

HEI Presents GBD MAPS Results at Major Chinese Air Pollution Meeting

In June, representatives of HEI and collaborators from Tsinghua University in Beijing, China, presented the results of HEI's Global Burden of Disease from Major Air Pollution Sources (GBD MAPS) project at a major Chinese conference on air pollution.

GBD MAPS (see [HEI Update, Fall 2014](#)) was designed to estimate the burden of disease attributable to coal-burning and other major air pollution sources in China in 2013, and in 2030 under four policy-relevant scenarios. The research results,

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HEI Consulting Scientist Aaron Cohen speaks at the meeting in Shanghai, China.

Annual Conference a Mile-High Success

Against a surprise snowy backdrop in May, diverse participants from academia, government, industry, and nongovernmental organizations gathered in Denver, Colorado, for HEI's 30th Annual Conference. The three-day meeting provided interactive sessions featuring the latest research on air pollution and health and opportunities to meet others with similar interests.

Sunday morning kicked off with a workshop on causal inference methods, explaining to a nonstatistical audience recent developments in approaches to estimating whether air pollution exposures may be causally linked to health outcomes. The official opening session on Sunday afternoon featured presentations on the links between climate, air pollution, and health, highlighting potential implications of increased wildfires, extreme temperatures, and allergies related to changes in vegetation and pollen.

On Sunday evening, keynote speaker Chris Murray presented recent progress in the Global Burden of Disease (GBD) project, which is getting worldwide attention with each new update of global data on health outcomes attributed to a variety of risk factors. He mesmerized the audience with the interactive [GBD Web site](#), where data for different diseases, causes, and changing trends over time can be instantly visualized by country, cause, and risk.

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Reflecting on new research at a poster session. PHOTO BY JAY MALLIN

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Warren Washington (left), outgoing member of the HEI Board of Directors, receives a framed photograph of the group from Chair Richard Celeste in recognition of Washington's eight years of service on the Board.



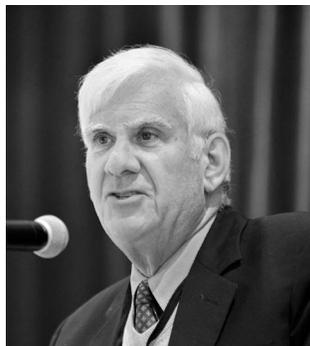
Kalpana Balakrishnan, Sri Ramachandra University, India.



Walter A. Rosenblith New Investigator Award recipients, from left: Kymberly Gowdy, East Carolina University (2015); Jason Surratt, University of North Carolina–Chapel Hill (2012); and Nga Lee (Sally) Ng, Georgia Institute of Technology (2013).



Allison Crimmins, U.S. Environmental Protection Agency.



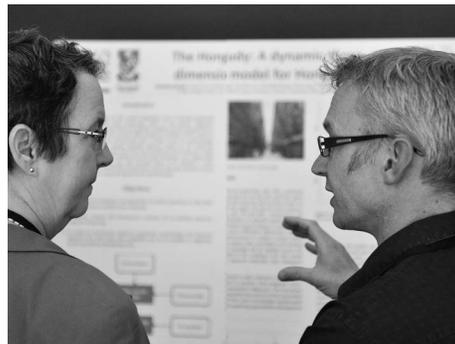
Mark Utell, University of Rochester.



From left, Julian Marshall, University of Washington; Allen Robinson, Carnegie Mellon University and HEI Research Committee; Michelle Bell, Yale University; and Petros Koutrakis, Harvard University.



Maria Costantini of HEI (left) with Kymberly Gowdy of East Carolina University, recipient of the 2015 Walter A. Rosenblith New Investigator Award.



Lianne Sheppard, University of Washington and HEI Review Committee, with Benjamin Barratt, King's College London.



Roger Peng, Johns Hopkins University and HEI Review Committee.

ANNUAL CONFERENCE (Continued from page 1)

After a general update on HEI's research program, Monday morning continued with a discussion of the institute's new studies that will be examining the relationship between air pollution exposure and health outcomes at the relatively low pollutant concentrations seen in the United States and Europe. On Monday

afternoon were presentations of recent results of HEI's Global Burden of Disease from Major Air Pollution Sources (GBD MAPS) program focusing on disease burden attributed to specific air pollution sources under the relatively high exposure conditions seen in China and India (see related story).

Tuesday morning featured a session on ozone, providing an overview of the science behind the current ozone standards in the United States and new data on respiratory and cardiovascular effects in volunteers exposed to near-ambient concentrations of ozone in HEI's Multicenter Ozone Study in Elderly Subjects (MOSES). Tuesday

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Annemoon van Erp, HEI.



