled from 2011-2014. Total Hg in maternal blood were median 3.66 ng/g. Only slight association was found that compared to infants of lowest maternal Hg quartile, infants of highest maternal Hg quartile had a reduced birth head circumference. Consider as a whole, the results suggest that there are no associations with prenatal Hg exposure and birth size at this level.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 23
Exposure to Heavy Metals and Its Detrimental Health Effects in Asia and Pacific Region
Chair: Shu-Li Wang, Taiwan

The metal exposure from air pollution and health impacts in Asia; It's a review

Presenter: Syed Emdadul Haque, UChicago Research Bangladesh, Dhaka, Bangladesh

Authors: S. Emdadul Haque[1], J. Rana[2], M. Mutahara[3], H. Ahsan[4];
[1]UChicago Research Bangladesh, Dhaka, BANGLADESH, [2]North South University, Dhaka, BANGLADESH, [3]Bridge of Community Development Foundation, Dhaka, BANGLADESH, [4]The University of Chicago, Chicago, IL.

Background: Globally, air pollution is one of the major global environmental health threat and suffering most of the people worldwide. Without any doubt, the global environmental pollution is considered an international public health issue with multiple facets including social, economic, and legislative concerns. The long-term effects associated with air pollution are chronic asthma, pulmonary insufficiency, and cardiovascular mortality. Moreover, air pollution seems to have various malign health effects in early human life, leading to infant mortality or chronic disease in adult age. The situation is worse in low-resources countries which mostly located in Asian countries. Thus, this review was conducted to see the major toxic metal's exposure from air pollution and its impacts on health among people in Asia. Methods: This review was conducted using available online information during 1 January 2012 to 10 March 2020. Results: Air pollution showed disastrous effect on all components of the environment, including water, soil, and air. It poses a serious threat to human health. For example, Particulate Matter (PM) has adverse health effects both in short-term and long-term effects. Besides, Ozone increased the daily number of deaths (0.33%), respiratory deaths (1.13%), and cardiovascular deaths (0.45%). Inhaling carbon monoxide caused headache, dizziness, weakness, nausea, and vomiting. Although Nitrogen Oxide (NO2) is a traffic-related pollutant but its irritant of the respiratory system inducing respiratory diseases, coughing, wheezing, and dyspnea. Sulfur dioxide (SO_2) affects on human, animal, and plant life. Lead toxicity affects on soft tissue, liver, lung, bones, nervous, and reproductive systems.Conclusion: Evidences showed that air pollution impacts on human health. The only way to tackle this problem is through public awareness coupled with a multidisciplinary approach by scientific experts; national and international organizations must address the emergence of this threat and propose sustainable solutions to the policy makers through evidences.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 4
SYMPOSIUM 23
Exposure to Heavy Metals and Its Detrimental Health Effects in Asia and Pacific Region
Chair: Shu-Li Wang, Taiwan

Blood Lead Level Estimates for Low- and Middle-Income Countries

Presenter: Bret Ericson, Macquarie University, Sydney, Australia

Authors:
Bret Ericson, PhD; Howard Hu, MD; Emily Nash, MS; Greg Ferraro, MS; Julia Sinitsky, MA; and Mark Patrick Taylor, PhD

Background
Since the global phase-out of leaded petrol, reports have suggested that lead exposure remains substantial or is increasing in some low- and middle-income countries (LMICs). However, few studies have recently attempted to systematically assess blood lead levels (BLLs) over the full range of LMICs.
Methods
We searched the PubMed database with the keywords 'blood,' 'lead,' and '[country name]' for the 137 countries in World Bank LMIC country groupings, yielding 12,695 articles published between 1 January 2010 and 31 October 2019. They were then screened using pre-defined criteria. Data on BLLs were extracted and pooled, as appropriate, to make country-specific estimates of the distribution of background BLL levels among children and adults, along with information on specific sources of exposure where available.
Findings
The review returned 538 papers containing 1,126 sampled populations from 48 countries comprising 1,012,456 individuals. Background BLLs could be pooled and were used to estimate background BLL distributions for 1·28 billion children in 34 countries. Of these, 631 (95%CI: 395–778) million (49%) were estimated to have BLLs exceeding the U.S. Centers for Disease Control's reference value of 5 µg/dL. The primary reported sources of exposure were occupations (for adults), emissions from battery manufacturing/recycling, electronic waste, mining, and other industries, and consumer products.
Interpretation
Many children have BLLs exceeding 5 µg/dL in LMICs despite leaded petrol phase-outs. Given the toxicity of lead, even at low levels of exposure, urgent attention is required to control exposures and expand population-based sampling in countries with no or scant data.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Untreated wastewaters and their impacts on human health in cases of lake to access to safe drinking waters

Presenter: Driss Belghyti, University Ibn Tofail, Faculty of Sciences, Kénitra, Morocco

Authors: D. BELGHYTI;
University Ibn Tofail, Faculty of Sciences, Kénitra, MOROCCO.

Untreated wastewaters and their impacts on human health in cases of lake to access to safe drinking waters.BELGHYTI DrissAbstract: Morocco is an arid country that faces sporadic periods of drought, that's why it is forced to reuse its used waters raw without any treatment. These waters are highly rich in humus and are available with important quantities. The problem is that the use of these wastewaters raw without any treatment is hazardous for the environment.Our study focused on the used wastewaters of the urban area of Sidi Yahia Gharb rejected without treatment in Tiflet river and their parasitological characterization by three major collectors of the city.On the level of the upstream, percentages of positive samples of helminth eggs found into wastewaters are the Nematodes (Ascaris sp, Trichuris sp, and Enterobious vermicularis) respectively are between 30, 20 and 10%. Cestodes (20% of Teania sp and 20% larvae of Strongles) on the level of domestic collector (C) the Nematodes principally represented by the Ascaris eggs sp. 20% followed by the Trichuris sp 20% while the Ankylostoma eggs sp represent only 10%. The same for Enterobius vermicularis eggs sp represent 10% eggs of Cestodes category were isolated into used waters with percentages of positive samples of 20% for Taenia eggs sp and 10% for nana Hymenolepis eggs for larvae Strongles 10% presented in used waters, on the level of downstream, Netomades category are 60% with 30% of Ascaris sp 10 Ankylostoma sp and Trichuris sp Cestodes category are represented by 20% of Teania sp for Strongyles larvae , the percentage of positive samples are 20%. Exceeding standards of WHO. These parasites represent an eventual danger for the users of the waters of Sidi Yahia Gharb Kénitra.Keywords: wastewaters, parasites, River Tiflet, Sidi Yahia of Gharb, Kenitra, Morocco.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Health Impact Assessment of Contamination of River Ravi

Presenter: Zafar Fatmi, Aga Khan University, Karachi, Pakistan

Authors: Z. Fatmi;
Aga Khan University, Karachi, PAKISTAN.

The River Ravi is one of six transboundary rivers comprising the Indus River system. The Ravi drains a catchment area of about 25,000 km^2 (14,500 km^2 in India; 10,500 km^2 in Pakistan). There are extreme low flows in the River Ravi for most of the year and flows that are considerably lower than historical in the summer monsoon season. Approximately 50 million people of Punjab province live in the basin, with more than 10 million concentrated in Lahore, its largest city. We conducted the health impact assessment of the population of the basin in Pakistan due to contamination of River.The parameters of assessments included communicable and non-communicable diseases associated with water contamination. We initially conducted a systematic review of existing literature about the contamination level and health status of the population in the basin. Secondly, we carried out a review and compilation of the information from nationally representative surveys and management information systems. In addition, we carried out block sampling of water quality regarding biological and chemical contaminants in the river basin. Furthermore, we carried out in-depth interviews of community, public and private sector health care providers and other stakeholders. The fecal coliform and E.coli were in acceptable range in only 71% and 75% of groundwater samples, respectively. However, 80% samples from the metropolitan areas of the basin were contaminated. High levels of TDS and fluoride (52-70%), and arsenic (23%) were also observed across the basin. The water quality across the Ravi River Basin, poses a significant, risk to public health both due to chemical contaminants as well as biological contamination. However, the risk may be mitigated if sufficient effort is made to sensitize the vulnerable communities regarding improved hygiene, and disease prevention measures; combined with efforts to enhance the health care facilities within the basin.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Water and Conflict in the Eastern Mediterranean Region

Presenter: Wael Al-Delaimy, UC San Diego, San Diego, United States

Authors: W. Al-Delaimy;
UC San Diego, San Diego, CA.

Mediterranean Region (EMR) is a hot spot for conflict and political instability, especially in the past decades. This is interrelated to climate change and access to water resources. The EMR includes some of the most water-poor countries globally. The use of existing water, mostly underground, is unsustainable. Even countries with large rivers such as Iraq and Egypt are suffering water shortage that is leading to political tensions and threats of war. Climate change that is causing low rainfall, extreme heatwaves and drought are having a major role in water shortage and indirectly contributing to regional conflicts. This presentation will describe case studies from several EMR countries where water shortage is instigating conflict or exacerbating existing ones. The role of environmental epidemiology is absent and measures for sustainable water use are overtaken by politically driven decisions. This presentation will describe case studies from several EMR countries where water shortage is instigating conflict or exacerbating existing ones in Occupied Palestinian Territories, Syria, Yemen, Egypt, and Iraq. Potential roles of the ISEE EMR Chapter, the WHO, and environmental health researchers are proposed.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Monitoring WASH for Health in the WHO Eastern Mediterranean Region

Presenter: Mazen W Malkawi, World Health Organization Center for Environment and Health, Amman, Jordan

Authors: M. W. Malkawi;
World Health Organization Center for Environment and Health, Amman, JORDAN.

Safe water, sanitation, and hygiene (collectively known as WASH) are crucial for human health and well-being. Yet, Globally, an estimated 2 billion people drink water that is faecally contaminated, 4.5 billion people use a sanitation system that does not adequately protect either their family or the downstream community from harm, and many vulnerable patients and students suffer from poor access to water, sanitation, and hygiene (WASH). In the Eastern Mediterranean Region, only 11 countries report safely managed water informing that 75 million people remain without access to improved drinking water. 14 countries report on safely managed sanitation, 131 million people lack basic sanitation in vulnerable countries of the Region (Afghanistan, Pakistan, Sudan, Somalia, and Yemen). Unfortunately, 54 million people are still practicing open defecation in 5 countries of the Region. In the EMR effective WASH service delivery is not only determined by the state of infrastructure but also by complex institutional, governance and financial management systems. Most countries have requisite components in place, but many countries responded that they have yet to operationalize and fully implement measures to support and strengthen their national WASH systems. In the 11 countries, governments are utilizing the project to: improve national planning and target-setting; improve coordination mechanisms among WASH stakeholders; identify issues and plan activities to overcome these issues; inform policy revisions; support WASH reporting to regional and global bodies; strengthen national WASH monitoring, and to advocate for resources to WASH Future plans are to expand this project to cover the rest of the countries of the Region taking into consideration that some of these countries are living protracted emergencies and conflicts.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Water and Wastewater Management in Healthcare Centers in the West Bank of Palestine

Presenter: Issam Al- Khatib, Birzeit University, Birzeit, Palestinian Territory

Authors: I. Al-Khatib;
Birzeit University, Ramallah-Birzeit, PALESTINIAN TERRITORY.

The availability of drinking water and the proper management of wastewater in healthcare centers are important pillars for maintaining the safety of workers and visitors of these centers. Healthcare wastes include contaminated wastewater, which must be treated before disposed to the environment. Since information from healthcare centers was limited, qualitative and quantitative data were collected and analyzed. The questionnaire study showed that 93% of the healthcare centers in Palestine are connected to public water networks, 4% of them purchase water tanks and 3% of them depend on harvested rainwater which may cause contamination and waterborne diseases. Regardless of the source of fresh water, the water quality has to be regularly examined and compared to local and international standards to promote public health. Almost 58% of the healthcare centers were not connected to wastewater networks and used tight and porous cesspits instead. Once these cesspits were filled off, wastewater was randomly disposed into neighboring valleys causing dramatic environmental impacts on air, water and land resources. Healthcare wastes have to be appropriately treated into medical wastewater treatment plants for safe disposal to the surrounding environment. Proper healthcare wastewater management can protect both public health and the environment in the West Bank.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Remote Sensing & Geographical Information System in Sudan to determine children'sMalnutrition caused by water & environmental factors.

Presenter: Egbal Hashim Mohammed Elnageeb, National Centre For Research, Khartoum, Sudan

Authors: E. H. Elnageeb;
National Centre For Research, Khartoum, SUDAN.

background: sudan has a huge burden of severe acute malnutrition (sam), khartoum state; where this study was conducted is among the top states with increasing number of severely malnourished children in sudan. rapid urbanization in khartoum state has put huge pressure on water supplies. moreover, the incidence of disease is made worse by unclean water & poor hygiene conditions in most poor neighborhoods. furthermore, flooding in khartoum has a major impact on health as pools of stagnant water, coupled with poor sanitation lead to infectious diseases. remote sensing & geographical information system (rs/gis) are applied as instruments.. the main objectives of this study were to investigate applying the gis technique to map the distribution of young children with sam ages 6-59 months in khartoum state in 2016, & to detect the relationship between environmental deficiencies & sam cases.
methods: health data we used included records of 1150 cases of children with complicated sam & 5796 children with non-complicated sam & applying a retrospective study based on hospitals and outpatient therapeutic programme (otps). using rs/gis integrated spatial & non-spatial factors.
results: showed variation of distribution of children with sam in khartoum state as shown by thematic maps influenced by several factors such as: demographic, maternal, socioeconomic & environmental factors. sam cases are concentrated in administrative units (aus) areas where poverty, limited drinking water resources & poor hand washing practices is more preeminent such as alnaser & asalam aus. furthermore, the results showed variation in distribution of sam cases in khartoum state over months of the year (attributed to meteorological factors & floods).
conclusion: both rs & gis technologies have the capability to link & update the information on disease (sam)& monitoring of environmental changes through mapping of cases.

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ABSTRACT E-BOOK

August 27, 2020 / 10:00 - 11:30 / Parallel 5
SYMPOSIUM 2
Water and Sanitation in the Eastern Mediterranean
Chair: Wael Al-Delaimy, US

Water, Sanitation and Hygiene (WASH) Efforts and Sustainable Development Goal 6 (SDG6)

Presenter: Rawan Araj, GHD/EMPHNET, Amman, Jordan

Authors: R. Araj;
GHD/EMPHNET, Amman, JORDAN.

