



HEI update

SPRING 2015

HEI's Strategic Plan for 2015–2020 Now Under Way

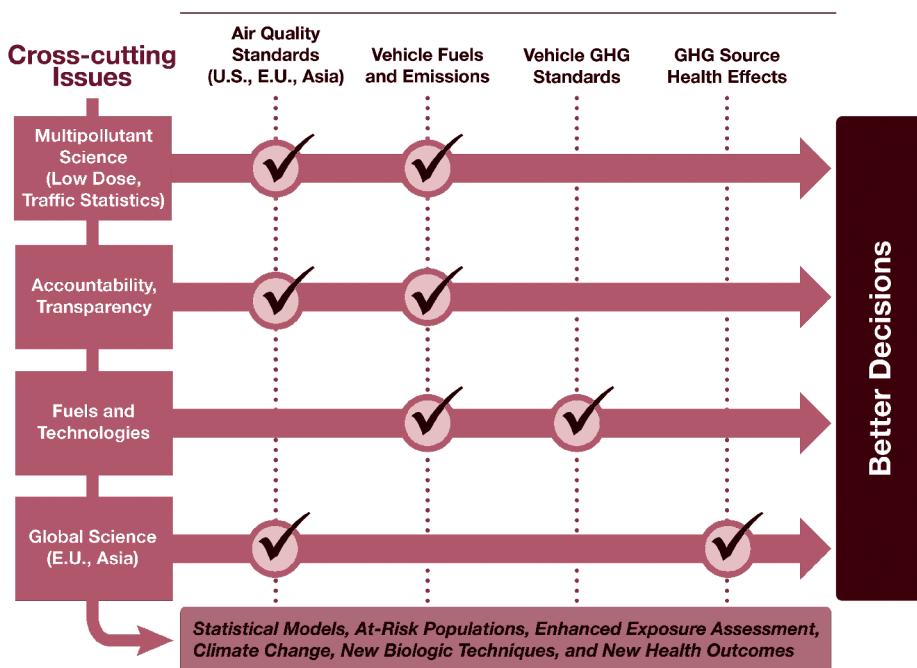
At the Annual Conference this spring, HEI launched its *Strategic Plan for Understanding the Health Effects of Air Pollution 2015–2020*, highlighting a number of initiatives already getting started under the new plan. These include the following:

- Completion of studies on ozone and cardiovascular effects, traffic exposure, diesel engine exhaust, accountability, and other important topics, and communication of their key results;
- Targeted scientific review, including an updated review of the health effects of exposure to traffic, and synthesis of scientific findings across many studies; and
- The launch of major new research projects, including, among others, studies examining potential health

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The HEI Strategic Plan 2015–2020 ... and beyond

Informing Decisions on Air Quality and on Climate-Driven Technology



The four core program elements in HEI's Strategic Plan for 2015–2020. GHG = greenhouse gas.

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Greenbaum Chairs NRC Review of U.S. Climate, Health Assessment

HEI President Dan Greenbaum has been tapped to chair a committee of the National Research Council (NRC) that is conducting an independent review of the interagency report *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. This assessment is the latest in a series of scientific evaluations of climate change being produced by the United States Global Change Research Program.

The committee, which includes a range of experts in exposure, health, population modeling, food security, infectious disease, and other areas, will provide an overall critique of the draft report and address questions such as

- Is the report responsive to the nation's need for information on the health impacts of climate change and their potential implications?

- Does the report accurately reflect the scientific literature? Are any critical content areas missing from the report?
- Are the approaches to quantitative modeling reasonable and adequately supported by existing literature?
- Are the research needs identified in the report appropriate?

A draft report was released in early April. The committee held a public session to review the report at the National Academies in early May and expects to prepare its critique for review under NRC procedures by June before releasing a final critique during the summer. More information on the project can be found at www8.nationalacademies.org/cp/projectview.aspx?key=49694. [HEI]

STRATEGIC PLAN (Continued from page 1)

effects at lower levels of exposure to air pollutants (see *HEI Update*, Fall 2014); targeted studies of the health effects of exposure to traffic; and, with additional funds from foundations, source-specific assessment of the health burdens of air pollution in developing countries.