Arden Pope, Brigham Young University, and Jonathan Samet, University of Southern California.



From left, Tim Hunt, American Forest and Paper Association; Francesca Dominici, Harvard University and HEI Research Committee; and Bruce Copley, ExxonMobil Biomedical Sciences.



James Merchant, University of Iowa and chair, HEI Review Committee (left) with Xiaoliang Wang, Desert Research Institute.



Keynote speaker Christopher Murray, Institute for Health Metrics and Evaluation.



Amy Herring, University of North Carolina—Chapel Hill and HEI Research Committee.



Jana Milford, University of Colorado—Boulder and HEI Review Committee.



Corwin Zigler, Harvard T.H. Chan School of Public Health.

PHOTOS BY JAY MALLIN

ANNUAL CONFERENCE (Continued from page 2)

afternoon the conference wrapped up with a session on traffic-related air pollution, highlighting knowledge gaps in contributing factors, such as traffic noise and socioeconomic status of exposed populations, leading into a research planning workshop the following day on the best approaches going forward for a next wave of traffic and health research. 

The final conference program and all presentation slides are available at www.healtheffects.org/annual.htm. Next year's Annual Conference is scheduled for April 30–May 2 in Alexandria, Virginia. Registration and program information will be available in early 2017.

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HEI is a nonprofit organization funded jointly by government and industry to research and evaluate the health effects of air pollution. An overview of HEI, information on its current research program, and all published HEI reports are available for downloading, free of charge, from the Web site.

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HEI Publishes Research on Pregnancy Outcomes

New Investigator Leads California-Based Study

There is growing epidemiologic evidence of associations between maternal exposure to ambient air pollution and adverse birth and pregnancy outcomes. Research findings, however, have been mixed so far because of differences in study populations and locations, or related to study design and methods.

HEI Research Report 188, *Adverse Reproductive Health Outcomes and Exposure to Gaseous and Particulate-Matter Air Pollution in Pregnant Women*, presents a study that aimed for more reliable results. Jun Wu of the University of California–Irvine, a recipient of HEI’s Walter A. Rosenblith New Investigator Award, led a study of air pollution and adverse birth and pregnancy outcomes using data from about 4.4 million birth records in California. Wu and her colleagues estimated a large suite of air pollution exposure metrics at each maternal residential address.

The study found associations between increases in various air pollution metrics and increased risk of preterm birth, whereas the evidence was overall weaker for term low birth weight; in addition, decreases in many air pollution metrics were associated with an increased risk of preeclampsia and gestational diabetes mellitus, an unexpected result.

In its independent review of the study, the HEI Review Committee concluded that the investigators conducted a comprehensive study examining air pollution exposure and birth and pregnancy outcomes. The very large data set and the extensive exposure assessment were strengths of the study. The investigators used a small number of two-pollutant models that were run for preterm birth and provided important insights, showing the strongest association for PM_{2.5} mass, while components and source-specific positive associations largely disappeared after adjusting for PM_{2.5} mass. On the other hand, underreporting, especially in groups with lower socioeconomic status, and poor geocoding were potential explanations of the many negative associations found for preeclampsia and gestational diabetes mellitus. The Committee recommended that these and other limitations be further explored. Overall, this study adds to the ongoing debate about whether some particle components and sources are of greater public health concern than others.

Research Report 188 will soon be available for downloading, free of charge, at <http://pubs.healtheffects.org>. For more information, contact Hanna Boogaard (jboogaard@healtheffects.org).

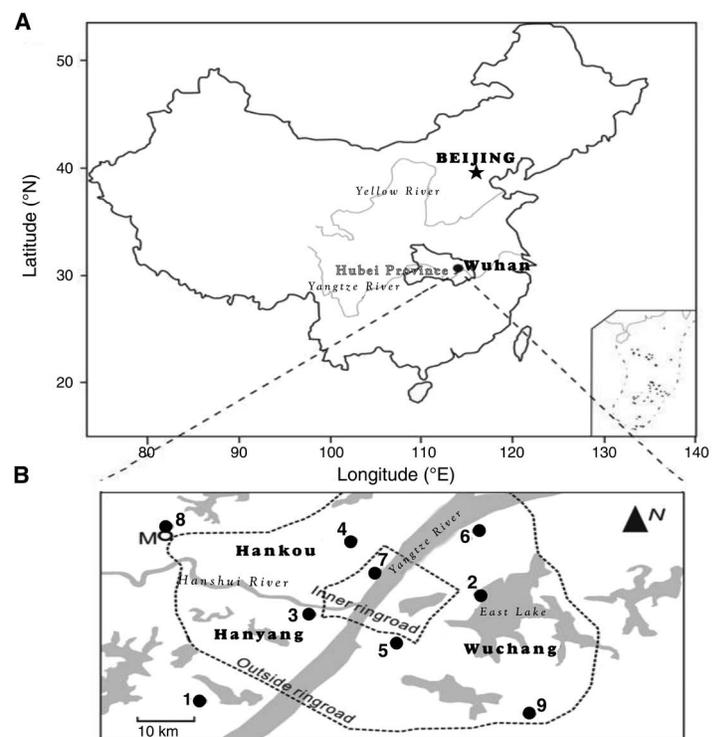
Study of Preterm Births and Low Birth Weight in Wuhan, China

