



Details of HEI Strategic Plan for 2020–2025 Take Shape

Every five years, HEI undertakes a detailed process of planning and prioritizing its activities for the following five years, which results in its Strategic Plan. Developed in consultation with HEI’s scientific committees, industry sponsors, government organizations, the broader scientific community, environmental organizations, and others, the Plan addresses key scientific and policy needs, anticipates future policy questions, and outlines HEI activities that would respond to these needs. It also provides a roadmap to ensure that HEI is focused on accomplishing these goals.

After reviewing a broad First Draft Plan at a public session of its Annual Conference in Seattle last May, and receiving comments and inputs from many members of the HEI family, HEI made revisions accordingly and issued a [Second Draft Plan](#), which for the first time lays out specifically what the Institute is proposing to tackle in the coming five years.

The revised draft presents specific suggestions for better testing the link between air quality actions and health; improving our understanding of the complex air pollution mixture; examining the intersections between transport and urban health; and, with additional funding, exploring the global health implications of air quality. Early in the new Plan, HEI is proposing to convene an expert multidisciplinary panel to help advise on a key question — “Where can science best contribute?” — to determine how science can most helpfully be applied for tough

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HEI Releases Initial Results of Studies Assessing Low-Exposure Effects

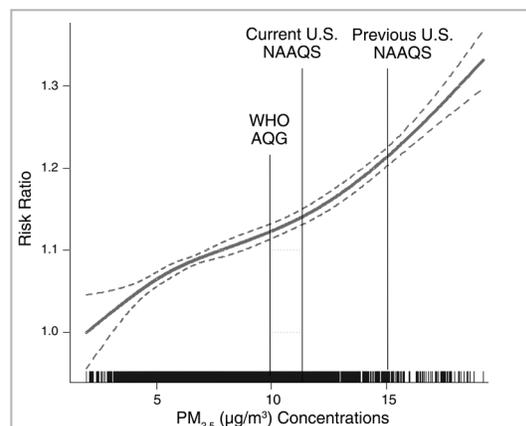
In November, HEI published Phase 1 reports from two in its trio of ongoing studies evaluating the extent to which air pollution at low levels of exposure may have consequences for public health. These major reports are based on research conducted by two teams of investigators, using U.S. and Canadian data. Results from the third study in this program — focused on Europe — are forthcoming.

Levels of most ambient air pollutants have declined significantly in the United States and many Western countries over several decades. Recent epidemiological studies, however, have suggested an association between exposure to low levels of ambient air pollution — even below the U.S. National Ambient Air Quality Standards (NAAQS) — and adverse health effects. In view of the importance of such findings, HEI in 2014 issued a request for applications seeking research to investigate this question further. HEI funded three studies under this program, each using state-of-the-art exposure methods and very large populations, based in the United States, Canada, and Europe.

The low-exposure-level studies are scheduled to be completed in mid-2020. In 2018, in order to inform the U.S. Environmental Protection Agency reviews of the NAAQS for fine particles and ozone, HEI requested Phase 1 reports from the U.S. and Canadian investigators, and appointed the Low-Exposure Epidemiology Studies Review Panel to review their results and write commentaries.

U.S. Cohort Study

As presented in [Research Report 200](#), *Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Air Pollution*, Francesca Dominici and her colleagues at Harvard University used Medicare data for



Shape of the concentration–response function for mortality associated with fine particulate matter in an earlier Canadian cohort analysis.

NAAQS = National Ambient Air Quality Standard; WHO AQG = World Health Organization Air Quality Guidelines. (Courtesy R. Burnett, for Research Reports 200 and 203)

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61 million Americans, ages 65 and older and enrolled between 2000 and 2012. They used both cohort and case–crossover designs to analyze the long- and short-term associations between exposure to PM_{2.5} and ozone and all-cause mortality. By combining air monitoring, satellite, transport modeling output, and other data, the investigators developed hybrid models for the continental United States to estimate fine particle and ozone levels at 1 km × 1 km grids.

For both long- and short-term exposures, Dominici and her team report associations between nonaccidental all-cause mortality and PM_{2.5} and ozone at concentrations at and below the NAAQS (12 µg/m³ PM_{2.5} and 70 ppb ozone); these associations were robust to most adjustments for potential confounding by lifestyle and behavioral factors for which data were available. Various sensitivity analyses also did not substantially change the findings of association.

Canadian Cohort Study

Research Report 203, *Mortality–Air Pollution Associations in Low-Exposure Environments (MAPLE)*, presents the findings of Mike Brauer at the University of British Columbia and his colleagues, who used a cohort of approximately 9 million Canadians, based on census data. They combined satellite data, ground-level measurements, atmospheric modeling data, and land-use covariates to estimate PM_{2.5} exposures at a fine resolution across North America from 1981–2016.

Brauer and colleagues report associations between nonaccidental mortality and PM_{2.5} concentrations at and below the annual U.S. ambient air quality standard of 12 µg/m³. These associations were robust to most adjustments for potential confounding by lifestyle and behavioral factors, and by exposure to nitrogen dioxide, although effects of ozone exposures on the main PM_{2.5} results need further exploration.