- Pursuit of important cross-cutting issues in all of HEI's efforts: innovation and testing of statistical analysis and modeling approaches, assessment of at-risk populations, development of new biologic techniques, and more.

This plan follows significant progress under HEI's strategic plan for 2010–2015. Over the past five years, the institute has initiated, conducted, and/or completed more than 80 studies on a range of topics and communicated the results throughout the United States, Europe, Asia, and Latin America. The total number of downloads of reports from the HEI Web site averaged 128,000 each year; its published reports and accompanying journal articles were cited in the scientific literature an average of 89 times per report between 2010 and 2014; and its work was cited extensively in major decision documents from the U.S. Environmental

Protection Agency, the World Health Organization, the International Agency for Research on Cancer, and many other organizations.

"In our consultations for preparing this new plan, we heard one key message: while we should plan for specific actions we will take in the next five years, we should do so with a clear eye on the much longer time frames for future air quality and climate decisions."

— Dan Greenbaum, HEI president

"The quality of this plan depends on HEI's ability to gather input from a wide variety of audiences — our sponsors in government and industry, the scientific community, environmental and industrial stakeholders, and international, national, state, and local agencies — to ensure that our work targets the most important topics," said HEI President Dan Greenbaum. "In our consultations for preparing this new plan, we heard one key message: while we should plan for specific actions we will take in the next five years, we should do so with a clear eye on the much longer time frames for future air quality and climate decisions."

Challenging questions on how to set air quality standards continue to arise

around the globe as science evolves, and private- and public-sector decisions on technology to meet goals for limiting greenhouse-gas emissions (for example, from vehicles and stationary sources) are already aimed at meeting standards set for 2025; those standards are likely to be extended beyond 2025. With this in mind, HEI has built the next strategic plan around one overarching theme: informing decisions on air quality and on climate-driven technology for 2015–2020 and beyond. The plan integrates this theme into four core program elements — the continuing challenges of multipollutant science, accountability and transparency, assessing emerging fuels and technologies, and global health science — and describes detailed plans and a timeline for HEI's research and scientific activities in each area.

Moreover, given the need to think farther into the future, HEI has also included in the timeline a "Mid-Plan Review" in order to assess progress, scope out continuing and likely future policy directions, make modest adjustments to ensure that the institute is attuning its work to the greatest science and policy priorities, and, most important, develop a longer-term perspective — "Vision 2020" — to guide HEI beyond this current five-year plan. [HEI]

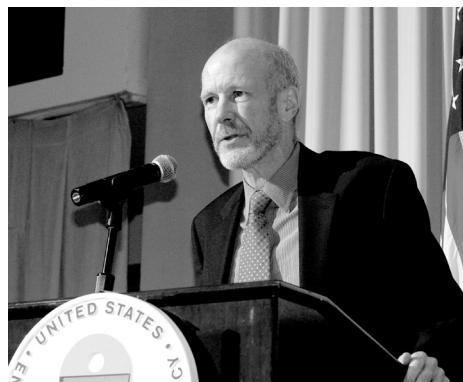
The *HEI Strategic Plan for Understanding the Health Effects of Air Pollution 2015–2020* is available for downloading, free of charge, at <http://pubs.healtheffects.org>; for a printed copy, contact pubs@healtheffects.org.

Mark Your Calendar!
HEI Annual Conference
May 1–3, 2016, Denver, Colorado

O'Keefe Closes Out Successful Run on Key Air Advisory Committee

HEI Vice President Robert O'Keefe recently concluded six successful years of service on the U.S. Environmental Protection Agency (EPA) Clean Air Act Advisory Committee. This senior-level policy committee was established in 1990 to advise the EPA on air pollution issues. In his role there, O'Keefe contributed independent advice on air pollution and its impact on health, accountability research to assess air quality actions, and key studies at the science–policy interface. He also drew on his past experience as a state regulator to

inform deliberations related to implementing the Clean Air Act Amendments of 1990 and to help the EPA address challenging questions, such as how to safeguard sensitive populations from emissions. In addition to providing formal briefings on the latest results from HEI studies on the health effects of air pollution, he also played a central role in reviewing and ranking innovative submissions from government, business, and the environmental community for the annual Clean Air Excellence Awards. [HEI]



Robert O'Keefe.