Water, sanitation and hygiene (WASH) can be characterized by accessibility, availability and safety among others. These characteristics are unique to the Eastern Mediterranean Region (EMR) given its context and volatile situation. In this session, WASH services and progress towards the Sustainable Development Goal 6 (SDG 6) related to availability and sustainable management of water and sanitation will be examined. This examination will consider the different challenges faced by EMR countries and the key capacities needed to reach the SDG targets and empower health systems and communities. Focus will be given to some of the SDG6 indicators pertaining to water services, population use, treatment, quality, efficiency, resources, management, cooperation, ecosystem changes, development assistance, procedures and policies. The session will also highlight some of the regional and national approaches for water management and their relation with environmental health issues and some diseases. The discussion will shed light on water scarcity, sanitation and hygiene issues, impact on health, food and waterborne diseases in EMR. Additionally, examples of health stakeholders' initiatives and WASH involvement in the region will be provided, especially from countries in emergencies, vulnerable communities and remote areas. The session will indicate some of the areas where other health stakeholder can collaborate to further assess the WASH situation in the region in relation to health, promote better WASH practices, and generate evidence for policy makers to take needed actions.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 30
Air Pollution, Mental Health, and Behavior
Chairs: Heather Volk, US & Aisha Dickerson, US

Fine particulate matter exposure during childhood relates to hemispheric-specific differences in cortical thickness

Presenter: Megan Herting, University of Southern California, Los Angeles, United States

Authors: M. M. Herting[1], D. Cserbik[1], R. McConnell[1], K. Berhane[2], E. Sowell[3], J. Schwartz[4], D. A. Hackman[1], C. Fan[5], J. Chen[1];
[1]University of Southern California, Los Angeles, CA, [2]Columbia University, New York, NY, [3]Children's Hospital Los Angeles, Los Angeles, CA, [4]Harvard University, Cambridge, MA, [5]University of California San Diego, San Diego, CA.

Background: Hemispheric and regional patterns are an essential feature of child and adolescent neurodevelopment. Emerging findings have increased concern that exposure to fine particulate matter air pollution (aerodynamic diameter ≤2.5 μm; $PM_{2.5}$) may be neurotoxic, even at low-levels. Methods: In the current cross-sectional study, we examined the associations between outdoor $PM_{2.5}$ exposure and brain thickness in 9- and 10- year-old children from the landmark Adolescent Brain Cognitive Development study (N=10,393). FreeSurfer was used to quantify brain structure using high-resolution structural T1-weighted brain scans and yearly $PM_{2.5}$ exposure estimates were assigned to the primary residential address at the study inception using an ensemble-based model. Results: Individual $PM_{2.5}$ exposure levels were found to be largely below the regulatory 12 μg/m^3 standard set by the U.S. Environmental Protection Agency, and only one site had median exposure levels above the World Health Organization's standard of 10 μg/m^3. After multiple comparison correction and adjusting for familial relationships, study site location, as well as age, sex, socioeconomic status, and race/ethnicity, annual residential $PM_{2.5}$ exposure was associated with widespread hemispheric-specific differences in cortical thickness. Specifically, negative associations were seen between exposure and thickness in the left frontal lobes (superior frontal, lateral orbital, cingulate) and right inferior temporal and parahippocampal gyrus, whereas positive associations were seen in the right frontal lobes (lateral orbital, paracentral, and cingulate gyrus) and the left middle temporal gyrus. Conclusions: Structural brain differences in today's developing youth may be attributable to low-levels of ambient fine particulate matter. The observed hemispheric-specific differences in cortical volume associated with exposure suggest that $PM_{2.5}$ neurotoxicity may alter the timing of a synaptic pruning, by either delaying or accelerating this process. A possible biological mechanism of $PM_{2.5}$ on the pruning process may be through its action on microglia cells which engulf dendritic spines during pruning.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 30
Air Pollution, Mental Health, and Behavior
Chairs: Heather Volk, US & Aisha Dickerson, US

Prenatal Fine Particulate Matter Exposure and Childhood Anxiety Symptoms

Presenter: Laura McGuinn, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: L. McGuinn[1], I. Kloog[1], A. Reichenberg[1], A. Just[1], B. Coull[2], S. Martínez Medina[3], L. Schnaas[3], M. Téllez-Rojo[4], R. J. Wright[1], R. O. Wright[1];
[1]Icahn School of Medicine at Mount Sinai, New York, NY, [2]Harvard T.H. Chan School of Public Health, Boston, MA, [3]National Institute of Perinatology, Mexico City, MEXICO, [4]Center for Research on Nutrition and Health, National Institute of Public Health, Cuernavaca, MEXICO.

Background: Air pollution has been linked to neurotoxic effects; however, there is limited research on mental health, particularly in younger populations in which symptoms often first arise. We studied the association between prenatal fine particulate matter ($PM_{2.5}$) exposure and symptoms of anxiety in a cohort of 8-9 year olds in Mexico City.
Methods: Participants included 173 mother-child pairs from the Programming Research in Obesity, Growth, Environment and Social Stressors longitudinal birth cohort in Mexico City. Daily $PM_{2.5}$ predictions were estimated using a 1km satellite-based exposure model and averaged over trimesters and the entire pregnancy. Symptoms of anxiety were assessed using the Revised Children's Manifest Anxiety Scale (RCMAS-2) (Spanish Version) administered by psychologists during the face-to-face interview at the 8-9 year study visit. Linear regression models were used to estimate the change in continuous anxiety symptoms with each 5-$\mu g/m^3$ increase in $PM_{2.5}$, for each trimester and the entire pregnancy. Models were adjusted for maternal education, maternal SES, maternal depression, maternal age, child's age at study visit, and season of conception. We additionally assessed sex-specific effects by including an interaction term between $PM_{2.5}$ and sex.
Results: Higher levels of $PM_{2.5}$ exposure averaged over the entire pregnancy was associated with increases in childhood anxiety symptoms at age 8-9, in males only (β for males = 2.06, 95% CI: 0.20, 3.91; β for females = -0.45, 95% CI: -2.38, 1.48; p-int: 0.02). This sex-specific effect was primarily seen for exposures during the 1st trimester (β for males= 1.13, 95% CI: -0.06, 2.32, p-int: 0.06).
Conclusions: $PM_{2.5}$ exposure in early pregnancy may be a critical window for elevated symptoms of anxiety in the mid/late childhood period. Future analyses will use distributed lag models to further define time and sex-specific effects, as well as adjust for other urban stress correlates such as environmental noise.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 30
Air Pollution, Mental Health, and Behavior
Chairs: Heather Volk, US & Aisha Dickerson, US

Identifying Sensitive Windows of Air Lead Exposure Associated with Behavioral Outcomes at Age 12

Presenter: Erika Rasnick, Cincinnati Children's Hospital Medical Center, Cincinnati, United States

Authors: E. Rasnick[1], P. Ryan[1], A. J. Bailer[2], T. Fisher[2], K. Yolton[1], N. C. Newman[1], B. P. Lanphear[3], C. Brokamp[1];
[1]Cincinnati Children's Hospital Medical Center, Cincinnati, OH, [2]Miami University, Oxford, OH, [3]Simon Fraser University, Burnaby, BC, CANADA.

Background: Despite the precipitous decline of airborne lead concentrations following the phase-out of leaded gasoline, lead is still detectable in ambient air in urban areas. Few studies, however, have examined the health effects of contemporary airborne lead concentrations in children.
Objective: To determine if airborne lead concentrations are associated with behavioral outcomes in children and identify sex-specific developmental periods of vulnerability.
Methods: We estimated monthly air lead exposure among 263 children from the Cincinnati Childhood Allergy and Air Pollution Study (CCAAPS), using temporally scaled predictions from a validated land use model, and assessed behavioral outcomes at age 12 years using the parent-completed Behavioral Assessment System for Children, 2nd edition (BASC-2). We used distributed lag models (DLMs) to estimate the effect of air lead exposure on behavioral outcomes while adjusting for maternal education, community-level deprivation, blood lead concentration measured at age 12, greenspace, and traffic-related air pollution. Sex-stratified DLMs were fit when the air lead-sex interaction was significantly associated with BASC-2 scores.
Results: We observed a potential window of vulnerability during the first year of life, peaking at birth, where an IQR-increase (0.56 ng/m^3) in airborne lead was associated with a 2.1-point (95% CI: 0.8, 3.4) increase in BASC-2 anxiety scores. In females, we also observed an association between increased air lead during the first two years, peaking at birth, and elevated depression scores (3.5 points/IQR; 95% CI: 1.8, 5.2). Finally, we observed associations between air lead exposure during the first two years of life with aggression and conduct problem scores among females, but not males.
Discussion: Associations between exposure to air lead concentrations and elevated anxiety (entire cohort) and depression (females only) scores were observed at concentrations ten-times lower than the National Ambient Air Quality Standards set by the U.S. Environmental Protection Agency.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 1
ORAL SESSION 30
Air Pollution, Mental Health, and Behavior
Chairs: Heather Volk, US & Aisha Dickerson, US

Mental Health Outcomes Associated with Air Pollutants in California

Presenter: Rupa Basu, Office of Environmental Health Hazard Assessment, Cal EPA, Oakland, United States

Authors: R. Basu[1], A. Maithy-Nguyen[2], R. Thilakaratne[2], B. Malig[1];
[1]Office of Environmental Health Hazard Assessment, Cal EPA, Oakland, CA, [2]UC Berkeley School of Public Health, Berkeley, CA.

Background: Epidemiologic studies of air pollution and mental health are limited. We examined ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), and fine particles ($PM_{2.5}$), and emergency room (ER) visits from all mental disorders, bipolar disorder, depression, schizophrenia, substance abuse, homicide/inflicted injury, and suicide/self-harm. We also evaluated effect modification by season, age, race/ethnicity, and gender. Methods: Air pollutant data, provided by the US EPA, and ER visit data from the California Office of Statewide Health and Development Planning, were merged from 2005 through 2013. Data analyses were conducted using two-stage quasi-Poisson regression models, adjusting for long-term trends, holidays, day of the week, and mean apparent temperature. Several lag periods were considered (same day up to average of 7 days and average of 30 days). Results: Per interquartile range, weekly mean O_3 was associated with a 1.87% (95% confidence interval [CI]: 0.62, 3.15) increase in ER visits for depression (n = 162,451), a 1.43% (0.35, 2.51) increase for suicide/self-harm (n = 198,509), and a 2.83% (1.53, 4.15) increase for bipolar disorder (n = 158,906). O_3 (30 day lag; n = 632, 787), CO (2 day lag; n = 229,138) and NO_2 (2-day lag; n = 206,919) were associated with greater risks for homicides/self-inflicted injury (2.01% [1.01, 3.02]; 2.3% [1.3, 3.3]; and 2.6% [1.2, 4.0], respectively). Greater risk was found during the warm season for CO and NO_2. For some outcomes, differential risk was observed by gender, age, and race/ethnicity. These associations generally remained robust in co-pollutant models. No associations were found between $PM_{2.5}$ and any of the mental health outcomes considered. Conclusions: Our results suggest that short-term gaseous air pollution exposure increases the risk of homicides/inflicted injury (CO, NO_2 and O_3), and depression, suicide/self harm, and bipolar disorder (latter three outcomes for O_3 only) in California.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 31
Environmental Chemicals and Metabolic Health from Pregnancy to Adolescence
Chairs: Remy Slama,France & Barrett Welch, US

Prenatal exposure phthalates and the association with maternal hyperglycemia, impaired glucose intolerance, gestational diabetes, and gestational weight gain in a high-risk Latina population

Presenter: Helen Zukin, University of California Berkeley, Berkeley, United States

Authors: H. Zukin, B. Eskenazi, N. Holland, K. Harley;
University of California Berkeley, Berkeley, CA.

Background: Phthalates are ubiquitous in our environment and are frequently detected in humans. Commonly found in plastics and personal-care items, phthalates are considered endocrine disruptors. Some studies have associate phthalate concentrations in pregnancy with maternal hyperglycemia and gestational diabetes (GDM), however most studies have been in low-risk white and well-educated populations.
Objective: We investigated the relationship between concentrations of 11 prenatal urinary phthalate metabolites and GDM, impaired glucose tolerance (IGT), continuous plasma glucose level, and gestational weight gain (GWG) in a population of pregnant Latina women (N=415) in the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) cohort study.
Methods: Urine samples were collected twice during pregnancy and analyzed for phthalate metabolites using mass spectrometry. Gestational glucose levels, diagnoses of prior diabetes and GDM, and GWG were abstracted from medical records. We used multi-variable logistic and multi-linear regressions to evaluate the association between urinary phthalate metabolites (as continuous variables and quartiles of exposure) and maternal glycemic outcomes.
Results: Most women had detectable urinary phthalate metabolites, with detection frequencies for individual phthalates ranging from 100% to 87.7% and metabolite concentrations similar to those of a nationally representative sample. Thirty-one (7.5%) participants developed GDM, compared to the U.S. average in 2000 of 3.7%. Forty-nine (14.7%) participants experienced IGT. Monoethyl phthalate metabolite concentrations were associated with an increase odds of excessive GWG (OR: 1.15, 95% CI: 1.0 to 1.3). Contrary to previous studies, we observed no statistically significant association between any phthalate metabolite and GDM, IGT, or maternal glucose level.
Conclusion: While this study does not support previous findings of associations of maternal prenatal phthalate exposure and increased risk for maternal glucose metabolic intolerance and the development of GDM, it does suggest a possible mechanism of promoting excessive GWG.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 31
Environmental Chemicals and Metabolic Health from Pregnancy to Adolescence
Chairs: Remy Slama,France & Barrett Welch, US

Prenatal urinary phthalates and postpartum metabolic health in Women from Mexico City

Presenter: Haotian Wu, Columbia University Mailman School of Public Health, New York, United States

Authors: H. Wu[1], A. C. Just[2], E. Oken[3], N. McRae[2], A. Cantoral[4], R. O. Wright[2], M. M. Téllez-Rojo[4], A. A. Baccarelli[1], A. L. Deierlein[5];
[1]Columbia University Mailman School of Public Health, New York, NY, [2]Icahn School of Medicine at Mount Sinai, New York, NY, [3]Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA, [4]Center for Nutrition and Health Research, National Institute of Public Health, Cuernavaca, MEXICO, [5]School of Global Public Health, New York University, New York, NY.

