HEI HEALTH EFFECTS INSTITUTE

update

WINTER 2022

HEI Publishes Key Global Health Study

Assesses World's Burden of Disease from Exposure to Major Air Pollution Sources

HEI has published the first comprehensive global estimates of contributions from the most common sources of air pollution to people's exposure to fine particles and to the world's burden of disease from various causes. The study found that combustion of fossil fuels (coal, oil, and natural gas) was the single largest contributor to air pollution health burdens, contributing to an estimated one million deaths globally (27.3% of all mortality), with the majority of those deaths related to coal.

HEI Research Report 210, *Global Burden of Disease from Major Air Pollution Sources (GBD MAPS): A Global Approach,* led by Erin McDuffie and Randall Martin of Washington University, St. Louis, and Michael Brauer at the University of British Columbia, aims to help countries decide which air pollution source sectors to address with policies that limit emissions. The study team estimated source contributions at global, world region, and national scales. They used updated emissions inventories categorized by sector and fuel, satellite data and air quality modeling, and the most recent relationships between air quality and health.

The investigators found that major sources

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New Experts Join HEI's Scientific Committees

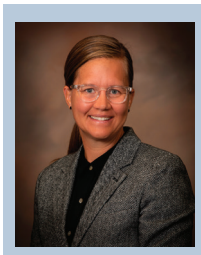
HEI's Board of Directors recently approved the appointments of three distinguished scientists to the Research Committee and two to the Review Committee.

In collaboration with HEI staff, these committees perform distinct and independent roles to ensure the quality and integrity of HEI's research. The Research Committee oversees new and ongoing research projects while the Review Committee critically reviews the results. Members can serve a maximum of two four-year terms.

Research Committee Members

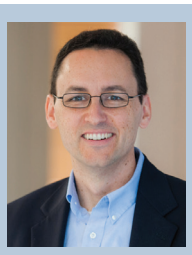
Heather A. Holmes is an associate professor in the Department of Chemical Engineering at the University of Utah. Her research focuses on transdisciplinary investigations of processes that govern the transport of atmospheric pollutants. Specifically, her research group uses ground-based sensors, atmospheric models, and satellite remote sensing to investigate atmospheric physics, air pollution sources, and transport and dispersion ultimately to provide data for human health and public policy assessments.

Holmes' most recent research efforts include incorporating air quality modeling estimates in health effects studies, using satellite remote sensing to model surface pollutant concentrations downwind of wildfires, developing data fusion techniques to improve air pollution exposure estimates, and improving atmospheric parameterizations in meteorological and air quality models. She has numerous peer-review publications and has received many awards for her scholarly activities, including a National Science Foundation CAREER award and a Fulbright scholar award. Holmes received a Ph.D. in mechanical engineering from the University of Utah.



Heather A. Holmes

Evangelia (Evi) Samoli



Gregory Wellenius

Sara D. Adar

Eric J. Tchetgen Tchetgen

Evangelia (Evi) Samoli is an associate professor of epidemiology and medical statistics at the Medical School of the National and Kapodistrian University of Athens, Greece. Her research interests include environmental epidemiology that focuses on the health effects of air pollution, statistical methods for the analysis of time-series and longitudinal data in environmental epidemiology, and cancer epidemiology that focuses on the investigation of risk factors for developing cancer. Samoli has been a member of committees for the World Health Organization, the European Commission, and HEI.

Samoli is a member of international scientific societies that are active in environmental epidemiology issues and has published more than 145 peer-reviewed articles in international journals. She received an M.Sc. in social statistics from the University of Southampton,

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Also in This Issue...

SAVE THE DATE! 2022 ANNUAL CONFERENCE April 24–26 Washington, DC

New HEI Study Examines Air Pollution and Brain Development in Children

Recent advances in neuroimaging that allow in vivo investigation of brain structure and function have the potential to lend credence to the nervous system outcomes reported in air pollution epidemiological studies. HEI investigator Mònica Guxens of the Barcelona Institute for Global Health (ISGlobal) and colleagues used new neuroimaging technology to assess the possible relationship of air pollution exposure during pregnancy and childhood with brain outcomes in children. Their findings are presented in HEI Research Report 209, *Associations of Air Pollution on the Brain in Children: A Brain Imaging Study.*

Guxens, the 2016 recipient of HEI's Walter A. Rosenblith New Investigator Award, and her team studied brain structural and functional measures using neuroimaging techniques in Generation R, an existing birth cohort in Rotterdam, the Netherlands. The investigators used air pollution data and neuroimaging data collected in about 800 school-age children and in about 3,100 pre-adolescents. Early-life exposure was estimated at the residential address level for various air pollutants using existing land-use regression models, mainly from the European ESCAPE project.

