



Promoting Dialogue *Building Trust*



Conferring

Stakeholders in government and industry as well as the scientific community bring diverse perspectives to HEI's table. Pictured: Susan Collet, Toyota, with Alan Vette, U.S. Environmental Protection Agency.

Across the Aisle, Across the Nation, Across



Convening

Our conferences attract experts from a range of scientific disciplines, such as Sanjay Rajagopalan (right), director of Case Western Reserve University's Cardiovascular Research Institute, shown with HEI Director of Science Rashid Shaikh.

Photography: "Conferring" and "Facilitating," Melissa Ostrow; "Convening" and "Connecting," Jay Mallin



Facilitating

The Research Committee meets with staff at HEI's Boston headquarters. Once a year, sponsors also join in the discussion so the Committee can hear directly from them about priority topics HEI should address. Above: Erika Sasser, U.S. Environmental Protection Agency, and (foreground, right) Greg Martin of Ford.

For nearly four decades the Health Effects Institute has been a trusted, nonpartisan source for credible research on air quality and health, and a place for open dialogue on the results

Mission

Our mission is to support informed decisions related to air quality. We do this by funding, overseeing, and critically evaluating research on the health effects of air pollution, and then putting the findings into the context of current science and policy debates.

The HEI Process

Every step of our process is designed to make sure our work is timely, relevant, and credible.

1. Informed Priorities

HEI's research priorities, articulated in the [HEI Strategic Plan for Understanding the Health Effects of Air Pollution](#), are informed by consultation with sponsors, the scientific community, and environmental, industry, and state-level stakeholders.

2. Checks and Balances

Our Board of Directors appoints widely respected experts to the HEI Research Committee and HEI Review Committee. These bodies act independently from one another so that the process of selecting and overseeing research projects is separate from the process of critically evaluating and communicating research results.

3. Rigorous Independent Science Programs

The Research Committee works with HEI's scientific staff to design targeted research and funds investigators competitively to answer key science and policy questions. When each HEI study is completed, the Review Committee subjects it to a thorough peer-review process to ensure the scientific integrity of the methods and findings. Sponsors help set the overall priorities but are not involved in the conduct or review of the research.

4. Interpretation and Commentary

The Review Committee works with HEI's scientific staff to produce commentaries that explain — in both summary and more detailed form — what the studies mean for science and policy.

Common Ground

Open dialogue is crucial to creating impactful solutions to air quality problems. By providing trusted science and a neutral forum to discuss complex issues, HEI creates a space where diverse stakeholders can find common ground.

We're honored to serve as a hub for connecting people around the world who are united by a desire for cleaner air and better health.



Connecting

Scientists and HEI sponsors hear HEI investigator Stuart Batterman discuss his work on traffic exposure modeling.

the Globe

Balance

With balanced funding from government and industry, we support independent investigations into air pollution, its health impacts, and its solutions.

Rigor

Over the decades we've honed a meticulous peer-review system that ensures our research stands up to scrutiny and our commentary adds value. The integrity of this process has made HEI a respected, go-to source for decision makers in both the public and private sectors.



Tackling the Tough Questions

One question is crucial to crafting smart policy solutions for today's challenges: What has worked in the past? There are no simple answers. In a highly dynamic world, it's tricky to separate the outcomes of any one policy from the many other changes — driven by economic forces, social shifts, disruptive technologies, and other policies — happening at the same time. Getting an accurate picture of how air quality regulations actually impact emissions and human health takes a high degree of expertise and sophisticated scientific methodology.

New Studies Make Important Progress

Tracing the health impacts of emissions controls

Ying-Ying Meng (University of California, Los Angeles) and colleagues, in a study funded by HEI, are evaluating the effects of a plan California implemented in 2006 to reduce emissions associated with ports and goods movement. Initial results suggest the pollution controls appear to have had significant health benefits.

Examining the health effects of low-level pollution

US: In a pathbreaking HEI study, Harvard T.H. Chan School of Public Health researcher Francesca Dominici and colleagues are using data from tens of millions of Medicare and Medicaid enrollees to examine health effects of long-term exposure to low levels (below current standards) of air pollution in the United States.

Canada: Michael Brauer (University of British Columbia) and colleagues are using Canadian health data to develop new methods for understanding how exposure to low-level pollution affects the risk of death from a variety of causes.

Europe: In a third study, a team led by Bert Brunekreef (University of Utrecht, Netherlands) is combining data from a series of European studies and other health databases to understand the nuances of health effects associated with exposure to low concentrations of various air pollutants.

HEI is up to the challenge. Since 2003, our [Accountability Research Program](#) has established HEI as a leader in developing concepts and methods to evaluate effects of air quality interventions. In two waves of research (with a third recently launched), HEI has refined approaches to test whether the actions met their projected goals.