Studies have reported associations between phthalates, a family of ubiquitous environmental contaminants, and metabolic complications of pregnancy, but no study has considered these outcomes beyond pregnancy. We examined associations of prenatal phthalates exposure with postpartum metabolic health biomarkers in the PROGRESS cohort.
The longitudinal PROGRESS cohort includes 948 pregnant women recruited during the second trimester from 2007 to 2011. We quantified 15 phthalate metabolites from spot urines collected during the second and third trimesters. Maternal metabolic health biomarkers were fasting blood measures of glycemia [glucose, insulin, %glycated hemoglobin (HbA1C%)] and lipids (total, high-density lipoprotein (HDL-C), low-density lipoprotein (LDL-C) cholesterol, and triglycerides], collected at 48 and 72 months postpartum. We used linear mixed models, weighted quantile sum regression, and Bayesian Kernel Machine Regression to estimate associations of geometric mean urinary phthalate metabolite concentrations (between 2nd/3rd trimesters) and metabolic health biomarkers.
In multivariable-adjusted linear mixed models, each doubling of mean urinary mono-2-ethyl-5-carboxypentyl terephthalate (MECPTP) was associated with 0.12 uIU/L greater plasma insulin (95%CI: 0.0, 0.25) and 0.06% greater HbA1C% (95%CI: 0.03, 0.09). Mixtures analyses indicated that phthalate mixtures were positively associated with plasma insulin and HbA1c% and MECPTP and diisobutyl phthalate metabolites were the primary drivers. Mediation analyses found that greater gestational weight retention (GWR) mediated 29% of the observed association between urinary MECPTP and plasma insulin. No mediation by GWR was observed for HbA1C%.
We found that prenatal MECPTP concentrations were positively associated with plasma insulin and HbA1C% up to 72 months postpartum. In previous analyses of this cohort, we found that prenatal MECPTP was associated with greater GWR and blood pressure. Collectively, these findings suggest that exposure to di-2-ethylhexyl terephthalate, parent compound of MECPTP, may contribute to poorer metabolic health among women. GWR may be one mediator of later metabolic dysfunction; other underlying mechanisms and clinical implications are unknown.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 31
Environmental Chemicals and Metabolic Health from Pregnancy to Adolescence
Chairs: Remy Slama,France & Barrett Welch, US

Prenatal exposure to multiple persistent organic pollutants and childhood BMI trajectories- a comparison of three different methods for exposure mixture analysis in a mixed model framework

Presenter: Elena Colicino, -Mount Sinai, New York, United States

Authors: E. Colicino[1], K. Margetaki[2], N. Stratakis[2], M. Vafeiadi[3], T. Roumeliotaki[3], S. Kyrtopoulos[4], H. Kiviranta[5], E. Stephanou[3], M. Kogevinas[6], R. McConnell[2], K. Berhane[7], L. Chatzi[2], D. Conti[2];
[1]-Mount Sinai, New York, NY, [2]Keck School of Medicine, University of Southern California, Los Angeles, CA, [3]University of Crete, Heraklion, GREECE, [4]National Hellenic Research Foundation, Athens, GREECE, [5]National Institute for Health and Welfare, Kuopio, FINLAND, [6]Universitat Pompeu Fabra, Barcelona, SPAIN, [7]Mailman School of Public Health, Columbia University, New York, NY.

Background: Prenatal exposure to organochlorine compounds has been associated with increased risk for pediatric obesity; however, evidence is still inconclusive and most previous studies did not include repeated outcome measures.Aim: To determine the association between prenatal exposure to three organochlorine pesticide and six polychlorinated biphenyl concentrations in 2nd pregnancy trimester maternal serum and childhood body mass index (BMI) trajectories across 4 to 11 years of age in 280 child-mother dyads from the prospective mother-child RHEA study.Methods: We first applied independent linear mixed effect models to evaluate the association between individual compounds and BMI trajectories, using a Bonferroni adjustment to account for multiple comparisons. As an alternative, we applied the Bayesian Weighted Quantile Sum Regression (BWQSR) to model all exposures jointly and to provide an overall association of all compounds on BMI trajectories. We also used the Bayesian varying coefficient kernel machine regression (BVCKMR) to model the exposure mixture jointly while allowing for non-linear and non-additive associations. All results were adjusted for socio-demographic information.Results: From the linear mixed model, a 10-fold increase of HCB and PCB-118 was significantly associated with 0.5 kg/m2 (95%CI: 0.3, 0.7) and 0.3 kg/m2 (95%CI:0.2, 0.6) increase in BMI trajectories across 4-11 years respectively. The BWQSR found that an increase in the chemicals mixture was associated with an increase of 0.12 kg/m2 (95%CI: 0.02, 0.24) in childhood BMI trajectories; HCB, DDE, and PCB-156 were important drivers of this association, as indicated by posterior inclusion probabilities. The BVCKMR identified positive associations of HCB, DDT, and PCB-118 with BMI trajectories and a negative association between DDE and BMI trajectories.Conclusions: Despite some inconsistencies, all three analyses demonstrated a positive association between HCB and BMI trajectories. Novel methods offer new opportunities for assessing exposure mixture effects on outcome trajectories, but results should be interpreted considering each method's strengths and limitations.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 31
Environmental Chemicals and Metabolic Health from Pregnancy to Adolescence
Chairs: Remy Slama,France & Barrett Welch, US

Periods of Susceptibility: Exposure to Per- and Polyfluoroalkyl Substances and Children's Body Composition

Presenter: Yun Liu, Brown University, Providence, United States

Authors: Y. Liu[1], N. Li[1], G. D. Papandonatos[1], A. M. Calafat[2], A. Chen[3], B. P. Lanphear[4], K. M. Cecil[5], H. J. Kalkwarf[5], K. Yolton[5], J. M. Braun[1];
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Background/Aim: Some epidemiological studies suggest that per- and polyfluoroalkyl substances (PFAS) exposure may increase adiposity and obesity risk in children. However, we are unaware of any studies extending these findings into adolescence or identifying potential periods of heightened susceptibility. Thus, we estimated associations of five repeated measures of pre- and postnatal PFAS exposure with body composition in adolescence.
Methods: We studied 212 mother-offspring pairs from the HOME Study, a prospective pregnancy and birth cohort study that enrolled pregnant women in Cincinnati, OH from 2003-2006. We quantified serum perfluorooctane sulfonate (PFOS), perfluorooctanoate (PFOA), perfluorononanoate (PFNA), and perfluorohexane sulfonate (PFHxS) concentrations in mothers at ~16 weeks gestation and their children at birth and ages 3, 8, and 12 years. At 12 years, we assessed children's adiposity using anthropometry and dual X-ray absorptiometry (DXA). We used multiple informant models to estimate covariate-adjusted associations of ln-transformed PFAS with adiposity measures for each exposure period, and tested the difference in these associations.
Results: Prenatal serum concentrations of all four PFAS were positively associated with body fat, but there was no clear pattern for postnatal PFAS exposures. For instance, each ln-transformed increase in prenatal PFOA and PFHxS was associated with higher android (PFOA: β=1.9%, 95%CI: 0.0, 3.8; PFHxS: β=2.0%, 95%CI: 0.2, 3.9) and visceral fat percent (PFOA: β=1.9%, 95%CI: -0.2, 3.9; PFHxS: β=2.4%, 95%CI: 0.5, 4.4). Associations were generally stronger for central adiposity measures compared to peripheral ones. In multipollutant models, prenatal PFOA and PFHxS were more strongly associated with body fat than PFOS and PFNA. We observed evidence suggesting that prenatal PFOA was more strongly associated with greater adiposity in girls, but not boys.
Conclusions: Prenatal, but not postnatal, serum concentrations of PFAS, particularly PFOA and PFHxS, were positively associated with measures of central body fat in adolescence.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 31
Environmental Chemicals and Metabolic Health from Pregnancy to Adolescence
Chairs: Remy Slama,France & Barrett Welch, US

Prenatal and postnatal exposure to per- and polyfluoroalkyl substances (PFAS) and cardiometabolic profile in children from six European cohorts.

Presenter: Eleni Papadopoulou, Norwegian Institute of Public Health, Oslo, Norway

Authors: E. Papadopoulou[1], N. Stratakis[2], X. Basagaña[3], M. Casas[3], D. V. Conti[2], S. Fossati[3], R. Gražulevičienė[4], L. S. Haug[1], B. Heude[5], L. Maitre[3], R. R. McEachan[6], O. Robinson[7], T. Roumeliotaki[8], R. Slama[9], J. Urquiza[3], M. Vafeiadi[8], J. Wright[6], M. Vrijheid[3], L. Chatzi[2];
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Developmental low-dose exposures to PFASs have been linked to reduced birth weight and impaired immune function, while there is less consistent evidence on obesogenic effects, insulin resistance, high blood pressure, dyslipidemia, and the composite metabolic syndrome in children. In 1089 mother-child pairs from six European birth cohorts, we examined the association between prenatal and postnatal exposure to PFAS and a composite metabolic syndrome score (MetS score) and its components: waist circumference, systolic and diastolic blood pressure (BP), HDL cholesterol (HDL-C), triglycerides and insulin. Maternal concentrations of perfluorooctanoate (PFOA), perfluorononanoate (PFNA), perfluorohexane sulfonate (PFHxS) and perfluorooctane sulfonate (PFOS) were measured in blood collected during pregnancy and child PFOA, PFNA, perfluoroundecanoate (PFUnDA), PFHxS and PFOS in samples collected at the 8-years follow-up (age range: 6-12 years). All PFAS concentrations were log-transformed and the outcomes were gender and age standardized z-scores. We applied Bayesian Kernel Machine Regression (BKMR) to examine exposure-outcomes associations. Pre- and post-natal exposure to a mixture of PFASs was negatively associated with the MetS score, insulin and waist circumference and positively associated with HDL-C and systolic BP. When exposure of the PFAS mixture was at the 75th percentile vs 25th percentile, the reduction in MetS score was -0.39 (95%CI=-0.67,-0.12), in insulin z-score -0.12 (95%CI=-0.23,-0-01), in waist circumference z-score -0.20 (95% CI=-0.39, -0.07). Postnatal PFOA and PFNA were the main contributors in the derived PFAS mixture, as shown by the high posterior inclusion probabilities (PIPs>0.50). The corresponding increase in HDL-C and systolic BP z-scores when comparing the PFAS exposure at the 75th percentile vs. 25th percentile was 0.20 (95% CI=0.00,0.40) and 0.35 (95% CI=0.04, 0.67), respectively. Our results indicate that developmental exposure to PFASs is associated with lower cardiometabolic risk. The underlying role of inflammatory and lipid regulation pathways will also be studied.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 2
ORAL SESSION 31
Environmental Chemicals and Metabolic Health from Pregnancy to Adolescence
Chairs: Remy Slama,France & Barrett Welch, US

Dysregulated Lipid and Fatty Acid Metabolism link Perfluoroalkyl Substances Exposure and Impaired Glucose Metabolism in Young Adults

Presenter: Zhanghua Chen, University of Southern California, Los Angeles, United States

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The aim of this project is to investigate the association between perfluoroalkyl substances (PFAS) exposure and altered metabolic pathways linked to increased cardiometabolic risk in young adults. The study population comprised 102 young adults (17-22 years, 60% Hispanic) enrolled in Southern California during 2014-2017. A spectrum of cardiometabolic outcomes were measured including oral glucose tolerance test (OGTT) measures, body fat percent, ectopic fat, and lipid profiles. High-resolution metabolomics was used to quantify plasma exposure levels of three PFAS congeners and intensity profiles of the untargeted metabolome. Fasting concentrations of 45 targeted metabolites involved in key metabolic pathways including fatty acid and lipid were used to replicate untargeted metabolomics findings. Bayesian Kernel Machine Regression (BKMR) was used to examine the associations between PFAS exposure mixture and cardiometabolic outcomes adjusting for covariates. Metabolome-wide association analysis followed by Mummichog pathway analysis were used to explore PFAS-associated metabolic pathways. Furthermore, the effect of PFAS exposure on the entire metabolic network including metabolomic profiles and multiple cardiometabolic traits were investigated by integrated network analysis. Higher exposure to perfluorooctanoic acid (PFOA) was associated with higher 30-minute glucose levels and glucose AUC during OGTTs ($p<0.001$). These associations were stronger among Hispanic participants. PFAS exposure was also associated with altered lipid pathways, including glycerophospholipid, glycosphingolipid and unsaturated fatty acids, which could contribute to the link between PFOA and higher glucose levels after OGTTs. Targeted metabolomics analysis further supported the findings that higher PFOA exposure was associated with higher levels of glycerol and short-chain acylcarnitines ($p=0.004$ and 0.046, respectively), which themselves were also associated with higher 30-min glucose ($p<0.01$). In conclusion, increased lipolysis and fatty acid oxidation could contribute to the biological mechanism linking PFAS exposure and impaired glucose metabolism among youth. The Hispanic population may be more susceptible to the adverse effect of PFAS on glucose metabolism.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 32
Causal Inference in Environmental Epidemiology
Chairs: Tarik Benmarhnia, US & Erika Garcia, US

The relationship between phthalate risk score and gestational age at delivery is mediated by cytochrome p450 derived eicosanoids: application of a novel analytical pipeline for high-dimensional multivariate mediation analysis