The study found some evidence of associations between early-life air pollution exposure and various measures of brain structural morphology, structural connectivity, and functional connectivity in children. For example, exposure to air pollution during early life was associated with a thinner cortex in various regions of the brain in school-age and pre-adolescent children.

In its independent review of the study, the HEI Review Committee noted several major strengths: the availability of high-resolution neuroimaging data for a large subset of the cohort (the largest sample to date), the wealth of individual-level covariate data, and estimation of a large suite of air pollution exposure metrics. The clinical relevance of the findings remains unclear, however. Because the brain has a dynamic structure that is constantly evolving throughout life, longitudinal studies beginning as early as possible are the best means to assess the effects of air pollution on the developmental trajectories of the brain outcomes included in the current cross-sectional analysis.

The Committee considered Guxens an exceptional recipient of HEI's New Investigator Award and was impressed by her performance and successful completion of a pioneering project. HEI

Research Report 209 will soon be available for downloading at www.healtheffects.org/publications. For more information on the study, contact Hanna Boogaard, jboogaard@healtheffects.org.

Coming Soon: State of Global Air Special Analysis

How Does Your Air Measure Up Against the WHO Air Quality Guidelines?

HEI's Global Health program will soon publish new data that make it possible to compare how ambient fine particulate matter ($PM_{2.5}$) and ozone in each country of the world compare to updated Air Quality Guidelines (AQGs) and the associated interim targets released by the World Health Organization (WHO) in September 2021. Initial results of this State of Global Air Special Analysis indicate that more than 50% of the world now lives with air pollution that exceeds even the least stringent WHO air quality guidelines. These data offer both an accounting of exposures to air pollution globally and a foundation for informing decisions and actions toward cleaner air.

Members of HEI staff and expert committees played various roles in development and review of WHO's new AQGs. These updated guidelines reflect the growing body of evidence on impacts of exposure to air pollution that has accumulated over the past few decades and create a strong push for countries to improve air quality and protect people's health.

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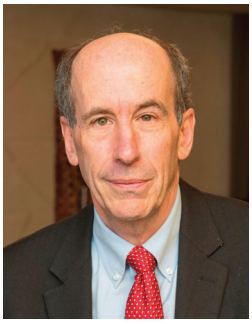
Greenbaum Appointed to EPA Clean Air Committee

HEI President Dan Greenbaum was appointed to the U.S. Environmental Protection Agency's (EPA) Clean Air Act Advisory Committee (CAAAC) this fall by EPA Administrator Michael Regan, along with several other new members. The CAAAC is a senior-level policy committee established in 1990 to advise EPA's Office of Air and Radiation and the broader EPA on issues related to implementing the Clean Air Act Amendments of 1990.



Dan Greenbaum

At the first meeting of the newly re-formed committee, in October, the committee considered and accepted a report produced by former and current members on "Successes and Challenges of Fifty Years of the Clean Air Act." Greenbaum notes that "the report documents a range of impressive progress for cleaner air since major changes to the Act were adopted in 1970, but it identifies several important continuing challenges, chief among them addressing issues of inequitable exposure and effects of air pollution and adapting the Act to address climate change."

The committee meets two or more times a year. The assistant administrator for the Office of Air and Radiation determines the committee agenda, and the CAAAC provides advice to the agency on critical air quality policy issues during face-to-face meetings and through specific work group reports. HEI

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State of Global Air: *www.stateofglobalair.org*

Richard A. Meserve, *Chair, Board of Directors*
Daniel S. Greenbaum, *President*

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.

Production Staff for *Update:*
Hope Green, *Editor*
David A. Wade, *Wadeink, Graphic Designer*

HEI Takes Health-Conscious Approach to Reopening Office

HEI has seen 22 months of successful and productive virtual operations, with both locally based staff members and a growing number of remote colleagues. This past fall, as vaccination levels increased in Massachusetts and COVID levels began to decline, some staff members began returning to HEI's headquarters in Boston, Massachusetts, for occasional or weekly in-person activity.