PHOTO BY ERIC VANCE

Communicating Results

HEI Science Highlighted at EPA Workshops

In February, HEI staff shared scientific findings on air pollution at two three-day workshops hosted by the U.S. Environmental Protection Agency (EPA) in Research Triangle Park, North Carolina. The first workshop kicked off the EPA's upcoming review of the National Ambient Air Quality Standards (NAAQS) for particulate matter (PM). The second workshop focused on ultrafine particles (UFPs), which raise continuing questions in the scientific and policy communities.

Informing Air Pollution Standards

The purpose of the NAAQS workshop was to highlight significant new and emerging PM research from the United States and around the world and to make recommendations to the EPA regarding the design and scope of the next PM NAAQS review. Major topics included characterization of PM emissions, air quality, and exposures; planning for review of the health-effects evidence; quantitative assessments of health risk and exposure; and integration of information to characterize the broader public health impacts of PM. HEI Principal Scientist Aaron Cohen served as a lead discussant for two sessions, one on the evaluation of cancer, genotoxicity, and mutagenicity and the other on quantitative risk assessment. HEI President Dan Greenbaum cochaired the final session, "Integrating Evidence and

Quantitative Assessments," with Dan Costa of the EPA.

The EPA will use the information shared at the workshop to help complete its planning process and to inform the next steps in the review of the PM NAAQS, including the Integrated Science Assessment and Risk/Exposure Assessment. The detailed agenda and list of speakers can be found at <https://sites.google.com/site/pmworkshop2015/agenda>.

Airing New Evidence on UFPs

More than 150 people attended the workshop on UFPs in person, and about 50 more listened in via webinar. The EPA indicated it did not plan to consider any limits on UFPs in this current round of standard setting; rather, the goal of this workshop was to air scientific evidence that has emerged since the 2009 PM NAAQS review. Katherine Walker of HEI helped lay some of the groundwork by presenting the key findings and research needs from HEI's Perspectives 3, *Understanding the Health Effects of Ambient Ultrafine Particles*, published in 2013. The audience heard presentations on the relevance of alternative UFP metrics (e.g., particle number counts, mass, and surface area), new developments in instruments for measuring UFPs, recent research on their health effects, control strategies, and policy considerations. The agenda and presentation abstracts are available at <https://sites.google.com/site/2015ufpworkshop/>. [HEI]

HEI in the News

Wide Audience for ACES Findings

Media outlets worldwide covered the publication, in January, of HEI's Research Report 184, *Advanced Collaborative Emissions Study (ACES): Lifetime Cancer and Non-Cancer Assessment in Rats Exposed to New-Technology Diesel Exhaust*. The nonprofit Diesel Technology Forum (DTF) and HEI both issued press releases announcing the study's good news about emissions from diesel engines designed to meet strict federal

air pollution regulations enacted in 2007. According to data compiled by DTF, the two releases together generated hundreds of news stories, mainly in transportation-related trade publications but also in media outlets focusing on energy and the environment. Here is a sampling of the headlines:

"No Lung Cancer Risk from New Diesels, US Study Finds" (*Air Quality News*, United Kingdom, January 30, 2015)

"Study Finds No Link Between Diesel Technologies, Cancer" (*Greenwire*,

Washington, D.C., January 27, 2015)

"Study Affirms Diesel Emissions Technology, Boosting Efforts to Replace Old Engines" (*Pittsburgh Post-Gazette*, February 10, 2015)