Presenter: Max Aung, University of Michigan, Ann Arbor, United States

Authors: M. T. Aung[1], Y. Song[1], K. K. Ferguson[2], D. E. Cantonwine[3], L. Zeng[1], T. F. McElrath[3], S. Pennathur[1], B. Mukherjee[1], J. D. Meeker[1];
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Background: There are diverse toxicological mechanisms that may mediate the impact of several toxicant classes (phthalates, phenols, polycyclic aromatic hydrocarbons, and metals) on pregnancy outcomes. However, there is a critical knowledge gap for the assessment of high-dimensional mediation with biomarkers of inflammation, oxidative stress, and lipid metabolism pathways (cytochrome p450, lipoxygenases, cyclooxygenases). The objective of this study is to introduce an analytical pipeline that implements high-dimensional mediation analysis through dimension reduction of exposures analytes and endogenous mediator biomarkers.Methods: We implemented a high-dimensional mediation analysis pipeline in the LIFECODES prospective birth cohort (n=161), focusing on identifying mediation pathways using endogenous signaling molecules (q=63 biomarkers of intermediate effect) in the relationship between multiple environmental toxicants (p=38 exposure biomarkers) and gestational age at delivery. Our analytical pipeline included: (1) pairwise mediation with every possible unique combination of biomarkers of exposure and intermediate effect, (2) mediator shrinkage using Bayesian shrinkage mediation analysis and dimension reduction using population value decomposition, and (3) combining exposure dimension reduction by estimating environmental risk scores for each toxicant class. Results: Pairwise mediation yielded subtle natural indirect effects with no significant total or direct effects. Mediator and exposure dimension reduction demonstrated that one unit increase in the phthalate risk score was associated with a total effect of a 1.09 week reduction in gestational age at delivery (95% confidence interval: 1.78 - 0.36 weeks) and that 24.5% of this effect was mediated by the cytochrome p450 pathway.Conclusions: Although sparse effects are observed for individual exposure biomarkers, especially in underpowered samples, our findings for the cumulative effect of phthalates underline the importance of investigating these toxicants as mixtures. Endogenous eicosanoid products of the cytochrome p450 pathway may be important mediators for the toxic effects of phthalates during pregnancy.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 32
Causal Inference in Environmental Epidemiology
Chairs: Tarik Benmarhnia, US & Erika Garcia, US

Maternal experience of multiple hardships and fetal growth: Extending environmental mixtures methodology to social exposures

Presenter: Dana Goin, UCSF, San Francisco, United States

Authors: D. Goin[1], M. Izano[2], S. Eick[1], A. Padula[1], E. DeMicco[1], T. Woodruff[1], R. Morello-Frosch[1];
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Background: Women can be exposed to a multitude of hardships prior to and during pregnancy that may affect fetal growth, but previous approaches have not analyzed them jointly as social exposure mixtures. Methods: We evaluated the independent, mixture, and pairwise joint associations between self-reported hardships and birthweight and birthweight for-gestational age z-scores in the Chemicals in Our Bodies-2 prospective birth cohort (N=510) using G-computation. We examined financial hardship, food insecurity, job strain, poor neighborhood environment, low perceived social status, caregiving, stressful life events, and unplanned pregnancy collected via questionnaire administered in the second trimester of pregnancy. We used propensity score-based restriction to ensure our analyses had sufficient data support and estimated absolute differences in outcomes. Analyses were adjusted for maternal age, race/ethnicity, educational attainment, and pre-pregnancy body mass index.
Results: Food insecurity and job strain were most strongly associated with reduced birthweight individually, with absolute differences of -155 g (95% confidence interval [CI] -316, 6) and -178 g (95% CI -347, -9), respectively. The pattern of association with birthweight for gestational age z-scores was similar for food insecurity, with an absolute difference of -0.20 (95% CI -0.49, 0.09), while the association for job strain was attenuated [-0.03 (95% CI -0.34, 0.28)]. Accounting for co-exposures resulted in similar findings. The pairwise joint effects on birthweight were strongest for food insecurity in combination with unplanned pregnancy [-305 g (95% CI -580, -29)] and stressful life events [-354 g (95% CI -612, -95)].
Conclusions: Experiencing food insecurity and job strain during pregnancy may affect fetal growth, and experience of multiple hardships may exhibit stronger effects on this health outcome.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 32
Causal Inference in Environmental Epidemiology
Chairs: Tarik Benmarhnia, US & Erika Garcia, US

Associations of BFR mixtures with ASD risk and SRS scores.

Presenter: Ghassan Hamra, Johns Hopkins University, Baltimore, United States

Authors: G. B. Hamra[1], R. F. MacLehose[2], L. Croen[3], C. Newschaffer[4];
[1]Johns Hopkins University, Baltimore, MD, [2]University of Minnesota, Minneapolis, MN, [3]Kaiser Permanente, Oakland, CA, [4]Penn State University, State College, PA.

Abstract
Objectives: To determine the association between a mixture of Brominated Flame Retardants (BFRs) and both Autism Spectrum Disorder (ASD) diagnoses and Social Responsiveness Scale (SRS) scores. Methods: We applied a novel Bayesian approach to estimate the association between BFRs (PBDEs 28, 47, 99, 100, and 153) and ASD diagnosis and SRS scores. This approach estimates a summed mixture effect and a percent contribution of each mixture component to that effect. Results: In adjusted models using EARLI data, the odds of ASD for a 1-unit increase in the weighted sum of PBDEs were 1.41 (95% highest posterior density 0.82, 2.50) times the odds of ASD for the unexposed and the change in z-score standardized SRS per 1 unit increase in the weighted sum of PBDEs is 0.15 (95% highest posterior density -0.08, 0.38) Conclusion: Our results suggest a relationship between PBDE exposures and both ASD diagnosis and increased SRS scores; components of the PBDE mixture were mostly similar in their contribution to this relationship. Our approach is more flexible than existing approaches and can be specified to allow multiple exposure groups based on a priori knowledge from epidemiology or toxicology.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 32
Causal Inference in Environmental Epidemiology
Chairs: Tarik Benmarhnia, US & Erika Garcia, US

Health Effects of Air Quality Regulations in Seoul Metropolitan Area: Applying Synthetic Control Method to Controlled Interrupted time Series Analysis

Presenter: Soo-yeon Kim, Korea university, Seoul, Korea, Republic of

Authors: S. Kim, J. Lee, H. Kim, G. Byun, Y. Choi;
Korea university, Seoul, KOREA, REPUBLIC OF.

Background: As air pollution became a major public health concern, there have been various air quality regulations since 2005 in Seoul metropolitan area, South Korea. However, there are a few studies to evaluate the health effects of these regulations so far. Thus, this study aims to estimate the health effects of the air quality regulations on cause-specific mortality rate (all-cause, cardiovascular, and respiratory mortality rate) in Seoul and Incheon with applying synthetic control method (SCM) to controlled interrupted time series (CITS). Methods: We firstly analyzed the trend of air pollution with descriptive statistics to hypothesize how the intervention would impact on the health effects. Then we constructed synthetic controls (SC) for each cause-specific mortality rate that is made to predict the counterfactual trends of mortality rate in each intervention group. We checked prediction fit of SC with normalized root mean squared error. After selecting well-predicting SC, we finally tested whether the air quality interventions had beneficial effects on cause-specific mortality rate with CITS. Results: We found that the air quality regulations were effective on reducing emission and ambient concentration of PM_{10} . At the stage of SCM, we identified that only the SCs of all-cause mortality rate and cardiovascular mortality rate, not respiratory mortality rate, predicted the counterfactual trend of mortality rate well in both Seoul and Incheon. We found robust evidence that the air quality regulations had beneficial effects on cardiovascular mortality rate in Seoul and Incheon at the stage of CITS. We identified that the regulations prevented monthly deaths due to cardiovascular diseases up to about 14% and 9% in Seoul and Incheon, respectively. Conclusions: With applying SCM to CITS, this study provides additional epidemiologic evidence that the air quality regulations implemented after 2005 in Seoul metropolitan area had beneficial effects on cardiovascular mortality rate in Seoul and Incheon.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 3
ORAL SESSION 32
Causal Inference in Environmental Epidemiology
Chairs: Tarik Benmarhnia, US & Erika Garcia, US

Air Pollution and Autism Spectrum Disorder in Israel: A Negative Control Analysis

Presenter: Raanan Raz, The Hebrew University of Jerusalem, Jerusalem, Israel

Authors: H. Magen-Molho[1], O. Pinto[2], D. Broday[3], K. Itai[4], A. Shtein[5], H. Levine[6], M. G. Weisskopf[7], D. Nevo[8], R. Raz[1];
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Background: Accumulating evidence suggest that perinatal exposure to particulate matter (PM), nitrogen dioxide (NO2) and nitrogen oxides (NOx), is associated with risk of autism spectrum disorder (ASD). However, evidence for such associations has been inconclusive. In addition, residual confounding remains a concern even when associations are present.
Methods: Based on data from the National Insurance Institute of Israel (NII), we conducted a population-based nested case-control study. Two populations were constructed of all cases of ASD under two separate exposure models of different spatiotemporal coverage: a satellite-based hybrid PM exposure model (N cases = 8,324, N controls = 83,240, born 2004-2012), and an optimized dispersion NO_2/NOx exposure model (N cases = 4,167, N controls = 41,670, born 2006-2012). Controls were 10 randomly selected children without ASD per case, of the same year of birth and spatial coverage for each study population. Exposure assessment was conducted for four time periods: 9 months before pregnancy, the entire pregnancy, first 9 months of life, and first 9 months after diagnosis. The post-diagnosis period was used as a negative control exposure, presumably impacted by the same possible confounders, but for which no causal effect is possible. Associations were estimated using logistic regression models, adjusted for year and calendar month of birth, population group, census-tract SES, and income.
Results: In separate single-pollutant, single-period models, all exposures over all periods were positively associated with ASD (e.g., OR [95% CI] for $PM_{2.5}$, NO_2 postnatal exposures = 1.13 [1.08-1.19] and 1.13 [1.1-1.17], respectively). In models that included both possibly-causal (pre-pregnancy, pregnancy, postnatal) and post-diagnosis exposure periods, OR [95% CI] for $PM_{2.5}$, NO_2 post-diagnosis exposure were 1.06, [1.02-1.09], and 1.04, [0.94-1.16], respectively.
Conclusions: Our negative control analyses indicate that postnatal exposure to NO_2 (and possibly NOx), but not other pollutants or periods, may increase the risk of ASD.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 33
Big Data in Air Pollution Health Studies: Computational Challenges and Advances
Chairs: Allan Just, US & Marianthi-Anna Kioumourtzoglou, US

Impact of Long-term Exposures to $PM_{2.5}$ Sources on Cause-Specific Mortality in U.S. Medicare Beneficiaries

Presenter: Fatemeh Kazemiparkouhi, University of Utah, Malden, United States

Authors: F. Kazemiparkouhi[1], K. Eum[1], B. Wang[2], T. Honda[3], J. Manjourides[2], H. Suh[1];
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Background: While studies have demonstrated associations between long-term $PM_{2.5}$ exposures and mortality, our understanding of the component(s) or sources responsible for observed mortality risks is poor. Methods: We examined the impacts of long-term $PM_{2.5}$ source and component exposures on cause-specific mortality for 15.4 million Medicare beneficiaries living within the conterminous United States between 2000 to 2008. We linked Medicare beneficiary and mortality data to daily $PM_{2.5}$ component concentrations from 323 stationary monitoring sites and to source-specific $PM_{2.5}$ estimated using factor analysis. We analyzed these data in age-, race-, and gender-stratified log-linear regression models controlling for potential confounding by other $PM_{2.5}$ components and area-level demographic and behavioral covariates. We assessed sensitivity of the mortality risk estimates to (1) variation in source estimates by urbanicity and geographical region and (2) to exposure error. Findings: We identified eight major $PM_{2.5}$ source categories (and key elements): soil (Si, Ca), traffic (EC, OC, NO_3^-), metals (Pb and Zn), biomass combustion (K and Cu), salt (Cl, Na), coal combustion (SO_4^{2-} Se), residual oil combustion (Ni, V) and steel (Mn, Fe). For all causes of death, we found the highest and most consistent RRs (per IQR increase) for coal combustion ($MRR_{all\text{-}cause}$: 1.052 (95% CI: 1.048-1.056)) and its key tracer elements, with no evidence of confounding by behavioral covariates. Traffic $PM_{2.5}$ was also significantly associated with increased risk of all-cause ($MRR_{all\text{-}cause}$: 1.010; 95% CI: 1.008, 1.012), CVD- and respiratory-related, and lung cancer mortality but not all cancer-related mortality. Associations were generally null for other examined $PM_{2.5}$ sources and causes of death. Conclusions: We found long-term $PM_{2.5}$ exposures from coal combustion and traffic-related sources to be most strongly associated with increased mortality for all causes of death.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 33
Big Data in Air Pollution Health Studies: Computational Challenges and Advances
Chairs: Allan Just, US & Marianthi-Anna Kioumourtzoglou, US

Estimates of Ozone-Attributable Burden of Disease in Urban Areas Worldwide

Presenter: Daniel Malashock, Department of Environmental and Occupational Health, Milken School of Public Health, George Washington University, Washington, United States

Authors: D. Malashock[1], S. Anenberg[1], M. Delang[2], J. Becker[2], M. Serre[2], J. West[2], K. Chang[3], O. Cooper[3]; [1]Department of Environmental and Occupational Health, Milken School of Public Health, George Washington University, Washington, DC, [2]Department of Environmental Sciences & Engineering, University of North Carolina, Chapel Hill, NC, [3]Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO.