Administrative staff and department directors had occupied the downtown office suite on a limited basis since the spring of 2020, but in early September 2021 HEI began to accommodate a hybrid model as an option for the entire staff, enabling in-person interaction – and the communication benefits that can come with that – even while keeping everyone safe.

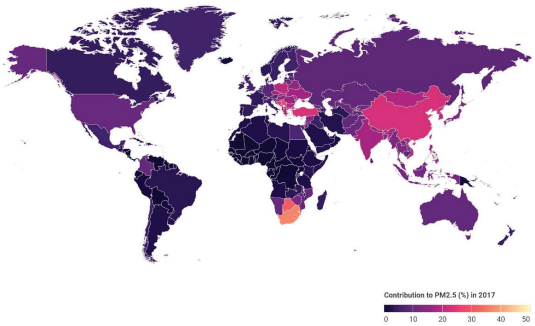
During this time of pandemic, the safety of HEI's staff and their families have remained of paramount concern and HEI has taken a number of steps to ensure that, including:

- air quality testing and the addition of air filters for better air exchange;
- masks required in all common areas;
- limited capacity in shared spaces, such as conference rooms;
- three-foot distancing and masks required for any in-person meetings; and
- masks, gloves, and hand sanitizer readily available inside the office space. A hand sanitizer dispenser also has been installed at the entrance.

In January 2022, in light of the Omicron variant, HEI temporarily suspended the hybrid operation while continuing to monitor caseloads and spread. HEI looks forward to the possibility of increasing in-person activity when conditions improve again.

KEY GLOBAL HEALTH STUDY *(Continued from page 1)*

of fine particles varied substantially by country, with notable contributions from energy generation, windblown dust, international shipping, and agriculture sectors in certain locations. An independent HEI Special Review Panel concluded that this study's results at the global scale are valuable additions to an understanding of how various sources of air pollution contribute to exposure and health burdens.



Population exposure to fine particles from coal combustion in 2017.

The study team has made all input data and results publicly available to support the active development of finer-scale air quality management strategies that focus on specific source sectors. UN Environment has already used the data from the GBD MAPS Global Project to highlight the importance of key sources of outdoor fine particulate matter as part of its Clean Air Day. Additionally, Clean Cooking Alliance has used data on the contribution of residential fuel use to levels of outdoor fine particles as part of an interactive StoryMap. This story map was released during the first ever Clean Cooking Week held between October 18 and 25, 2021. The data will be incorporated into future iterations of the State of Global Air report, a joint initiative of HEI and the Institute for Health Metrics and Evaluation (IHME).

Research Report 210 is available for downloading at www.healtheffects.org/publications. For more information on this study, contact Allison Patton, apatton@healtheffects.org.

EXPERTS JOIN HEI COMMITTEES *(Continued from page 1)*

United Kingdom, and her Ph.D. in epidemiology from the Medical School of the University of Athens.

Gregory Wellenius is a professor of environmental health at the Boston University School of Public Health. His research focuses on assessing the human health impacts of the built environment in the context of a rapidly changing climate. This work has contributed to scientific understanding of the health risks associated with air pollution, noise pollution, other features of the physical environment, and those posed by a changing climate. Wellenius has published more than 150 peer-reviewed articles and is currently the associate editor of *Epidemiology* and *Environmental Epidemiology*. He received a Sc.D. in environmental health and epidemiology from the Harvard T.H. Chan School of Public Health.

New on the Review Committee

Sara D. Adar is an associate professor and the associate chair of epidemiology at the University of Michigan School of Public Health. Her research focuses on the human health effects of air pollution, particularly cardiovascular, pulmonary, and cognitive health effects. She has a growing interest in identifying intervention strategies to reduce exposures and improve health.

Adar has served as an expert panelist for the Environmental Protection Agency, including participation in the development of the National Ambient Air Quality Standards for particulate matter and sulfur oxides. She received the Sandra A. Daugherty Award for Excellence in Cardiovascular Epidemiology from the American Heart Association and the Excellence in Teaching Award from the University of Michigan School of Public Health. She is the author of numerous peer-review publications, is a former member of the executive board of the International Society of Environmental Epidemiology, and serves as an associate editor of *Environmental Health Perspectives*.