Need for Further Analysis

In its independent review, the Review Panel concluded that both studies have conducted extensive and innovative sets of initial analyses in these very large air pollution and health data sets; in addition, both studies add to the growing body of epidemiological evidence regarding associations between air pollution and health effects at low ambient air pollution concentrations, and advance the science considerably. However, the Panel also noted several uncertainties in each of the studies, and it awaits the extensive further analyses underway before reaching full conclusions on the air pollution and public health implications of this important research. [HEI](#)

Research Reports 200 and 203 are available for downloading, free of charge, at www.healtheffects.org. For more information, contact Eleanne van Vliet, evanvliet@healtheffects.org.

STRATEGIC PLAN 2020–2025 (Continued from page 1)

questions about mechanisms and the effects of different PM components at the very low levels now experienced in many areas.

HEI welcomes comments on the **Second Draft Plan**, available at www.healtheffects.org/about/strategic-plan. Please contact Rashid Shaikh (rshaikh@healtheffects.org); Bob O’Keefe (rokeefe@healtheffects.org); or Dan Greenbaum (dgreenbaum@healtheffects.org). [HEI](#)

Effects at Low Concentrations of Ozone

The release of the low-exposure epidemiology studies by Michael Brauer and Francesca Dominici (see accompanying article) provides timely information for the ongoing U.S. Environmental Protection Agency (EPA) review of the National Ambient Air Quality Standard (NAAQS) for particulate matter. At the same time, EPA is reviewing the NAAQS for ozone, for which another HEI-funded study is contributing important information: the Multicenter Ozone Study in oldEr Subjects (MOSES).

MOSES tested whether ozone has short-term cardiovascular effects at present-day ambient levels. It reported respiratory but not cardiovascular effects in 87 healthy participants (60 years old on average) who were exposed to 0, 70, or 120 ppb ozone for 3 hours while exercising moderately (see **Research Report 192, Part 1**, available at www.healtheffects.org/publications).

Part 2 of the MOSES study evaluated whether the controlled ozone exposures of elderly participants in experimental chambers were potentially influenced by exposure to ambient ozone and other air pollutants up to a week before the experimental exposure. (The participants breathed clean air on the day before the experiment to minimize this possibility.) Part 2 has been completed, and HEI expects to publish a final report in early 2020. Recently, EPA released a draft assessment that the ozone standard is likely to remain the same; that is, it will be neither tightened nor loosened based on current scientific knowledge. That assessment is currently undergoing peer review.

Data Access

For all HEI-funded studies with potential regulatory importance, HEI encourages the investigators to make the underlying data publicly available, according to its long-standing **Data Access Policy** (available at www.healtheffects.org/accountability). For the MOSES study, all data are available through a public repository, **Dataverse** (<https://dataverse.harvard.edu/dataverse/moses>).

In addition, biological samples are available for researchers interested in conducting additional analyses (see **Databases**, www.healtheffects.org/research/databases). Certain data and other information for the low-exposure epidemiology studies by Brauer and Dominici, as well as by Bert Brunekreef of Utrecht University in the Netherlands, will be made available after the full results of those studies are published in 2021. To protect participants’ privacy, the investigators cannot directly release confidential health records, such as from Medicare, but they are providing details of what health data they used — and those data are available from the Centers for Medicare and Medicaid Services. [HEI](#)

Upcoming Joint Meeting in Brussels to Inform EU Air Quality Policies

To help inform air quality decisions in the European Union, HEI, the World Health Organization, the International Society for Environmental Epidemiology, and the European Respiratory Society plan to hold a joint meeting on January 21–22, 2020 in Brussels, Belgium (see **draft agenda**). The event, also supported by the European Commission, will update a similar workshop that HEI helped organize in Brussels during the European Union’s “Year of Air” (2013). After the workshop, a briefing on research results will be presented to the European Parliament.

For more information, contact jboogaard@healtheffects.org. To request attending the meeting, contact roberta.sadauskaitė@ersnet.org. (Note that space may be limited.) [HEI](#)

Review Committee Welcomes Jerrett

Michael Jerrett, an internationally recognized expert in geographic information science for exposure assessment and spatial epidemiology, recently joined the [HEI Review Committee](#). He is a full professor and the chair of the Department of Environmental Health Sciences, as well as director of the Center for Occupational and Environmental Health, at the Fielding School of Public Health, University of California, Los Angeles.



Michael Jerrett.

Jerrett earned his Ph.D in geography from the University of Toronto. Over the past 23 years, he has researched how to characterize population exposures to air pollution, how to determine the social distribution of these exposures among different groups

(e.g., low vs. high income), and how to assess the health effects from environmental exposures. He has worked extensively on how the built environment affects exposures and health, particularly the role of parks and open spaces on physical activity promotion and obesity prevention.

Jerrett has published some of the most widely cited papers in the fields of exposure assessment and environmental epidemiology in leading journals, including *The New England Journal of Medicine*, *The Lancet*, *Proceedings of the National Academy of Sciences of the United States of America*, and *Nature*.