"HEI Data May Aid Bid to Replace Older Diesel Engines to Cut Cancer Risk" (*Inside EPA Clean Air Report*, Washington, D.C., January 29, 2015)

"Latest Diesel Engines as Clean as Expected Under EPA Rules, Study Shows" (*Yahoo! Autos*, January 29, 2015) [HEI]

Novel Statistical Methods for Studying Pollutant Mixtures

How well do current statistical methods characterize the health effects associated with individual pollutants, groups of pollutants, or pollutants from different sources? How can the implications for health of inhaling a mixture of pollutants, rather than individual pollutants, best be characterized? These are among the questions that Brent A. Coull of the Harvard T. H. Chan School of Public Health and Eun Sug Park of Texas A&M Transportation Institute, with their colleagues, sought to answer in separate studies presented in HEI Research Report 183, *Development of Statistical Methods for Multipollutant Research*. Both studies were funded in response to an HEI Request for Applications (RFA 09-1). A third study on this topic, led by John Molitor of Oregon State University, also received funding and will be published later this year.

Air pollution is a complex mixture of gases and particles of varying sizes and composition. Individual pollutants may be highly correlated with one another, reflecting similar sources, or may differ in how well exposures to them are measured in space and over time. These factors create substantial challenges for conventional statistical methods, which may focus on just one or, at most, a handful of pollutants. In particular, scientists have been concerned that conventional methods might overestimate or underestimate the health effects associated with individual pollutants or sources under these circumstances. In this Research Report, Coull and Park

and their colleagues offer alternatives to the conventional two-stage approach to the analysis of ambient air pollution, in which exposures and health outcomes are first estimated separately and then combined in one model.

In their study, *Statistical Learning Methods for the Effects of Multiple Air Pollution Constituents*, Coull and his colleagues developed a method using a technique called Bayesian kernel machine regression to simultaneously select pollutants for inclusion in the model; to allow for exposure-response relationships that are nonlinear rather than just linear, as is often assumed; to identify interactions among pollutants; and to quantify the potential uncertainty in the health effects estimates. The study by Park and her colleagues, *Development of Enhanced Statistical Methods for Assessing Health Effects Associated with an Unknown Number of Major Sources of Multiple Air Pollutants*, involved the development of enhanced Bayesian statistical methods for the assessment of source-specific health effects, using multivariate source characterization and apportionment models, together with a health analysis. Innovations in this approach included the joint assessment of exposure and health effects and the ability to represent the uncertainties from the source apportionment process more fully in the estimates of the source-related health effects.

In its independent review, the HEI Review Committee concluded that both studies made meaningful contributions

to the advancement of multipollutant statistical methods. Both teams followed appropriate processes for statistical methods development, whereby each first developed a model based on solid conceptual underpinnings, followed by validation — initially using simulation studies to create data sets with known properties and then testing their methods in real-world data sets. The committee thought further work would be necessary to apply and evaluate the methods in a broader range of settings representing different types of sources, components, and levels of data complexity. As part of future work, the committee said, these methods must continue to be compared with more conventional statistical methods to help determine whether the additional complexity leads to better understanding of the effects of pollutant mixtures and their sources — and ultimately to better decisions about how to protect public health. **[HEI]**

Research Report 183 will soon be available for downloading, free of charge, at <http://pubs.healtheffects.org>; printed copies can be purchased from HEI. For more information, contact Katherine Walker (kwalker@healtheffects.org).

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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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Journal Spotlights NPACT Studies

In its special May issue focusing on "Air Quality and Human Health," the *Journal of the Air & Waste Management Association* includes an article that the association had invited HEI to submit — "Particulate Matter Components, Sources, and Health: Systematic Approaches to Testing Effects." The article provides an overview of the results of the National Particle Component Toxicity (NPACT) initiative, and brings in evidence from other key studies and literature reviews that shed light on the question of whether certain components of particulate matter may be more toxic than others. It also discusses what evidence is consistent across NPACT and other studies and what research gaps remain to be addressed. The article is coauthored by Kate Adams, Dan Greenbaum, Rashid Shaikh, and Annemoon van Erp of HEI, along with Armistead Russell of the Georgia Institute of Technology, one of the two cochairs of the NPACT Review Panel, who also serves on the HEI Review Committee. It is available at www.tandfonline.com/doi/full/10.1080/10962247.2014.1001884. **[HEI]**