Funded studies have included investigations into the effectiveness of Clean Air Act amendments, emissions controls targeting the movement of goods in California, air quality regulations in the southeastern United States, traffic control measures in London, a coal ban in Irish cities, legislation to reduce sulfur in fuel in Hong Kong, air quality measures enacted during the Beijing Olympic Games, and other interventions.

Through this work, we are proud to help decision makers — at all levels of government and in the private sector — apply lessons from the past to inform future actions.

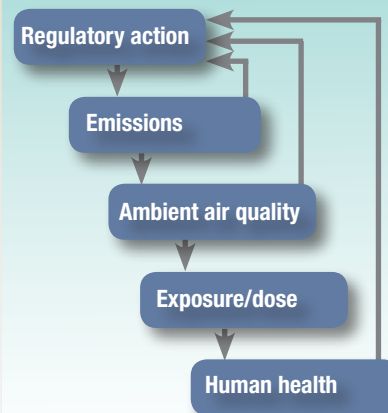
A Leader in Accountability Research

A major study released in 2018 demonstrates the complexity — and value — of accountability research. The study comprehensively evaluated the impact of a suite of air quality regulations on emergency department visits in the Atlanta area over a period of nearly 15 years, concluding that the pollution-control measures prevented almost 9,000 emergency department visits each year for respiratory and cardiovascular diseases.

The study ([HEI Research Report 195](#)), by Armistead Russell and colleagues at the Georgia Institute of Technology and Emory University, was a mammoth undertaking. The team developed advanced models that incorporate detailed emissions and pollution data and hospital admission records, while accounting for confounding variables, to analyze impacts from national and state-level regulations on emissions from both power plants and vehicles. The researchers used their models to compare actual pollution levels and hospital records with outcomes that would be expected to occur in the

Chain of Accountability

HEI diagram showing relationship of regulatory action to health effects of air pollution.



absence of the regulatory action, providing solid evidence of the regulations' air and health benefits.

Like previous HEI accountability studies, the Russell study received attention from a wide range of constituencies, drawing hundreds of diverse government regulators, industry stakeholders, and community members from around the globe to an interactive HEI webinar with the investigators and HEI scientists in April 2018.

The study also helped answer an earlier question raised by an HEI investigator in Atlanta. A 2010 HEI study by Jennifer Peel, now at Colorado State University, had found that the relatively limited traffic-control measures Atlanta instituted when it hosted the 1996 Olympics had not had clear air and health benefits. Russell's work showed that the full suite of regulations implemented in the Atlanta area over two decades was indeed correlated with reduced emissions, improved air quality, and measurable health improvements.

With a new wave of research funding announced in 2018, HEI is continuing to invest in improving the accuracy and usefulness of accountability studies. In particular, future studies will aim to increase statistical power and improve the ability to account for background trends and attribute changes to a single intervention among many regulatory actions.



A World on the Move

Reconsidering the Future of Cars

When Venkat Sumantran, Chairman of Celeris Technologies, delivered the keynote address at HEI's 2018 Annual Conference, he challenged attendees to think about cars not as they are but as they may soon be. Sumantran, coauthor of *Faster, Smarter, Greener: The Future of the Car and Urban Mobility*, pointed to a series of trends that are shaking up how people get from place to place, and explored what it all might mean for the air we breathe.

As we move toward a future of “smart cities” — powered by big data, artificial intelligence, and personal choice — governments and individuals have an opportunity to make more conscious decisions about how we balance convenience, budget, carbon footprint, privacy, and other factors when choosing modes of transit. To guide informed decisions, Sumantran emphasized the need for research to track the impacts of shifting transportation patterns, examine trade-offs between alternative interventions, and nudge people toward choices that are better for them and their communities.

Vehicles have garnered longstanding attention for their contributions to air pollution and health effects. For decades, traffic pollution research focused on the number of vehicles on the road and what's coming out of their tailpipes. While those factors remain important, researchers today are posing a much broader array of questions to track how far we've come in reducing traffic-related pollution — and what disruptive changes may lie ahead.



New Tech, New Questions

Cars and traffic conditions have changed dramatically since the first widespread emissions standards were rolled out in the 1960s. Meander down America's iconic Route 66 today and you're apt to encounter a diverse mix of vehicles powered by gas, diesel, biodiesel, electricity, and even hydrogen fuel cells. An ever-increasing number of cars, buses, and trucks are incorporating artificial intelligence and self-driving technologies. Rapid growth in urban areas, the emergence of ride-sharing apps, and new models for public transit are increasingly influencing where people go and how they get there.