In 2009, the National Academy of Sciences appointed Jerrett to the Committee on Human and Environmental Exposure Science in the 21st Century, which issued its report, *Exposure Science in the 21st Century: A Vision and a Strategy*, in 2012. He also served on the National Academy of Sciences Standing Committee on Geographical Sciences from 2016 to 2019. [HEI](#)

PHOTO COURTESY OF UCLA FIELDING SCHOOL OF PUBLIC HEALTH

Communicating the Science

Epidemiological Insights

In August, HEI staff attended the 31st annual conference of the International Society for Environmental Epidemiology (ISEE 2019) in Utrecht, the Netherlands. HEI had a strong presence in discussions of the history and future of environmental epidemiology.

Hanna Boogaard of HEI and Francesco Forastiere (King's College London, UK and HEI Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution) organized a symposium on new health research on low-level ambient air pollution. HEI President Dan Greenbaum spoke on the implications of such research for future risk-benefit assessments and regulations.



From left, Manolis Kogevinas, David Savitz, Bob O'Keefe, and Kristie Ebi at the ISEE conference.

In a workshop on "Developing Credible Research Partnerships with Industry," HEI Vice President Robert O'Keefe presented on HEI's success and continuing challenges in engaging industry and its regulators in research to advance science and public health. HEI Research Committee Chair David Savitz, Brown University, led the discussion; also presenting were

Manolis Kogevinas of ISGlobal and Kristie Ebi, University of Washington.

HEI Consulting Scientist Aaron Cohen and Jon Samet of the Colorado School of Public Health organized a [symposium](#) on issues and challenges of estimating the global risk and burden of particulate air pollution exposure. HEI's State of Global Air team distributed [materials](#) in the exhibition hall promoting its data-rich website at www.stateofglobalair.org.

HEI staff highlighted other activities in the poster session. Boogaard and Allison Patton presented posters on the protocol and early results of paper screening in HEI's ongoing [systematic literature review](#) on the health effects of long-term exposure to traffic-related air pollution. Anna Rosofsky presented a poster on [HEI-Energy's review of the epidemiology literature](#) on human health effects associated with unconventional oil and gas development.

Diesel Emissions and Ultrafines

HEI Director of Science Rashid Shaikh and President Dan Greenbaum communicated HEI's latest findings at several events this fall.

In September, Greenbaum presented "The Future is Urban: What Will That Mean for Transportation?" at the Commercial Vehicle Engineering Conference, sponsored by SAE International in Indianapolis, Indiana. For the large number of heavy-duty vehicle and emissions engineers in attendance, he highlighted significant trends that are

shaping the future of urban air quality.

In early October, Shaikh was the keynote speaker at a conference organized by the Mining Diesel Emissions Council in Toronto. Since the late 1990s, the Council has provided a global forum to disseminate research on how to control diesel engine emissions. Shaikh summarized HEI's studies on emissions from modern diesel engines that strongly support such controls.

Later in October, Shaikh addressed the National Association of Clean Air Agencies' fall membership meeting in Washington, D.C. He described scientific evidence on the potential health impact of ambient ultrafine particles and summarized findings of the [2013 HEI report on ultrafines](#), results of a recent review for the German Umweltbundesamt, and other evidence. [HEI](#)

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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 website.

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Assessing the Science on Traffic-Related Air Pollution

HEI's Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution met with HEI staff in Boston on October 30–31 to apply its systematic approach to search the epidemiological literature on long-term exposure to traffic-related air pollution and selected health outcomes, assess study quality, summarize results, and reach conclusions about the body of evidence, as reflected in its [protocol](http://www.healtheffects.org/system/files/TrafficReviewProtocol.pdf) (www.healtheffects.org/system/files/TrafficReviewProtocol.pdf). The protocol has been largely based on standards set by the Cochrane Collaboration, the World Health Organization, and the National Institute of Environmental Health Sciences.

The Panel was appointed in 2018 by HEI's Board of Directors following the publication of HEI's well-cited 2010 critical



Front row, from left: Eleanne van Vliet, Jennifer Vveuve, Sharon Sagiv, Evi Samoli, Jeff Brook, Danielle Vienneau, Audrey Smargiassi, and Allison Patton. Back row, from left: Francesco Forastiere, Hanna Boogaard, Barbara Hoffmann, Richard Atkinson, Gerard Hoek, Fred Lurmann, Adam Szpiro, Greg Wellenius, Meltem Kutlar Joss, and Rashid Shaikh.

review. HEI expects to publish the Panel's findings as a Special Report in Fall 2021. Further information is available online at www.healtheffects.org/air-pollution/systematic-literature-review-traffic-related-air-pollution, or contact Hanna Boogaard at HEI, jboogaard@healtheffects.org.  PHOTO BY MELISSA OSTROW

HEI ANNUAL CONFERENCE April 5–7, 2020 • Renaissance Boston Waterfront Hotel, Boston, MA

Registration materials and a preliminary program available soon at www.healtheffects.org/annual-conference.