City-level estimates of the respiratory disease burden attributable to ambient ozone exposure are sparsely available, especially for low and middle-income countries. Over half of the world's population now currently reside in urban areas, which underscores a need for improved understanding of the impact of urban air pollution on health. Until now, estimates of ozone-attributable respiratory mortality, such as those conducted by the 2017 Global Burden of Disease Study, have been constrained to a national and global scale only, due to limitations with respect to spatial resolution. However, the recent availability of air pollution datasets at a finer resolution has created an opportunity to produce such estimates at a city-level. Our approach uses year-specific 6-month average of the 8-hour daily maximum ozone concentration estimates, population, disease rates, and concentration-response relationships from the forthcoming 2019 Global Burden of Disease, to generate ozone-attributable mortality rates in cities worldwide. Results will include the number and rate of ozone-attributable respiratory mortality in hundreds of cities around the world, including temporal trends from 1990 to 2017. Preliminary results for the year 2017 demonstrate that the 6-month average of the 8-hour daily maximum ozone concentration ranges 3.5-fold (25.91 to 91.40 ppb) across the most populated 250 cities worldwide, and we expect greater heterogeneity in ozone-related health impacts since disease rates also vary. By using methods that are consistent across cities, we can compare how urban ozone mortality trends differ for cities that have experienced different patterns of growth and regulation. Our results will provide an improved understanding of the range in ozone concentrations and their associated disease burden in cities worldwide, which can be used to inform air pollution and climate change mitigation actions by individual cities and across cities that are members of urban sustainability networks.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 33
Big Data in Air Pollution Health Studies: Computational Challenges and Advances
Chairs: Allan Just, US & Marianthi-Anna Kioumourtzoglou, US

Long-term Effects of Fine Particulate Matter on Neurological Disorders in the US Medicare Population: A Nationwide Analysis

Presenter: Liuhua Shi, Rollins School of Public Health, Emory University, Atlanta, United States

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Background. Accumulated evidence links fine particulate matter (PM2.5) to mortality, cardiovascular and respiratory disease. However, less is known about the impact of PM2.5 on neurological disorders, including Parkinson's disease (PD), Alzheimer's disease and related dementias (AD/ADRD). Methods. We constructed a population-based nationwide open cohort comprised of all fee-for-service Medicare beneficiaries (aged ≥65, N=63,038,019) in the contiguous US (2000-2016). We assigned PM2.5 zip code concentrations based on annually-averaged predictions from a high-resolution model. To accommodate our massive dataset, we applied Cox-equivalent Poisson models utilizing parallel computing to estimate hazard ratios (HR) for first PD and AD/ADRD hospitalization, adjusting for confounding. Results. We identified ~1.0 million cases of PD and ~3.4 million cases of AD/ADRD. For each 5 μg/m3 increase in annual PM2.5 concentrations, the HRs were 1.14 (95% confidence interval [CI]: 1.13, 1.15) and 1.15 (95% CI: 1.14, 1.16) for first PD and AD/ADRD hospitalization, respectively. For both outcomes there was strong evidence of linearity below 16 μg/m3 (95th percentile of the PM2.5 distribution), followed by a plateaued association with increasingly larger confidence bands. Conclusions. Using a large nationwide cohort and robust epidemiologic analyses, we provide strong evidence that exposure to PM2.5 was significantly associated with an increase in the hazard of first admission with PD and AD/ADRD. For the aging US population, improving air quality to PM2.5 levels below current national standards may yield substantial health benefits by reducing the burden of neurological disorders among the elderly.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 33
Big Data in Air Pollution Health Studies: Computational Challenges and Advances
Chairs: Allan Just, US & Marianthi-Anna Kioumourtzoglou, US

Chronic effects of low-level air pollution on cause-specific mortality among 30 million residents of Europe: meta-analysis of 7 European large administrative cohorts in the ELAPSE project

Presenter: Massimo Stafoggia, Department of Epidemiology, Lazio Region Health Service / ASL Roma 1, Rome, Italy

Authors: M. Stafoggia[1], M. Bauwelinck[2], D. Vienneau[3], B. Oftedal[4], Z. J. Andersen[5], R. Atkinson[6], M. Renzi[1], S. Rodopoulou[7], N. Janssen[8], G. Hoek[9];
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Background Long-term exposure to air pollution has been related to cause-specific mortality. However, results vary across studies because of heterogeneities in exposure assessment and statistical analysis. In addition, there is uncertainty on the shape of the association at low concentrations. The multicentre Effects of Low-Level Air Pollution: A Study in Europe (ELAPSE) study collected data from multiple European cohorts using standardized protocols for exposure assessment and statistical analysis, with focus on the exposure-response functions at low concentrations. Methods We analysed data from seven large administrative cohorts: Norway, England, Denmark, the Netherlands, Belgium, Switzerland and Rome, Italy. Annual average concentrations of $PM_{2.5}$, NO_2, BC and O_3 were centrally modelled for Europe by hybrid land use regression at 100-m spatial resolution. Within each cohort we applied Cox proportional hazard models with adjustment for area- and individual-level confounders. We evaluated associations with cause-specific mortality (natural, cardiovascular, respiratory and lung cancer). Flexible approaches were used to capture non-linearity in the air pollution-mortality association. Finally, cohort-specific results where pooled into a random-effects meta-analysis. Results We analysed data on 27,896,312 subjects and observed 3,257,837 deaths from natural causes. We found significant associations with NO_2 and $PM_{2.5}$, with pooled hazard ratios (HRs) 1.04 (95% CI: 1.02, 1.07) and 1.05 (1.02, 1.09) per increments of 10 $\mu g/m^3$ and 5 $\mu g/m^3$, respectively. Similar results were obtained for cardiovascular and respiratory mortality, while higher estimates were reported for lung cancer mortality: 1.09 (1.02, 1.16) and 1.08 (1.05, 1.12). Associations with natural mortality remained significant when the analyses were restricted to very low concentrations, i.e. HRs below the WHO guidelines for $PM_{2.5}$ (10 $\mu g/m^3$) and NO_2 (40 $\mu g/m^3$) were 1.05 (1.00, 1.11) and 1.05 (1.02, 1.07), respectively. Conclusions Long-term exposure to low levels of air pollutants was associated with natural, cardiovascular, respiratory and lung cancer mortality in seven large European cohorts.

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ABSTRACT E-BOOK

August 27, 2020 / 12:00 - 13:30 / Parallel 4
ORAL SESSION 33
Big Data in Air Pollution Health Studies: Computational Challenges and Advances
Chairs: Allan Just, US & Marianthi-Anna Kioumourtzoglou, US

Association of Short-Term PM2.5 with Hospital Readmissions in Heart Failure Patients in North Carolina, USA

Presenter: Lauren Wyatt, US Environmental Protection Agency, Chapel Hill, United States

Authors: L. Wyatt[1], A. Weaver[1], J. Moyer[1], J. Schwartz[2], Q. Di[3], D. Diaz-Sanchez[1], W. Cascio[1], C. Ward-Caviness[1];
[1]US Environmental Protection Agency, Chapel Hill, NC, [2]Harvard TH Chan School of Public Health, Boston, MA, [3]Tsinghua University, Beijing, CHINA.

Background/Aim: Short-term changes in ambient fine particulate matter (diameter ≤ 2.5 μm, $PM_{2.5}$) air pollution increase the risk for hospital admission and readmission. Additional research is needed to understand these risks in individuals with underlying cardiovascular disease. Here, we measure the $PM_{2.5}$-realted readmission risk in heart failure (HF) patients and examine how this risk varies with respect to time following discharge. Methods: The study cohort included 17,674 HF patients (49,835 inpatient hospitalizations) admitted to a University of North Carolina-affiliated hospital between July 2004 and December 2016. Daily ambient $PM_{2.5}$ was estimated using a neural network with 1km resolution. Time-dependent Cox proportional hazards models estimated the association between daily ambient $PM_{2.5}$ and the risk of a 30-day readmission (any cause) after adjusting for sex, race, age, prior hospital visits, temperature, relative humidity, length of stay, and discharge day. Time-dependent readmission risk was addressed by examining two time windows: early (1-7d) and late (8-30d) readmissions. Results are expressed as the hazard ratio per 10 $\mu g/m^3$ increase in same day $PM_{2.5}$. Results: The 30-day readmission risk associated with a 10 $\mu g/m^3$ increase in same day $PM_{2.5}$ was on average increased by 2.8% (95% CI: -0.9-6.6%), but varied based on the time since discharge. $PM_{2.5}$-realted readmission risks were greatest during the early time period (1-7d), where a 10 $\mu g/m^3$ increase in $PM_{2.5}$ was associated with a 6.2% (95% CI: 0.03-12.4%) increased readmission risk. Readmissions occuring 8-30 days after discharge had weaker associations with PM2.5 that included the null (2.8%, 95% CI: -1.4-7.5%). Conclusions: Elevated daily $PM_{2.5}$ is associated with increased risk of a 30-day hospital readmission, particularly in the first week following hospital discharge. Our results suggest that reducing exposure to $PM_{2.5}$ could reduce the burden of frequent readmissions on patients and the healthcare system. This abstract does not reflect EPA policy.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 1
ORAL SESSION 34
Metals as Cardiovascular Risk Factors: New Evidence
Chairs: Ana Navas-Acien & Miranda Jones, US

Blood-based DNA methylation biomarkers for cumulative lead exposure: associations with cardiovascular disease incidence and mortality in the Strong Heart Study

Presenter: Xu Gao, Columbia University, New York, United States

Authors: X. Gao[1], A. Domingo-Relloso[1], E. Colicino[2], S. A. Cole[3], K. Haack[4], L. G. Best[5], J. G. Umans[6], M. D. Fallin[7], M. Tellez-Plaza[7], A. A. Baccarelli[1], A. Navas-Acien[1];
[1]Columbia University, New York, NY, [2]Icahn School of Medicine at Mount Sinai, New York, NY, [3]University of North Carolina Gillings School of Public Health, Chapel Hill, NC, [4]Texas Biomedical Research Institute, San Antonio, TX, [5]Missouri Breaks Industries Research, Inc, Eagle Butte, SD, [6]MedStar Health Research Institute, Hyattsville, MD, [7]Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.

Lead is a ubiquitous toxicant associated with increased cardiovascular disease (CVD) risk. Blood and bone (patella and tibia) lead are established biomarkers of cumulative lead exposure, but because specialized technologies are needed for analysis, they are typically not available for clinical and epidemiological applications. We recently developed and validated three polygenic biomarkers that estimate lead exposure in blood, patella, and tibia samples based only on blood DNA methylation (DNAm) data. Whether these methylation-biomarkers predict lead-related CVD risk is unknown. We thus investigated the associations of these DNAm lead biomarkers with CVD incidence and mortality in the Strong Heart Study (SHS), a population-based cohort study of CVD in American Indian adults recruited in 1989-1991. The three DNAm lead biomarkers were computed from Illumina EPIC BeadChip blood DNAm data available at baseline among 2,321 SHS participants aged 45-75 years (~41% male). During a median follow-up of ~20 years, 1,023 participants had incident CVD events and 452 died due to CVD. After adjustment for sociodemographic and cardiovascular risk factors, the three DNAm lead biomarkers were associated with CVD mortality, but not with non-fatal CVD events. The hazard ratios (95% CI) for CVD mortality were 1.15 (1.01 - 1.31), 1.12 (1.01 - 1.25), and 1.20 (1.06 - 1.37) per interquartile increase in DNAm-estimated blood, patella, and tibia lead biomarkers. All biomarkers were also associated with coronary heart disease mortality. In subgroup analyses, the associations of lead biomarkers with CVD mortality were stronger in males and ever smokers. These newly developed DNAm lead biomarkers may aid in identifying individuals at risk for CVD mortality resulted from cumulative lead exposure.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 1
ORAL SESSION 34
Metals as Cardiovascular Risk Factors: New Evidence
Chairs: Ana Navas-Acien & Miranda Jones, US

Urinary arsenic and heart disease mortality in NHANES 2003-2014

Presenter: Anne Nigra, Columbia University Mailman School of Public Health, New York, United States

Authors: A. Nigra, A. Navas-Acien;
Columbia University Mailman School of Public Health, New York, NY.

Background: Evidence evaluating the association between low- to moderate- inorganic arsenic (iAs) exposure and heart disease (HD) mortality in the general US population is limited. We evaluated the association between urinary iAs concentrations and HD mortality in the 2003-2014 National Health and Nutrition Examination Survey (NHANES).Methods: We estimated multi-adjusted hazard ratios (HRs) for HD mortality by increasing urinary iAs levels for 10,072 NHANES participants from survey-weighted, Cox proportional hazards models. We considered restricted quadratic spline (RQS) models for flexible dose-response analyses. For models stratified by race/ethnicity, we compared geometric mean ratios (GMRs) of iAs in case versus non-case participants due to small sample sizes. We modeled iAs internal dose as total arsenic and dimethylarsinate restricted to participants with low arsenobetaine. Sensitivity analyses considered three additional iAs biomarker approaches, including the sum of inorganic and methylated species with Bayesian Tobit regression imputation for values below detection limits. Participant mortality outcomes were obtained from the National Death Index. Results: Out of 2,620 participants with low urinary arsenobetaine, 54 experienced fatal HD events. The fully adjusted HR (95% CI) of HD mortality comparing a change in the interquartile range of iAs levels was 1.56 (0.58, 4.18). RQS models indicated that elevated HRs were driven largely by Mexican-American participants. GMRs comparing iAs levels in cases versus non-cases were 1.36µg/L (95% CI 0.77, 2.54) for Mexican-American participants (N= 6 cases) and 1.08µg/L (95% CI 0.89, 1.32) for non-Hispanic white participants (N= 34 cases). Analyses considering other iAs biomarkers yielded dissimilar results.Conclusions: iAs exposure at low- to moderate- levels is relevant for HD mortality in the US population. We found substantial modification by race/ethnicity, with HRs for Mexican-American participants far greater than those for non-Hispanic white and black participants. Limitations include a small number of cases and limited follow-up time.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 1
ORAL SESSION 34
Metals as Cardiovascular Risk Factors: New Evidence
Chairs: Ana Navas-Acien & Miranda Jones, US

Do We Underestimate Risk of Mortality due to Lead Exposure?

Presenter: Sung Park, Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, United States

Authors: S. K. Park[1], H. Hu[2];
[1]University of Michigan School of Public Health, Ann Arbor, MI, [2]University of Washington School of Public Health, Seattle, WA.

Background/Aim: Studies using data from the National Health and Nutrition Examination Survey-III (NHANES-III) have demonstrated significant associations between blood lead levels and increased mortality. However, blood lead reflects primarily recent exposure and lead mobilized from internal organs. Bone lead represents cumulative lead burden and thus is a better biomarker for assessing chronic impacts, but its in vivo assessment requires special K-x-ray fluorescence (KXRF) instrumentation. Our team used KXRF measurements of lead in bone and blood lead levels in participants of the Normative Aging Study to develop an algorithm predicting bone lead levels from a combination of blood lead levels and standard biochemical, hematologic, and questionnaire data. We examined the associations of our algorithm-estimated bone lead levels and mortality in NHANES-III.
Methods: We included 11,065 adults followed up to December 31, 2015. Estimated tibia and patella bone lead levels were calculated using our prediction algorithm. We used survey-weighted Cox proportional hazards models to compute hazard ratios (HRs) and 95% confidence intervals (CIs).
Results: During the median follow-up of 22.4 years (216,565 person-years), 4,103 participants died (mortality rate=1,895 per 100,000 adults/year). Means (95% CIs) of blood lead, tibia lead, and patella lead were 3.47 µg/dL (3.27-2.67), 2.98 µg/g (2.23-3.75), and 3.04 µg/g (1.94-4.14), respectively. After adjustment for potential confounders, the HRs comparing participants at the 90th vs. 10th percentiles of exposure with regards to all-cause mortality were 1.25 (95% CI: 1.05-1.50) for blood lead, 1.91 (1.36-2.68) for tibia lead, 2.00 (1.45-2.77) for patella lead; for CVD mortality, 1.67 (1.20-2.34) for blood lead, 1.89 (0.98-3.67) for tibia lead, 2.24 (1.26-4.00) for patella lead; and for cancer mortality, 1.35 (0.98-1.84) for blood lead, 2.52 (1.30-4.90) for tibia lead, 2.45 (1.29-4.66) for patella lead.
Conclusions: These findings suggest that risk assessment based on blood lead levels may underestimate the true mortality risk of lead exposure.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 1
ORAL SESSION 34
Metals as Cardiovascular Risk Factors: New Evidence
Chairs: Ana Navas-Acien & Miranda Jones, US

Associations between $PM_{2.5}$ metal components and QT interval length

Presenter: Adjani Peralta, Harvard University, Boston, United States

Authors: A. A. Peralta, J. Schwartz, D. R. Gold, B. Coull, P. Koutrakis;
Harvard University, Boston, MA.