Adar received a B.S. in environmental engineering from the Massachusetts Institute of Technology, an M.H.S. in environmental health from the Johns Hopkins Bloomberg School of Public Health, and an Sc.D. from the Harvard T.H. Chan School of Public Health.

Eric J. Tchetgen Tchetgen is the Luddy Family President's Distinguished Professor and a professor of statistics and data science at the Wharton School of the University of Pennsylvania. His primary area of interest is in semiparametric efficiency theory with application to causal inference, missing data problems, statistical genetics, and mixed model theory. He develops statistical and epidemiologic methods that make efficient use of the information in data collected by scientific investigators, while avoiding unnecessary assumptions about their underlying data-generating mechanism. Tchetgen Tchetgen has received numerous awards and honors, has more than 200 peer-reviewed publications, is an associate editor of the *American Journal of Epidemiology*, and serves on the editorial boards of the *Journal of the American Statistical Association*, *Journal of the Royal Statistical Society*, *Observational Studies*, and *Journal of Casual Inference*. He received a Ph.D. in biostatistics from Harvard University.

More about HEI's research and review process is available on our website. For complete committee membership rosters see About HEI.

New Research Opportunities

Apply Now: New Investigator Award

With RFA 21-2, the Walter A. Rosenblith New Investigator Award, HEI is soliciting proposals from promising candidates at the assistant professor level or equivalent for research on air pollution and health. Preliminary applications are due on **March 25, 2022**. Full applications (by invitation only) will be due on **September 23, 2022**.

Applicants can learn more about the goals of the RFA and the process of applying by attending an **Applicant Webinar** on January 20, 2022.

To register for the webinar, learn about eligibility, and view the complete RFA and instructions, click **here**. Applicants should contact HEI to check their eligibility before applying.

Background about the award, including past recipients, can be found **here**.

Seeking Studies in India

HEI has issued a Request for Statements of Information and Qualification (RFIQ 21-3) to solicit applications for studies on air pollution and health in India.

Air pollution is among the largest contributors to the overall burden of disease in India. Yet very few studies to date have assessed the effects of long-term exposure (i.e., over several years) to air pollution on mortality, whether from all causes or from specific causes.

RFIQ 21-3, supported by foundation funding, seeks to identify scientific teams to conduct epidemiologic studies of potential associations between exposure to air pollution and cardiovascular and respiratory disease or other relevant health outcomes in India. Submit information and qualifications by **February 11, 2022.** For more information, click **here**.

HEI Reviewing Applications to Study Non-Tailpipe Particle Emissions

HEI has issued RFA 21-1, Quantifying Real-World Impacts of Non-Tailpipe Particulate Matter Emissions, to study non-tailpipe PM emissions from motor vehicles and their impacts on air quality, human exposure, and human health.

An informational webinar for applicants was held in October in which HEI staff described the application process and summarized the RFA's goals. Webinar slides and a summary of the Q&A session that followed the presentation are available on the RFA 21-1 web page.

The RFA is soliciting applications to develop, evaluate, and apply real-world exposure indicators of non-tailpipe PM emissions from motor vehicles (e.g., from tire, brake, wheel weights, and road wear and resuspension of dust from the road surface) and to assess the impacts of such emissions on air quality, human exposure, and human health. The approaches of interest include:

- identifying and validating exposure indicators to characterize non-tailpipe PM emissions in near-road or ambient air,
- developing or extending existing approaches to measure non-tailpipe PM in the near-road environment, and
- estimating current and future potential impacts of non-tailpipe emissions from passenger and/or commercial vehicles on air quality, exposure, and/or potential contribution of non-tailpipe emissions to health burden attributable to ambient $PM_{2.5}$ mass.

More detailed information can be found on the RFA 21-1 web page.

Communicating the Science

HEI Webinars Spotlight SE Europe

In October and December, HEI held two webinars in a three-part series focusing on air pollution and health in Southeast Europe. The presentations, which will conclude with a third webinar on February 2, aim to:

- review the status of current evidence on the health effects of air pollution in the region and its interlinkage to current policy debate and actions,
- provide a platform to address major air quality and health-related questions in Southeast Europe, including the status of current evidence and policy directives, and
- discuss the accessibility and usability of the air quality and health data streams to enable use in research and build a regional evidence base.

A variety of experts and stakeholders participated in the first webinar in the series. To view a recording, and to register for the third webinar, visit the series' **web page**.

Old town of Plovdiv, Bulgaria.