What do these changes mean for air pollution? Over the decades, vehicle standards and emissions regulations have markedly reduced the amount of pollution

each vehicle produces, improving air quality and reducing exposure to traffic-related air pollution in many places. It's not yet clear, however, how shifting transit models and economic trends will affect overall traffic-related pollution in the years ahead. At the same time, previously overlooked impacts of roadways and vehicle traffic, such as noise pollution and effects on green space and the built environment, are garnering increased attention, while novel sensor technologies and data collection methods are opening new ways to measure pollutants and their health impacts.

Promoting Science Innovation and Dialogue

HEI combines innovative approaches to thinking about pollution that use new scientific methods and data collection capabilities with a strong desire to hear from and meet the needs of diverse parties. Our research in this area reflects the priorities of a wide variety of stakeholders who want to understand trends in traffic-related pollution and anticipate future needs. For example, a panel session at our 2018 annual conference brought together representatives from the Engine Manufacturers Association and U.S. Environmental Protection Agency, among others, to share what they view as continuing central research questions on traffic-related air pollution.

HEI's landmark report [*Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects*](#) has served as a vital resource for interpreting the large body of research on traffic-related air pollution since its release in 2010 and is still the most widely downloaded HEI report. But science continues to grow, and in 2018 HEI appointed a new expert panel to systematically review the latest scientific findings for an updated assessment of traffic-related air pollution exposures and potential adverse health effects. The panel's report is anticipated for release in late 2020.

New Science

A core strength of HEI's rigorous science programs is the ability to disentangle complex webs of causes, effects, and confounding variables. Three of our new studies aim to separate out the health effects of air and noise pollution from other factors that may influence health in communities located near roadways, including socioeconomic status, green space, physical activity, diet, and stress:

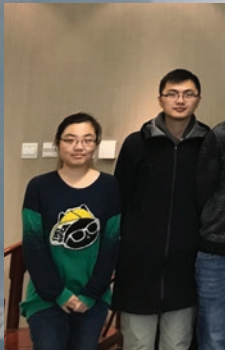
- Meredith Franklin (University of Southern California) and colleagues are assessing potential health effects of sources of vehicle-related pollution other than the tailpipe, including noise as well as non-tailpipe emissions of metals.
- Payam Dadvand and Jordi Sunyer (Barcelona Institute for Global Health, Spain) are tracking exposure to traffic-related air pollution and potential health effects among pregnant women and their babies.
- Ole Raaschou-Nielsen (Danish Cancer Society Research Center, Denmark) and colleagues will assess traffic pollution and noise exposure and their relationships to a variety of health outcomes in three large Danish cohorts.



Self-driving vehicles are expected to contribute to new forms of mobility in cities around the world.



HEI's Global Reach



Air pollution knows no borders. For better or worse, pollution generated — or prevented — in one place can affect air quality thousands of miles away, across continents and oceans. In the global economy, air quality regulations also transcend boundaries. To inform actions both at home and abroad, HEI conducts, exchanges, and shares air pollution research with scientists and decision makers around the world.

Leaders Turn to HEI for Reliable Science

The landmark report, *State of Global Air 2018*, presented a striking finding: 95 percent of the world's population lives in areas exceeding World Health Organization guidelines for healthy air. The annual report, produced by HEI and partners — the Institute for Health Metrics and Evaluation (IHME) at the University of Washington and the University of British Columbia — draws data from IHME's Global Burden of Disease project to create the most comprehensive analysis of global air quality and health impacts available.

Leading researchers, environmental groups, policy makers, and media outlets routinely cite the report's findings on air

quality and health impacts. HEI publishes it in conjunction with a dedicated, interactive State of Global Air website (www.stateofglobalair.org), which makes it easy for researchers, journalists, and many others to download data and zoom from worldwide data down to trends in individual countries. The website and report have attracted interest from users on six continents.

HEI's *Burden of Disease Attributable to Major Air Pollution Sources in India* (Special Report 21), also drawing on Global Burden of Disease data, takes a close look at India, where air pollution contributes to more than 1 million deaths per year. The study is the first to estimate the contributions of all major sources to air pollution exposure and health impacts in each state throughout India. By examining alternative future policies for energy use and pollution control, the study is designed to address important questions about air pollution's impact in Asia.

A Focus on Asia

Several recent and ongoing HEI studies delve into pollution sources and solutions in one of the most heavily polluted regions in the world: Asia.

One study, by HEI's China Shipping Working Group, focuses on Shanghai and the Yangtze River Delta and the area's role as a major shipping hub for transporting goods between mainland China and ports around the globe. By developing high-resolution emission inventories for shipping-related activities and tracking their influence on air pollution, the study aims to inform interventions to reduce the health burden of maritime commerce in one of China's biggest ports.