HEI will soon publish Research Report 189, *Ambient Air Pollution and Adverse Pregnancy Outcomes in Wuhan, China*, by Zhengmin Qian of Saint Louis University and his colleagues. The study was funded under HEI Request for Applications (RFA) 09-2, “Impact of Air Pollution on Infant and Children’s Health in Asia,” through HEI’s Public Health and Air Pollution in Asia (PAPA) program. It extends work Qian had previously conducted under the PAPA program on ambient particulate matter pollution and daily mortality in the same city.

Several recent studies have suggested that maternal exposure to air pollution might contribute to the prevalence of low birth

weight, preterm birth, and other outcomes that can adversely affect infant health. Most of these studies have been conducted in the United States or Europe, and at the time this study was initiated, relatively few had been conducted in China. Wuhan is the capital city of Hubei Province in central China (see figure). The city has a population of about 10 million people, generally experiences higher levels of air pollution than what is typically measured in the United States and Europe, and has collected detailed information on patients during pregnancy and delivery. Thus Wuhan provided a good opportunity to explore a number of important questions about air pollution and birth outcomes.

Qian and colleagues evaluated the associations of air pollution levels in Wuhan with preterm birth (delivery before 37 weeks of gestation), low birth weight (weights less than 2500 grams), and intrauterine growth retardation (defined as an infant whose birth weight falls below the 10th percentile of all singleton



In this figure, which appears in the report by Qian et al., the black dots represent the locations of Wuhan’s nine ambient air monitoring stations. Note that PM_{2.5} was measured only at stations 2 and 8. (Reprinted from *Environ Monit Assess* 176:259–271 with permission of Springer Science+Business Media.)

live births in Wuhan) in a cohort of nearly 96,000 mothers and infants. Specifically, the investigators examined the role of exposure to particulate matter with a mass median aerodynamic diameter less than 2.5 μm (PM_{2.5}) and 10 μm (PM₁₀), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), and carbon monoxide (CO) over the course of the entire pregnancy, as well as during individual trimesters and months. They studied the roles of additional factors that might explain or modify any observed effects of air pollution on birth outcomes, such as maternal age, numbers of previous births, other medical conditions during pregnancy, extremes of temperature around

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presented in advance of publication, indicate that coal combustion was the single largest source of air pollution-related mortality in China in 2013, contributing to some 366,000 premature deaths, with significant contributions as well from industry, domestic burning, and transportation.

Although China has undertaken extensive air quality management efforts aimed at reducing emissions from coal-burning and other sources, GBD MAPS estimates that even with such actions currently under way, the growth and aging of the population can be expected to lead to increased mortality in the future. However, more aggressive pollution control measures and energy efficiency could prevent more than 275,000 premature deaths in 2030, reducing the future burden by more than 50 percent.

The GBD MAPS results, soon to be published in HEI Special Report 20, *Burden of Disease Attributable to Coal-Burning and Other Major Sources of Air Pollution in China*, were presented at the Fourth Annual International Conference on Air Benefit and Cost and Attainment Assessment, a collaborative effort between Chinese universities and the U.S. Environmental Protection Agency. In attendance were more than 200 scientists, including representatives from many Chinese provinces as well as the China Ministry of Environmental Protection. Ma Qiao, of Tsinghua University, presented the GBD MAPS results in a session cochaired by HEI Vice President Robert O’Keefe and Hao Jiming, a distinguished Tsinghua Academician and member of the GBD MAPS Steering Committee. HEI Consulting Scientist Aaron Cohen, Kan Haidong of Fudan University in Shanghai, and Zhou Maigeng of the Chinese Center for Disease Control and Prevention presented the global and Chinese evidence on the health effects of, and burden of disease due to, air pollution. HEI President Dan Greenbaum provided summary and concluding remarks. 