Other Webinars Available on Replay

Tune in to these any time:

- A discussion of HEI's major new European study led by Bert Brunekreef of the University of Utrecht: "New Results on Health Effects at Low Air Pollution Levels in 28 Million Participants Across Europe Informing Europe's Air Quality Policies."
- A talk by HEI President Dan Greenbaum on "Tying it All Together: Approaches to Assessing and Synthesizing Environmental Health Evidence for Better Decisions," an information-gathering session of a National Academies of Sciences, Engineering, and Medicine committee charged with weighing evidence of air pollution's health effects to help inform the U.S. National Ambient Air Quality Standards.

STATE OF GLOBAL AIR *(Continued from page 2)*

The updated WHO Air Quality Guideline for annual average $PM_{2.5}$ is set at 5 μg/m^3 based on evidence of health effects of long-term exposure to $PM_{2.5}$. WHO has suggested four interim targets set at progressively lower concentrations for regions of the world where $PM_{2.5}$ levels remain high: 35 μg/m^3, 25 μg/m^3, 15 μg/m^3, and 10 μg/m^3. The AQGs, although not legally binding, can influence decision making on air quality standard setting globally, both in the near and long term. Following the release of this SoGA Special Analysis, the next full State of Global Air report is due out early in 2022 on *www.stateofglobalair.org*, an interactive website for public access to all associated data. The report and website bring into one place a comprehensive analysis of the trends in air quality levels and health burdens for every country in the world. HEI

HEI's Global Health program is supported by a number of foundations and international agencies. Visit www.stateofglobalair.org to learn more, or e-mail any queries to contactsoga@healtheffects.org.

Apply for the 2022 Jane Warren Trainee Conference Award

HEI is inviting applications for the Jane Warren Trainee Conference Award for its 2022 Annual Conference. This award, previously known as the HEI Travel Award, is named in remembrance of Jane Warren, who joined HEI in the 1980s and led the Institute's scientific activities as director of science from 1999 until her retirement in 2008.

Up to six award winners (three from institutions in the greater Washington, D.C. area and three from any institution in North America or Europe) will be invited to present their research as part of HEI's Annual Conference in Washington, D.C. in April. The award will pay for travel, accommodations, and meals for the duration of the conference. Awardees will be selected on a competitive basis, upon review of the application and proposed abstract.

Eligibility

- If applying to the local track, awardees should be graduate students or postdocs at academic or research institutions in the greater Washington, D.C. area.
- If applying to the general track, awardees should be graduate students or postdocs at academic or research institutions in North America or Europe.
- The applicant's research shall not be currently funded by HEI.
- The applicant's research must be related to HEI's research interests in air pollution, exposure, and health (as described in HEI's Strategic Plan).
- The applicant must be able to attend HEI's Annual Conference from April 24-26, 2022 at The Westin Washington, Washington D.C.

Selection Criteria

- Scientific merit and writing quality of the abstract
- Relevance to, or advancement of, HEI's research interests in air quality and health

Applications are due by **February 17**. Click here for more information, including the application form and abstract instructions, or contact Martha Ondras with the subject line "HEI 2022 Jane Warren Trainee Conference Award." Applicants will be notified in March. HEI

Staff News

HEI Welcomes Two New Colleagues

Elise G. Elliott joined HEI this fall as a staff scientist, bringing expertise in exposure assessment and environmental epidemiology. Elliott is part of the Core and Energy Research programs to understand potential human exposures and health effects associated with air pollution and unconventional oil and gas development.

Elliott earned a Ph.D. in environmental health sciences from Yale University, where she assessed environmental exposures and public health impacts of unconventional natural gas development in a community-based study. She completed a postdoctoral fellowship in environmental epidemiology at the Harvard T.H. Chan School of Public Health, where she investigated exposure to multiple environmental and contextual factors in relation to chronic health outcomes and biomarkers of disease using data from nationwide, prospective cohort studies. She holds a B.S. in biology, a B.A. in philosophy of science, and an M.S. in environmental biology from Leiden University, the Netherlands.

Quoc Pham recently joined Lissa McBurney on the science administrative team, supporting HEI's core research programs on the health effects of air pollution and its Global Health programs. Previously he worked at Library Services at Springfield College in Springfield, Massachusetts. He earned a B.A. in history at the University of Massachusetts, Amherst. HEI

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