Background/Aim: Several studies have found associations between increases in QT interval length, a marker of cardiac electrical instability, and short-term fine particulate matter ($PM_{2.5}$). To our knowledge, this is the first study to examine the association between specific PM metal components and QT interval length. Methods: We measured heart-rate corrected QT interval (QTc) duration among 630 participants in the Normative Aging Cohort (NAS) based in Eastern Massachusetts between 2000 to 2012. We utilized time-varying linear mixed-effects regressions with a random intercept to analyze associations between QTc interval and moving averages (0 to 7-day moving averages) of 24-hour mean concentrations of PM metal components (vanadium, nickel, copper, zinc and lead) measured at the Harvard Supersite monitoring station. Models were adjusted for daily $PM_{2.5}$ mass estimated at a 1 km x 1 km grid cell from a previously validated prediction model and other covariates. Bayesian kernel machine regression (BKMR) was utilized to assess the overall effect of the PM components and the exposure-dose response curves. Results: We found consistent results with higher lead (Pb) associated with significant higher QTc intervals for both the multi-pollutant and the two pollutant ($PM_{2.5}$ and a PM component) models across the moving averages. The greatest effect of lead on QTc interval was detected for the 4-day moving average lead exposure. In the multi-pollutant model, each 2.72 ng/m^3 increase in daily lead levels for a 4-day moving average was associated with an 8.77 ms (95% CI: 4.25,13.29) increase in QTc interval. In the two-pollutant models with $PM_{2.5}$ mass and lead, each 2.72 ng/m^3 increase in daily lead levels for a 4-day moving average was associated with a 9.19 ms (95% CI: 5.09,13.30) increase in QTc interval. Conclusions: Our findings suggest that metals contained in $PM_{2.5}$ are associated with acute changes (0 to 7-day moving averages) in ventricular repolarization.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 1
ORAL SESSION 34
Metals as Cardiovascular Risk Factors: New Evidence
Chairs: Ana Navas-Acien & Miranda Jones, US

Urinary cadmium and risk of incident heart failure and acute myocardial infarction among never-smokers in the Danish Diet, Cancer, and Health Cohort

Presenter: Clara Sears, Brown University School of Public Health, Department of Epidemiology, Providence, United States

Authors: C. G. Sears[1], O. Raaschou-Nielsen[2], A. Harbo Poulsen[2], J. Harrington[3], C. J. Howe[1], K. A. James[4], G. A. Wellenius[5], J. Meliker[6];
[1]Brown University, Providence, RI, [2]Danish Cancer Society Research Center, Copenhagen, DENMARK, [3]Research Triangle Institute, Research Triangle Park, NC, [4]University of Colorado Denver, Denver, CO, [5]Boston University, Boston, MA, [6]Stony Brook University, Stony Brook, NY.

Background: Epidemiologic studies suggest cadmium exposure is associated with hypertension, peripheral arterial disease, and risk of cardiovascular mortality. However, these associations may be confounded by tobacco smoking, a dominant source of cadmium exposure. To clarify cardiovascular risk of cadmium exposure independent of smoking, we investigated the association of urinary cadmium with risk of incident heart failure and acute myocardial infarction (AMI) in a case-cohort study of never-smokers.
Methods: Between 1993-1997, 19,394 never-smoking participants (ages 50-64 years) were enrolled in The Danish Diet, Cancer, and Health cohort. From the full cohort, we identified incident heart failure (n=958) and AMI (n=809) cases occurring between baseline and 2015 using the Danish National Patient Registry. We randomly selected a sub-cohort of 600 males and 600 females for comparison. We quantified cadmium and creatinine concentrations in urine samples collected at baseline. Using an unweighted case-cohort approach, we estimated adjusted hazard ratios for heart failure and AMI in separate Cox proportional hazards models with age as the time scale, and stratified by sex.
Results: Overall, participants had relatively low concentrations of urinary cadmium as expected for never smokers (median= 0.20; 25th, 75th = 0.13, 0.32 g cadmium/g creatinine). In adjusted models, higher urinary cadmium concentrations were associated with a higher risk for heart failure (HR=1.11 per interquartile range difference; 95% CI= 1.02-1.21). Furthermore, sex modified this association ($P_{heterogeneity}$=0.012). Higher urinary cadmium concentrations were associated with higher risk for heart failure among males (HR= 1.48; 95% CI= 1.18, 1.85), but not among females (HR= 1.06; 95%CI= 0.97, 1.17). Higher urinary cadmium concentrations were not associated with a higher risk of AMI (HR=1.02; 95% CI= 0.93, 1.12).
Conclusion: Among never-smokers, urinary cadmium may be associated with higher risk for heart failure, especially among males. We did not observe an association between urinary cadmium and risk of AMI.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

NIH DR2 Empowering Data Collection for the COVID-19 Research Response

Presenter: Aubrey Miller, NIEHS, Bethesda, United States

Authors: Aubrey Miller, NIEHS, Bethesda, Maryland, US, Miller.aubrey@nih.gov

The National Institute of Health's (NIH) Disaster Research Response (DR2) Program (https://dr2.nlm.nih.gov/) leads the nation in fostering improvements in processes, frameworks, and infrastructure for executing timely and complex research responses to disasters and emerging threats. The growing field of disaster research aims to
advance transdisciplinary health research, and place environmental health into disaster response planning and to better understand the health impacts of disasters. One of the important ways to promote ethical post disaster research is through sharing best practices and existing research tools and protocols. DR2 hosts a website to collate and host a collection of tools to minimize the proliferation of one-off survey items, encourage comparisons across samples, and facilitate data integration and collaboration. This repository was initially created to focus on common disasters with an environmental impact, such as floods or hurricanes. Disaster focused tools include those for environmental sampling, biospecimen collection and for understanding the impacts of a disaster on a community. But environment and health are impacted by more than floods and accidents, and with the emergence of the SARS COV2 virus, a flurry of new data collection tools are being created by the hour. In an effort to minimize one off tool creation and to help provide researchers easy access to other questions of interest, early on in the COVID-19 response, DR2 organized meetings and correspondence across NIH Institutes and Centers to coordinate a process for tool collection and dissemination. DR2 now hosts COVID-19 related research protocols for new and existing cohorts and research studies. Multiple NIH Institutes and Centers and funding programs are encouraging not only data sharing, but sharing of tools and recommending researchers share via DR2. This unique platform, a voluntary, self submitted data collection platform is an important part of advancing DR2's mission to better share and standardize disaster research.
Keywords:
COVID, Research, tools, data sharing

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

Implementing Community Engaged Disaster Research in Response to Disasters

Presenter: Jennifer Horney, University of Delaware, Newark, United States

Authors: Jennifer Horney, University of Delaware, Newark, DE, USA
Katie Kirsch, Texas A&M, College Station, TX, USA
Garett Sansom, Texas A&M, College Station, TX, USA
Galen Newman, Texas A&M, College Station, TX, USA

The increasing frequency and severity of disasters like tropical storms and flooding place individuals and communities at higher risk of negative health outcomes associated with exposure to disaster-associated environmental contamination. Residents of environmental justice (EJ) neighborhoods have been documented as having excess risks of exposure to acute pollution, emergency response spills and incidents, and high-impact natural and man-made events. Therefore, rapid and credible post-disaster research in EJ neighborhoods is essential for protecting health. However, successful conduct of research in the aftermath of a disaster requires that 1) research protocols and other documents are in place; 2) mutually beneficial partnerships that include stakeholder groups and residents, academic researchers, and practice partners exist; and 3) baseline data are available to compare with post-disaster findings so that changes noted can be accurately attributed to the disaster. To address these requirements, the Texas A&M University Superfund Research Center: 1) leverages research protocols from the National Institute of Environmental Health Sciences Disaster Research Response (DR2) network such as pre-approved IRB protocols; 2) builds on established community partnerships and interdisciplinary service-learning programs developed as part of the University's Environmental Grand Challenge, Institute for Sustainable Communities, and Hazard Reduction and Recovery Center; and 3) supports the collection of pre-disaster data to improve our understanding of the potential pathways of exposure that may impact public health outcomes following a disaster. These approaches can further community engagement and foster trust in all phases of the disaster cycle (i.e., preparedness, response, and recovery), building community cohesion and resilience to future disasters. Keywords:
Post-Disaster Research; Field Data Collection; Community Engagement

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

Creating a National IRB Preparedness Training Program for the Review of Disaster-Related Research

Presenter: Joan Packenham, National Institute Of Environmental Health Sciences, Durham, United States

Authors: Joan Packenham, NIEHS RTP, NC, USA, packenhm@niehs.nih.gov

Disasters, both natural and manmade, are becoming more common and challenge national and global resiliency and response efforts. As a result, many government agencies have an increased interest in disaster research to strengthen preparedness, response, and recovery. With the field of disaster research greatly expanding, Institutional Review Boards (IRBs) are now being asked to review research protocols aimed at assessing health risks, exposures and outcomes from disaster survivors; however, few IRBs have significant experience reviewing disaster research protocols. As the national leaders of disaster research, the National Institutes of Health (NIH) Public Health Emergency and Disaster Research Response (DR2) Program recognized the need to develop IRB disaster-related research training curricula and protocol review tools. Key components of the DR2 program include the creation of a pre-approved disaster research protocol (Rapid Acquisition of Pre- and Post-Incident Disaster Data) and the development of the National Institute of Environmental Health Sciences (NIEHS) Working Group for Special IRB Considerations in the Review of Disaster Related Research, which established the first national recommendations that informed this innovative training program. This training program includes instructor led case studies that walk trainees through using the NIEHS Disaster Research protocol Review checklist, developing IRB Continuity of Operations Plans (I-COOP), and use of the Post-Disaster Researcher Engagement Assessment and Community Template (PD-REACT) that provides a community vulnerability assessment and disaster related contextual considerations for IRB review. These materials have been field tested and developed through mock IRB and training sessions held at the Centers for Disease Control's (CDC) National Institute for Occupational Safety and Health (NIOSH), University of Arizona, and NIEHS. This training assesses organizations' disaster research needs, aims to improve IRB preparedness and processes for reviewing disaster-related research and enhances institutional knowledge of best practices for disaster researchers to protect the rights and welfare of study participants.
Keywords:
Institutional Review Board
Ethics
Training
Best Practices

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

Capturing post-disaster environmental exposures

Presenter: Diana Rohlman, Oregon State University, Corvallis, United States

Authors: Diana Rohlman, Oregon State University, Corvallis, OR, USA
Samantha Samon, Oregon State University, Corvallis, OR, USA
Pete Hoffman, Oregon State University, Corvallis, OR, USA
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Michael Barton, Oregon State University, Corvallis, OR, USA
Cheryl Walker, Baylor College of Medicine, Houston, TX, USA
Winnie Hamilton, Baylor College of Medicine, Houston, TX, USA
Georgia Armstrong, Baylor College of Medicine, Houston, TX, USA
Melissa Bondy, Baylor College of Medicine, Houston, TX, USA
Kim Anderson, Oregon State University, Corvallis, OR, USA

Environmental disasters are increasing in frequency and scope, raising public health concern. Our research team has investigated environmental exposures following oil spills, wildfires and hurricane-related flooding using passive wristband sampling devices. We use a community-engaged approach to inform our research strategy, and return all data to impacted communities and study participants. Here, we will present the tools we used (rapid response disaster ethical protocol, wristband, individual report-back template) to investigate personal environmental exposures following Hurricane Harvey. Hurricane Harvey induced catastrophic rainfall-triggered flooding in the Houston metropolitan area. Of the 41 Superfund sites within Harris County, 13 flooded. There was immediate concern that these events may result in exposure to toxic chemicals. In collaboration with Baylor College of Medicine and UT Health, our team deployed wristbands immediately after the hurricane (T1; n=173) to flood-impacted communities within Harris County, and again one year later (T2; n=239). All wristbands were analyzed for 1,530 semi-volatile and volatile organic chemicals. Within the population we detected common (>50% detection frequency) and uncommon (<10% detection frequency) chemicals. At both T1 and T2, an average of 26 chemicals (T1 SD=6.02; T2 SD=5.27) were found per wristband, and an equivalent numbers of chemicals were detected (T1=183; T2=189), yet chemical composition differed between T1 and T2. Looking at the sum average, endocrine disrupting chemicals were highest in T1 and T2, followed by pesticide- (T1) and industrial-use chemicals (T2). While no dioxins or PCBs were detected in T1, very low levels were detected in T2. Based on preliminary data, wristbands from Houston contained many common chemicals, but also demonstrated unique exposures when compared to non-disaster environmental exposures. The results from this study will inform characterization of post-disaster environmental exposures and will be communicated to all study participants and communities.