HEI will formally release Special Report 20, *Burden of Disease Attributable to Coal-Burning and Other Major Sources of Air Pollution in China*, in both English and Chinese in the near future. For more information about this report, contact Aaron Cohen (acohen@healtheffects.org). For questions regarding GBD MAPS, contact Robert O’Keefe (rokeefe@healtheffects.org).

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April 30–May 2, 2017 Alexandria, Virginia

the time of conception, socioeconomic status, and exposure to secondhand smoke, among other variables.

In its independent review of the study, the HEI Health Review Committee expressed high regard for the large data set Qian and his colleagues had assembled to test their hypotheses, one of the largest in China at the time it was funded. The investigators found weak evidence that exposures over the full pregnancy

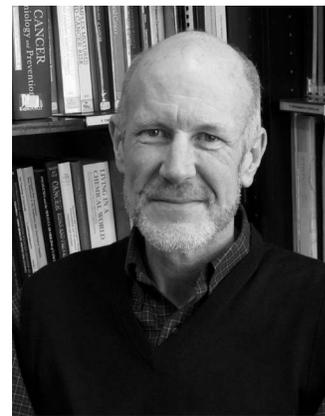
to some air pollutants may increase the likelihood of preterm births and, to a lesser extent, low birth weight, echoing to some extent the findings of other studies. At the same time, the same pollutants appeared to have no effect on, or to decrease the likelihood of, intrauterine growth restriction. The HEI Health Review Committee felt that a number of factors arising from analytic decisions made by the investigators, and from inconsistencies in the reported results,

made it difficult to draw firm conclusions from this study, and the Committee suggested further analyses to resolve some of the issues. 

Research Report 189 will soon be available for downloading, free of charge, at <http://pubs.healtheffects.org>. For more information, contact Katy Walker (kwalker@healtheffects.org).

HEI’s Global Health Science Shared with U.S. Air Pollution Experts and Regulators

In May, HEI Vice President Robert O’Keefe was invited to address the spring membership meeting of the National Association of Clean Air Agencies (NACAA) in Santa Fe, New Mexico. NACAA is the national nonpartisan association of air pollution control agencies in 40 states, the District of Columbia, U.S. territories, and metropolitan areas. The association is a forum for communication and cooperation among leading federal, state, and local regulatory agencies engaged in air quality management.



HEI Vice President Robert O’Keefe.

The semi-annual membership meetings bring together leading state air quality regulators with Janet McCabe, Acting Assistant Administrator for the Office of Air and Radiation; senior program directors at the U.S. Environmental Protection Agency; and national experts on air quality regulation, compliance, technology, health effects, and related issues.

O’Keefe presented the methods and latest results from HEI’s work with the Institute for Health Metrics and Evaluation (IHME) to quantify the worldwide health impacts from air pollution in the context of the larger, ongoing Global Burden of Disease project coordinated by IHME. He also presented preliminary results from HEI’s Global Burden of Disease from Major Air Pollution Sources program (GBD MAPS; see related article), a major initiative to understand the source-specific health impacts from coal and other major sources in China (and, soon, in India and Eastern Europe).

HEI’s work on the health effects of air pollution in developing Asia is supported by internationally focused domestic foundations and designed to provide credible science to inform Asian policy makers and stakeholders. 



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The EPA honored recipients of the 2016 Clean Air Excellence Awards (above) at a ceremony attended by members of the Clean Air Act Advisory Committee. For more about the awards, see <https://www.epa.gov/caaac/clean-air-excellence-awards>.

HEI at EPA Clean Air Act Advisory Committee

HEI President Dan Greenbaum participated in the late-June meeting of the U.S. Environmental Protection Agency (EPA) Clean Air Act Advisory Committee in Arlington, Virginia, where diverse stakeholders and experts advised EPA on the best ways forward to implement the Clean Air Act. The Committee gathered on June 27 at EPA headquarters to join EPA Administrator Gina McCarthy in honoring the recipients of this year's Clean Air Excellence Awards. Early the next morning, the meeting led off with an interactive discussion

with Janet McCabe, EPA's Acting Assistant Administrator for Air and Radiation, about the latest regulatory and policy developments on ozone and the National Ambient Air Quality Standards for particulate matter, as well as developments in the Clean Power Plan and other areas. The Committee then engaged on a range of priority issues, including recommendations to improve EPA's air toxics programs, applications of new handheld air pollution sensors, health risks associated with climate change, and EPA's Ports Initiative. 