Eyes on the Future

HEI Sponsors Meet with Research Committee to Discuss the Path Forward

In February, HEI's sponsors braved Boston's snowy winter to meet with the HEI Research Committee for their annual update on the progress of key HEI-funded studies and for a discussion of priorities for implementing the institute's new *Strategic Plan for Understanding the Health Effects of Air Pollution, 2015–2020*. The sponsors supported

the major thrusts of the plan and raised questions to ensure that HEI would continue its commitment to accountability studies, apply the best new statistical models to its work, and make every effort to produce results in time for upcoming decisions on air quality standards. [HEI]

PHOTOS BY MELISSA OSTROW



Stuart Johnson of Volkswagen and Michael Spallek of EUGT.



Bryan Hubbell, U.S. Environmental Protection Agency, and Howard Feldman, American Petroleum Institute.



Kathryn Sargent, U.S. Environmental Protection Agency.



Carol Henry, consultant to Cummins, and Chad Bailey, U.S. Environmental Protection Agency.



Research Committee members Francesca Dominici, Harvard T.H. Chan School of Public Health, and Richard Smith, University of North Carolina—Chapel Hill.



Dan Costa, U.S. Environmental Protection Agency.



Bruce Copley, ExxonMobil Biomedical Sciences.



Alyssa Werthman, Ford Motor Company, and Susan Collet, Toyota Motor Engineering & Manufacturing.



Barbara Hoffmann, IUF-Leibniz Research Institute for Environmental Medicine and Heinrich Heine University of Düsseldorf, Germany, and David Foster, University of Wisconsin—Madison, both of the HEI Research Committee.



From left: Robert O'Keefe, HEI vice president; Rashid Shaikh, HEI director of science; David Christiani, Harvard T.H. Chan School of Public Health and HEI Research Committee; and Dan Greenbaum, HEI president.



Health Effects Institute

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Walter A. Rosenblith New Investigator Award Announced

Lydia Contreras, assistant professor in the Cockrell School of Engineering at the University of Texas–Austin, has been selected as the recipient of HEI's 2014 Walter A. Rosenblith New Investigator Award. Named for the first chair of the HEI Research Committee, the award supports the work of a promising scientist early in his or her career.

Contreras received a Ph.D. in chemical and biomolecular engineering from Cornell University in 2008. After doing postdoctoral work at the New York State Department of Health, she joined the faculty at the University of Texas in 2011. Her prior and current work focuses on the characterization and understanding of the roles of different types of ribonucleic acid (RNA) molecules inside cells. Her research and teaching have been recognized with numerous awards, including a National Science Foundation Faculty Early Career Development (CAREER) Award and an Air Force Office for Scientific Research Young Investigator Award.

For her Rosenblith Award project, Contreras will engineer novel biosensors for assessing modifications to RNA molecules and will investigate chemical changes induced in messenger and regulatory RNA molecules after exposure to urban air mixtures.

In selecting recipients for the Rosenblith Award, the Research Committee considers each applicant's potential for a productive scientific career in the study of air pollution and its effects on health, the support provided by the applicant's institution, and the scientific merit of the research project and its relevance to HEI's mission. The committee thought that Contreras's proposal to focus on changes in RNA molecules after exposure to air pollution and how these perturbations affect normal patterns of cellular regulation was innovative. The committee also felt that Contreras is in an excellent academic environment to conduct the investigation and has the potential to contribute substantially to a novel field in the study of the effects of air pollution.

Contreras is the 20th scientist to receive the Rosenblith Award since the inception of the program in 1999 (see the list of awardees at www.healtheffects.org/rosenblith.htm). 



Lydia Contreras.
PHOTO BY KOREY HOWELL