Keywords:
Environmental disasters
Passive sampling wristband
Personal exposures
Air pollution

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

The DR2 toolkit: Lessons learned from the NIH Disaster Research Response program in the midst of COVID-19

Presenter: Richard Kwok, Raleigh, United States

Authors: Richard Kwok (NIEHS)
Aubrey Miller (NIEHS)

The NIH Disaster Research Response (DR2) program was created shortly after the 2010 Deepwater Horizon oil spill to better position research in the midst of disaster response scenarios. Research conducted in the wake of a disaster can provide information to help mitigate health consequences, support future recovery efforts, and improve resilience. With the recent COVID-19 pandemic, the DR2 program served as a central repository for new instruments, protocols and tools that were developed specifically to address this disaster. In this talk we will describe how the efforts of the NIH DR2 Program, which provides a suite of resources, including data collection tools, research protocols, institutional review board guidance, and training materials will enable the development and implementation of time-critical studies following this major public health emergencies. In describing our experiences related to the COVID-19 pandemic and the ongoing efforts through the NIH DR2 Program, we aim to help improve the timeliness, quality, and value of future disaster-related data collection and research studies.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

Crossing Silos and Networking to Advance Environmental Health Disaster Research

Presenter: Karen Lutrick, Tucson, United States

Authors:

No change in the environment is as extreme, or often as sudden, as the change that comes after a disaster. The Disaster Research Response (DR2) Program, championed by the National Institutes of Health (NIH) is an important component in understanding environmental health threats and issues following a disaster. While an increasing number of environmental health researchers are taking steps to prepare for, and to conduct, research in disaster environments, they often work in disciplinary silos, whereas the impacts of disasters are often crosscutting, impacting divergent communities, scientific disciplines, and across jurisdictional borders. Previous responses to disasters like the Deepwater Horizon Oil Spill have inspired efforts to improve the nation's capacity to perform timely interdisciplinary disaster research. Many new efforts are springing up to promote transformative collaborations in disaster research. This session will include a mix of discussions highlighting specific situations involving applied epidemiologic research or efforts to improve the process for such research to be performed. Speakers begin by explaining the importance of disaster research to environmental health. Presenters will then discuss the development and accomplishments of a new environmental health sciences disaster research community of practice and ongoing efforts to facilitate behavioral, geoscience, and environmental health disaster research. Efforts to develop international networks, as well as to foster new strategies for applied research for humanitarian crises will be presented. A discussion will include ongoing efforts to develop IRB pre-reviewed protocols, guidance, and tools to help support and expedite timely research. Additional discussions will include examples of rapid collaborations among academic institutions after a major hurricane and a recent disaster workshop that sought to reach outside environmental health to the clinical care setting to harmonize and build capacity for disaster data collection and sharing. Presenters will share experiences, case studies, and lessons learned as part of these evolving efforts.
Please describe how the symposia relates to the meeting theme of Advancing Environmental Health in a Changing World. (100 words max):
Disasters and accidents are an extreme example of changing environments in a changing world. In seemingly the blink of an eye, a community can be impacted by contamination, floodwaters, or wildfire smoke and suddenly be concerned about environmental exposures they never considered previously. The growing field of disaster research, championed by the NIH Disaster Research Response Program (DR2), the NSF Natural Hazards Center, Fogarty International Center, and others seek to advance transdisciplinary health research, and place environmental health into disaster response planning, for changing and challenging situations. Recent efforts, in the US and globally, to conduct disaster research and to bring together researchers have begun to advance this important field of research.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 2
SYMPOSIUM 24
Crossing Silos and Networking to Advance Environmental Health Disaster Research
Chairs: Aubrey Miller, US & Gwen Collman, US

Building a Community of Practice to foster Multidisciplinary Disaster Research

Presenter: Erin Haynes, NASA, Lexington, United States

Authors: Erin Haynes, University of Kentucky, Lexington, Kentucky, USA
Nicole Errett, University of Washington, Seattle, Washington, USA

Disaster research requires rapid assembly of transdisciplinary research teams. These partnerships take time to assemble and develop. A network of National Institute of Environmental Health Sciences (NIEHS) investigators has been assembled to form a community of practice for disaster response research. Expertise is shared and multidisciplinary teams across multiple academic institutions can rapidly be assembled. Environmental health disaster research can be advanced through cross-institutional collaboration.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 25
Epidemiological Surveillance of Air Quality and Human Health in Latin America (LA)
Chairs: Horacio Riojas, Mexico & Carlos Santos-Burgoa, US

Environmental and Health surveillance of Air Quality in Chile

Presenter: Sandra Cortes, PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE. Departamento de Salud Pública. Advanced Center for Chronic Diseases (ACCDiS). Centro de Desarrollo Urbano Sustentable. Comité de Salud Ambiental Infantil. Sociedad Chilena de Pediatría., Santiago, Chile

Authors: S. Cortes[1], K. Yohannssen[2], E. Ahumada[3], C. Leiva[4], L. Tellerías[5];
[1]PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE. Departamento de Salud Pública. Advanced Center for Chronic Diseases (ACCDiS). Centro de Desarrollo Urbano Sustentable. Comité de Salud Ambiental Infantil. Sociedad Chilena de Pediatría., Santiago, CHILE, [2]Escuela de Salud Pública. Universidad de Chile. Comité de Salud Ambiental Infantil. Sociedad Chilena de Pediatría., Santiago, CHILE, [3]Universidad Andres Bello. Facultad de Ciencias de la Rehabilitación. Comité de Salud Ambiental Infantil. Sociedad Chilena de Pediatría, Santiago, CHILE, [4]PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE. Departamento de Salud Pública. Centro de Desarrollo Urbano Sustentable, Santiago, CHILE, [5]Comité de Salud Ambiental Infantil. Sociedad Chilena de Pediatría., Santiago, CHILE.

Background: Chile is considered a model for Latin American and Caribbean Countries (LAC) due to its growing development. However, its environmental regulations and regulatory processes, especially for air pollutants, represent population health risks.Objective: discuss on the Chilean environmental and health surveillance system and its limitations to protect the children and general populational health. Results: Despite the strong national network air monitoring, 70% of the stations belong to the industries and are supervised by the environmental authorities. On the whole country, criteria pollutant levels show insignificant changes over the past 15 years. The comparison of national regulations for particles (PM10, PM2.5) with the WHO recommendations clearly shows that 80% of the population is at risk of getting sick or dying from these pollutants. In communities near fixed sources, such as thermoelectric plants that use fossil fuels, residents are unequally exposed to pollutants and children and older people present greater health risks.Recently, several regional decontamination plans have been started. But, in them, the most important interventions are focused on indoor sources (as wood for heating) and adaptations of isolation conditions at homes. No changes are projected on national regulations or more restricted emission limits. In health promotion and prevention diseases, no changes have been made regarding the index on air quality, risk communication or epidemiological surveillance on health sentinel events. It is estimated in Chile that the number of cases of mortality and morbidity attributable to actual levels of air pollution in Chile could be underestimated. ConclusionsIt is proposed to improve the quality of indicators that help estimate the disease burden, including exposure assessment and use of exposure-response functions to have more accurate and less undervalued estimates at least for criteria contaminants for effectively protecting the pediatric and elderly populations.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 25
Epidemiological Surveillance of Air Quality and Human Health in Latin America (LA)
Chairs: Horacio Riojas, Mexico & Carlos Santos-Burgoa, US

Sector response plan for comprehensive health risk management for air quality in Bogotá, as a public health policy

Presenter: Luis Jorge Hernández, Universidad de los Andes, Bogata, Colombia

Authors: L. Hernández[1], L. Blanco[1], H. Riojas[2], L. Angela de la Sierra[2], M. Cortes[1], O. Bociga[1], D. Rodriguez[1], K. Medina[3], E. Osorio[3], J. Abella[3], S. Osorio[3];
[1]Universidad de los Andes, Bogata, COLOMBIA, [2]Instituto Nacional de Salud de Salud Pública, Cuernavaca, MEXICO, [3]Secretaría de Salud Bogotá, Bogata, COLOMBIA.

Background: In Bogotá, 2,165 deaths from cardiovascular and respiratory diseases are attributed annually to air pollution. The impact on health due to air pollution in the Capital District, especially by PM10 is evident for the years 2015-2018. The proportion of children who presented wheezing in the last year was 74.3%, with a difference between greater and lesser exposure of 79.6% vs. 69.0% (p <0.05). Symptoms of wheezing and expectoration were associated with higher PM10 exposure (RR 1.39 and 1.30). A child under 5 years of age exposed to PM10 is 1.70 times more at risk of being absent from school due to acute respiratory disease, and a decrease in PM10 would reduce this absence by 41.1%. The response from the health sector continues to be fragmented and reactive in the face of contingency levels of the environmental authority Objective: Design in a participatory way a strategic plan of response of the health sector for the improvement of air quality.
Results:
1.Health Promotion-Air Governance: It is the participation of citizens in air management in Bogotá-Region.2.Collective Risk Management: Social communication of risk in both contingencies and pre-contingencies from the IBOCA: Bogota Air Quality Index.3. Individual Risk Management: It is the counseling or orientation that is done in the outpatient consultation to the general population and in patients with basic diseases on air quality and health. It also includes the assessment of population vulnerability to air pollution from the life course and the socioeconomic condition of individuals, families and communities.4.Public Health Management: Inclusion of estimates of exposure to air pollution through averages closest to the population: nowcast.
Conclusions: Through a knowledge translation methodology and with institutional and citizen participation, the preparation of a proposal for a Strategic Plan for the Health Sector against Air Pollution was achieved.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 25
Epidemiological Surveillance of Air Quality and Human Health in Latin America (LA)
Chairs: Horacio Riojas, Mexico & Carlos Santos-Burgoa, US

Epidemiological research and air quality policies in Mexico

Presenter: Horacio Riojas, Instituto Nacional de Salud Publica, Cuernavaca, Mexico

Authors: H. Riojas, L. de la Sierra de la Vega, K. Valdez Trejo;
Instituto Nacional de Salud Publica, Cuernavaca, MEXICO.

The objective of this presentation is to show how information from epidemiological studies and health impact assessment studies has been used in Mexico to improve air quality management in several cities. We will show how during the last 10 years there has been a significant advance in health-related air quality standards and how that changes have been based on the best available scientific information. We will also show how epidemiological studies contributed to the creation, for the first time, of a national air quality index and health risks. We will include a description of how an epidemiological surveillance system in environmental health is being built. Additionally, we will give examples of how these changes are influencing areas other than health to improve air quality and its risks through intersectoral policies. Finally, the topics on which environmental epidemiology and air quality management need to collaborate more intensely will be discussed.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 3
SYMPOSIUM 25
Epidemiological Surveillance of Air Quality and Human Health in Latin America (LA)
Chairs: Horacio Riojas, Mexico & Carlos Santos-Burgoa, US

A proposal to strengthen public health surveillance systems on air pollution in Latin America and the Caribbean (LAC)

Presenter: Agnes Soares da Silva, Pan American Health Organization, PAHO/WHO, Washington, United States

Authors: A. Soares da Silva;
Pan American Health Organization, PAHO/WHO, Washington, DC.

Air pollution is a major public health problem and a contributor to health inequities. It causes 300,000 attributable deaths in the Americas (41/100,000 in middle and low income countries, and 14/100,000 in high income countries). However, public health managers and health professionals do not have agency on emissions control or air quality monitoring. We will report the current status of air pollution surveillance systems in LAC, mainly based on the results of a self-assessment survey answered by technical professionals working in Ministries of health, Ministry of environment, or other relevant national institution or organization. We argue that a well-structured and reliable environmental public health system is essential to: measure the status and the progress of a country towards clean air for all based on a systematic collection, analysis and reporting of a selected set of health indicators; and provide the tools public health managers and other health professionals need to contribute in a multi-sectoral dialogue and influence air quality management and air quality policies that best could protect public health. Finally, we also comment on knowledge gaps and research needs.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 4
ORAL SESSION 35
Chemical Exposures in Relation to Pubertal Development and Reproductive Hormones
Chairs: Gayle Windham, US & Dina Dobraca, US

Exposure to perfluorooctanoic acid and effects on reproductive hormones and pubertal onset in a longitudinal study of young girls

Presenter: Susan Pinney, University of Cincinnati College of Medicine, Cincinnati, United States

Authors: S. M. Pinney[1], C. S. Fassler[1], G. C. Windham[2], R. L. Herrick[3], C. Xie[1], L. H. Kushi[4], F. M. Biro[5]; [1]University of Cincinnati College of Medicine, Cincinnati, OH, [2]California Department of Public Health, Richmond, CA, [3]Sutter County Human Services, Health Division, Yuba Cita, CA, [4]Kaiser Permanente Division of Research, Oakland, CA, [5]Division of Adolescent Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH.

Background: Perfluorooctanoic acid (PFOA), an endocrine disrupting chemical with worldwide exposure, causes changes in mammary gland development in rodents. A few human studies report delay in pubertal events with increasing PFOA exposure but none have examined reproductive hormone levels. Methods: In a cohort of girls recruited at 6-8 years, clinical examinations were conducted annually or semi-annually with sequential Tanner staging. Serial serum samples were collected; PFOA concentration was measured in the first serum sample of 703 girls; estradiol, estrone (E_1), testosterone (T) and dihydroandrostendione sufate (DHEA-S) were measured in serum of 205 Cincinnati girls at three time points around puberty. Relationships between PFOA, BMI, reproductive hormones, age at thelarche, pubarche and menarche were analyzed using linear regression, survival and structural equation (SEM) models. Results: Median serum concentrations in Cincinnati (N=352, 7.3 ng/mL) and the San Francisco Bay Area (N=351, 5.8 ng/mL) were higher than in the US population. In multivariable Cox proportional hazard models (adjusted for race, BMI), increasing serum log-transformed PFOA was associated with a delay in pubarche (HR 0.82, p=0.021) and menarche (HR 0.57). The effect on pubarche was more pronounced in lean girls (BMI%<67.3) (HR=0.745). PFOA also was inversely associated with DHEA-S (p=0.007), E_1 (p= 0.027) and T (p=0.063) concentrations at six months prior to puberty. In SEMs of age at pubarche, PFOA had an inverse effect on endogenous variables E_1 (p=0.019) and BMI (p=0.028). The effect of PFOA directly on age at pubarche also was an inverse association (p=0.003). With DHEA-S replacing E_1, PFOA had similar inverse effects on BMI (p=0.026), DHEA-S (p=0.025) and age at pubarche (p=0.006). Conclusions: PFOA likely delays pubertal onset through the intervening effects on BMI and reproductive hormones. The decreases in DHEA-S and E_1 associated with PFOA represent biological biomarkers of effect consistent with the delay in onset of puberty.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 4
ORAL SESSION 35
Chemical Exposures in Relation to Pubertal Development and Reproductive Hormones
Chairs: Gayle Windham, US & Dina Dobraca, US

Prenatal and Peripubertal Exposure to Per- and Polyfluoroalkyl Substances and Pubertal Development in Boys and Girls in the HOME Study

Presenter: Yun Liu, Brown University, Providence, United States

Authors: Y. Liu[1], A. M. Calafat[2], A. Chen[3], B. P. Lanphear[4], N. Y. Jones[5], K. M. Cecil[5], S. Rose[5], K. Yolton[5], J. M. Braun[1];
[1]Brown University, Providence, RI, [2]Centers for Disease Control and Prevention, Atlanta, GA, [3]University of Cincinnati College of Medicine, Cincinnati, OH, [4]Simon Fraser University, Burnaby, BC, CANADA, [5]Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH.

Background/Aim: Per- and polyfluoroalkyl substances (PFAS) exposures in pregnancy and childhood have been associated with lower sex hormones levels in children, but few prospective studies have estimated the effect of PFAS on secondary sex characteristics. We examined the associations of prenatal and peripubertal exposure to PFAS with sexual maturation. Methods: We used data from a prospective pregnancy and birth cohort study in Cincinnati, OH (the HOME Study, enrolled: 2003-2006). We quantified serum concentrations of four PFAS—perfluorooctane sulfonate, perfluorooctanoate (PFOA), perfluorononanoate, and perfluorohexane sulfonate—in mothers at ~16 weeks gestation and their children at age ~12 years (120 girls and 96 boys). At age ~12 years, we collected pubertal data by self-reported Tanner staging of pubic hair growth (boys and girls) and breast growth (girls), as well as age at menarche in girls. We estimated covariate-adjusted associations between PFAS and stages of breast and pubic hair growth (stage 1 to 5) using ordinal regression models. We evaluated age at menarche using Cox proportional-hazard models that account for censored data. Results: Mean age at menarche was 11.6 years; 82% and 97% of boys and girls, respectively, were stage 2+ for pubic hair development; and 96% of girls were stage 2+ for breast growth. We observed that higher peripubertal serum concentrations of all PFAS were associated with later puberty among girls. For example, one IQR increase in PFOA (3.5 ng/mL) was inversely associated with breast (OR=0.47, 95%CI:0.22-0.98) and pubic hair (OR=0.84, 95%CI:0.45-1.58) growth, and age at menarche (HR=0.66, 95%CI:0.37-1.18). We found no clear pattern in males or for prenatal concentrations. Conclusions: These data suggest that higher peripubertal PFAS concentrations may be associated with later pubertal development in girls, but not boys.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 4
ORAL SESSION 35
Chemical Exposures in Relation to Pubertal Development and Reproductive Hormones
Chairs: Gayle Windham, US & Dina Dobraca, US

Fluoride exposure and reproductive health among adolescent females in the United States: NHANES 2013-2016

Presenter: Ashley Malin, Icahn School of Medicine at Mount Sinai, New York, United States

Authors: A. J. Malin, S. A. Busgang, J. C. Garcia, P. Curtin, A. P. Sanders;
Icahn School of Medicine at Mount Sinai, New York, NY.

Background: Fluoride can affect reproductive health in animals and is associated with later pubertal development and decreased testosterone production in adolescent and adult males. However, effects of fluoride on female reproductive health and pubertal development are unclear. Therefore, we examined associations of fluoride exposure with reproductive health outcomes among adolescent females in the United States. Methods: The sample included participants from The National Health and Nutrition Examination Surveys (2013 to 2016) who were aged 16-19. There were 524 and 460 participants who had plasma fluoride and household tap water fluoride measurements respectively, at least one reproductive health outcome examined and complete covariate data. We applied covariate adjusted survey-weighted linear or logistic regression to examine associations of fluoride exposure with age of menarche, menstrual cycle regularity, or $\log_2$ transformed serum sex steroid hormone levels. Covariates included age, race/ethnicity, body mass index and the ratio of family income to poverty. Participants taking sex hormone medication were excluded from relevant analyses (n=46 and n=41 for plasma and water fluoride samples respectively).Results: Median (IQR) water and plasma fluoride levels were 0.48 (0.53) mg/L and 0.34 (0.30) µmol/L respectively. An IQR increase in water fluoride was associated with a 3.3 month earlier first menstrual period (B= -0.28, 95%CI: -0.54, -0.02, p = 0.05). Additionally, we observed a significant interaction between plasma fluoride and race/ethnicity in association with age of menarche (p = 0.01). For non-Hispanic black females, each IQR increase in plasma fluoride was associated with a 5-month earlier age of menarche (B=-0.42, 95%CI: -0.61, -0.23, p < 0.001). Conclusion: Chronic low-level fluoride exposure may influence reproductive health outcomes in adolescents. These findings, as well as whether non-Hispanic black females are uniquely vulnerable to potential reproductive impacts of fluoride, should be explored in prospective studies.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 4
ORAL SESSION 35
Chemical Exposures in Relation to Pubertal Development and Reproductive Hormones
Chairs: Gayle Windham, US & Dina Dobraca, US

Associations between exposure to parabens and reproductive hormones: A study among Canadian girls age 6 to 17 years

Presenter: Maryse Bouchard, Université de Montréal, Montreal, Canada

Authors: M. F. Bouchard, M. Guth;
Université de Montréal, Montreal, QC, CANADA.

Background: Parabens are chemical substances used as preservatives for their antibacterial and antifungal properties in many personal care products, and also sometimes in pharmaceutical and food products. Concerns for adverse human health effects arise from in vitro and in vivo studies showing endocrine disrupting effects, such as changes in the timing of puberty and alterations in reproductive hormones activity.
Objective: To assess the associations between urinary levels of parabens and serum sex steroid hormones (estradiol and progesterone) and gonadotropins (follicle stimulating hormone [FSH] and luteinizing hormone [LH]) in girls and teens ages 6 to 17 years.
Methods: We used data from the Canadian Health Measures Survey (2014-2015), and excluded participants taking medication influencing hormones and those who were pregnant. Methylparaben, ethylparaben, propylparaben, and butylparaben levels were measured in urine, summed, and standardized for creatinine. Hormones and parabens were natural-log-transformed and analyzed with multivariable linear regressions, adjusting for potential confounders (i.e., age, body mass index, sampling season, household income, and ethnicity).
Results: The girls and teens included in the study (n=382) had a mean age of 11.0 years (standard deviation, 3.1), were white in majority (76%), and most had a normal BMI (73%). We observed significantly lower levels of hormones with higher paraben levels. A doubling in urinary parabens was associated with lower estradiol by 5.8% (95% CI -9.3, -2.1), lower FSH by 4.2% (95% CI -7.9, -0.3), and lower LH by 10.8% (95% CI -17.4, -3.7). Parabens were not associated with progesterone levels. Restricting the sample to girls who had not begun menstruation yielded similar results.
Discussion: Similar to studies in animal models, we observed that exposure to parabens was associated with reduced levels of circulating reproductive hormones. These findings suggest that these compounds could alter the development and function of the reproductive system in girls and teens.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 4
ORAL SESSION 35
Chemical Exposures in Relation to Pubertal Development and Reproductive Hormones
Chairs: Gayle Windham, US & Dina Dobraca, US

PBDE exposure and the association with testosterone, estrone and estradiol around the time of thelarche

Presenter: Cecily Fassler, University of Cincinnati College of Medicine, Department of Environmental and Public Health Sciences, Cincinnati, United States

Authors: C. S. Fassler[1], F. M. Biro[2], A. Chen[3], C. Xie[1], S. M. Pinney[1];
[1]University of Cincinnati College of Medicine, Department of Environmental and Public Health Sciences, Cincinnati, OH, [2]Cincinnati Children's Hospital Medical Center, Division of Adolescent Medicine, Cincinnati, OH, [3]University of Pennsylvania School of Medicine, Philadelphia, PA.

Background: Polybrominated diphenyl ethers (PBDEs) are flame retardants, exposing humans primarily though diet, dust and inhalation. Higher levels of PBDEs have been associated with adverse health outcomes including lower thyroid hormone levels and later ages of pubertal transition. We hypothesize that higher levels of PBDE are associated with lower levels of reproductive sex hormones by acting as endocrine disrupters. Methods: We analyzed data of 299 girls from Cincinnati, within a longitudinal cohort study of puberty (2005-2015). Semiannual exams included anthropometric measurements and pubertal maturation staging. PBDEs were measured in serum collected at the initial visit, ages 6-8. Four measured hormones, DHEA-S, estrone, estradiol, and testosterone, were associated with five time periods (-18 months, -12 months, -6 months, thelarche, +6 months) relative to each individual girl's onset of puberty, thelarche (median=8.83 years). Results: Linear regression analysis revealed a statistically significant inverse relationship between PBDE 153 and testosterone at -6 months (β=-0.1245, p=0.0271). PBDE 100 had an inverse relationship with testosterone at thelarche (β=-0.0939, p=0.0902). The ΣPBDEs (β=-0.1176, p=.0608), PBDEs 99 (β=-.09085, p=0.0948) and 100 (β=-0.1102, p=0.0626) had inverse relationships with estrone at thelarche. The ΣPBDEs (β=-0.1940, p=0.0556) and PBDEs 99 (β=-0.1522, p=0.0786) and 153 (β=-0.1843, p=0.0681) had inverse relationships with estradiol at 6 months after thelarche. There were no statistically significant relationships at -18 or -12 months or with DHEA-S. When stratified by BMI (lowest BMI 50% vs highest BMI 50%), the inverse relationships between the PBDEs and the hormones were strengthened for the girls with higher BMI% while the girls with a lower BMI% had no statistically significant relationships between the PBDEs and the hormones. Conclusions: We found evidence that suggests exposure to PBDEs in early childhood affects testosterone and estrone levels at thelarche and estradiol at 6 months after thelarche thus disrupting the endocrine system during puberty.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:30 / Parallel 4
ORAL SESSION 35
Chemical Exposures in Relation to Pubertal Development and Reproductive Hormones
Chairs: Gayle Windham, US & Dina Dobraca, US

Pubertal urinary phthalate metabolite concentrations and semen quality among young Russian men: exploring potential windows of susceptibility.

Presenter: Lidia Minguez Alarcon, Harvard TH Chan School of Public Health, Boston, United States

Authors: L. Minguez Alarcon[1], P. L. Williams[1], J. Burns[1], S. A. Korrick[1], M. M. Lee[2], S. V. Kovalev[3], S. A. Sokolov[3], A. T. Lebedev[3], L. Smigulina[3], H. M. Koch[4], O. Sergeyev[3], R. Hauser[1];
[1]Harvard TH Chan School of Public Health, Boston, MA, [2]Nemours AI duPont Children's Hospital, Wilmington, DE, [3]Moscow State University, Moscow, RUSSIAN FEDERATION, [4], Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Bochum, GERMANY.

Aim: To prospectively investigate the associations of urinary phthalate metabolite concentrations measured during four peri-pubertal windows with semen parameters in Russian men. Methods: 516 boys were enrolled at ages 8-9 years (2003-2005). Urine samples were collected annually and pooled into four pubertal exposure windows based on physician assessed Tanner stages and testicular volume (prepuberty, early puberty, late puberty and sexual maturity). 15 phthalate metabolites were quantified using isotope dilution HPLC-MS/MS at Moscow State University. We calculated molar sums (∑) of di-2-ethylhexyl phthalate (DEHP), non-DEHP, di-isononyl phthalate (DiNP) and di-isodecyl phthalate (DiDP) metabolites. At sexual maturity (18-19 years), men provided 1-2 semen samples for analysis. We estimated the associations between quintiles of ∑phthalate metabolites and semen parameters for each pubertal window by fitting generalized linear mixed models with random intercepts to account for repeated semen samples, adjusting for abstinence time, body mass index, and specific gravity. We also modelled the probability of having a semen sample below any WHO cut-offs measured as <15mil/mL for concentration, <39mil for count, or <32% progressive motility. Results: Higher urinary concentrations of ∑DiNP in the late pubertal samples were associated with poorer semen quality; men with the highest versus lowest quintile of ∑DiNP had 32% lower sperm concentration (p-trend=0.07), 34% lower count (p-trend=0.06) and 33% lower progressive motile count (p-trend=0.09). Also, men with the highest versus lowest quintile of ∑DiNP had 15% higher probability of having a semen parameter below WHO cut-offs (p-trend=0.04). ∑DiNP measured in the other three peri-pubertal windows was not associated with semen quality. No associations of ∑DEHP, ∑non-DEHP and ∑DiDP with semen quality parameters were observed. Conclusions: ∑DiNP metabolites in late puberty was associated with poorer semen quality, highlighting the importance of considering specific windows of exposure when investigating chemical exposures in relation to fertility in men. Funding: NIEHS R01ES0014370 and P30ES000002.

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ABSTRACT E-BOOK

August 27, 2020 / 15:00 - 16:00 / Parallel 5
EMS 9
Asthma in the Changing World. As Environmental Epidemiology Can Enrich the Practice in Promoting Health
Chairs: Telma Nery, Brazil & Rafael Buralli, Brazil

Asthma in the Changing World. As Environmental Epidemiology can enrich the practice in Promoting Health.

Authors: Telma Nery, INCOR HC FMUSP, São Paulo, Brazil; Lavinia Clara, Del Roio, INCOR - HC FMUSP, São Paulo, Brazil; Hegles Rosa Oliveira, Instituto Medico Salette, São Paulo, Brazil; Jefferson Freitas, Medical School Santa Casa, São Paulo, Brazil; Tito Cesar dos Santos Nery, SMS- SP/SP - Pulmonary Service, São Paulo, Brazil

Asthma is a pathology resulting from the integration between genetic changes and environmental and biological factors. Today it affects thousands of people worldwide. Environmental factors are intrinsically involved, and the data and approach must be differentiated. Work related asthma (WRA) has worse asthma control, worse quality of life and uses more emergency services, with more visits to the doctor (plus health cost) in relation to individuals with asthma unrelated to work. The negative socioeconomic outcomes are quite different and a few studies show worse psychological symptoms than the general population; the incidence and prevalence of WRZ increases, being one of the main occupational respiratory diseases in industrialized countries, as well as the sensitizers and irritants that can cause WRA (more than400 and constantly increasing) . The WRA affects individuals of working age (indirect costs, missed work, unemployment) . The WRA is under diagnosed and emergency services and primary health care (sometimes secondary) are not able to recognize and diagnose WRA. In Brazil and in the world we are seeing the loss of labor rights and job stability, uberization of work, lack of inspection. This session intends to discuss with pulmonologists, epidemiologists, occupational physicians, some methodologies of approaches considering the changing world and practices promoting health.

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