A second study, led by Roel Vermeulen of Utrecht University in the Netherlands, takes a broad look at health impacts of air pollution across many Asian countries. A collaborative project by the Asia Cohort Consortium, the study is combining information from dozens of research populations — some of which have been studied for more than



50 years — to understand the associations between exposures to air pollution and death from noncommunicable diseases (including cardiovascular and respiratory diseases and cancer) in Asia.

HEI on the Road

HEI's air pollution experts traversed the world in 2017–2018 to engage with researchers and leaders abroad.

Joint Workshop on India Pollution Findings

HEI released its Special Report 21, *Burden of Disease Attributable to Major Air Pollution Sources in India*, at a joint scientific workshop with the Public Health Foundation of India and the Indian Institute of Technology Bombay. A diverse crowd of leading physicians, air quality experts, government officials, and representatives of environmental nongovernmental organizations attended the event, held in New Delhi, to discuss the report's findings and learn about HEI's *Global Burden of Disease from Major Air Pollution Sources* (GBD MAPS) project.

Pacific Basin Consortium

HEI Director of Science Rashid Shaikh journeyed to New Delhi to deliver a plenary lecture at the 17th International Conference of the Pacific Basin Consortium for Environment and Health. Shaikh presented findings from major HEI studies of particulate matter and health and chaired a symposium on measuring and controlling ambient air pollution.

International Epidemiology Conference

Several HEI researchers headed to Sydney, Australia, where they were invited to present to the largest annual global gathering of environmental epidemiologists. While there, Consulting Principal Scientist Aaron Cohen received the prestigious John Goldsmith Award for Outstanding Contributions to Environmental Epidemiology. HEI Consulting Senior Scientist Hanna Boogaard served on the conference's scientific program committee and cochaired a symposium on studying air pollution effects in very large populations with HEI Review Committee member Lianne Sheppard, University of Washington, Seattle.



In December 2017, HEI Principal Scientist Katherine Walker, third from right, met with experts at Tsinghua University in Beijing for a workshop to identify studies for use in health impact assessments in China.



Energy Research Program

The Energy Research Committee (including Chair George Hornberger, facing page), toured oil and natural gas operations in Weld County, Colorado, in July. From left: Howard Hu, Elaine Faustman, Judy LaKind, Stefanie Ebelt-Sarnat, Shari Dunn-Norman, and Ted Russell.

Photo by Donna Vorhees

HEI's new **Energy Research Program**, designed to provide high-quality, impartial science to support decisions relevant to oil and natural gas development from unconventional sources, launched in January 2018 with separate funding and quickly became a hub for productive discussions among diverse stakeholders.

Independent Committee Appointed

The Energy Research Committee was established to define and oversee the multidisciplinary research program in collaboration with HEI staff. To ensure the highest scientific quality and integrity, the Committee consists of members who are internationally recognized experts in one or more subject areas relevant to the Committee's work, have demonstrated their ability to conduct and review scientific research impartially, are independent of sponsor organizations, and have been vetted for conflicts of interest.

First Steps

The program's initial phase focuses on identifying knowledge gaps that merit research. The Energy Research Committee is conducting comprehensive reviews of the health and exposure literature to date to determine what current studies do and do not tell us about potential exposures and effects and to understand which exposures are likely to have the greatest potential significance for health. This information will help guide the Committee's planning for scientific investigations scheduled to begin in 2019.



The Energy Research Committee held its third public workshop in September, in Austin, Texas.

Jana Birchum

Open Events Facilitate Dialogue, Build Trust

The Committee has hosted three public workshops to date, bringing together a wide range of scientific, government, industry, and environmental stakeholders in Boston, Denver, and Austin, Texas, to contribute their perspectives to the program's work and priorities. The events explored existing research



George Hornberger, Energy Research Committee chair.

on exposure assessment, trends in oil and gas operational practices and regulation, air and water quality impacts, and assessments of human health risk.

Looking Ahead

In future years, the Committee will oversee a research program to answer crucial questions about exposures and potential health risks.

HEI has announced the first seven members of the Energy Research Committee:

George M. Hornberger

Director, Vanderbilt Institute for Energy & Environment, Nashville, Tennessee

Shari Dunn-Norman

Missouri University of Science and Technology, Rolla, Missouri

Elaine M. Faustman

University of Washington, Seattle

Howard Hu

School of Public Health, University of Washington and School of Public Health, University of Michigan

Judy S. LaKind

LaKind Associates, LLC, Catonsville, Maryland, and Adjunct Faculty, University of Maryland, Baltimore

Armistead (Ted) G. Russell

Georgia Institute of Technology, Atlanta

Stefanie Ebelt Sarnat

Emory University, Atlanta, Georgia

Committees 2017–2018

RESEARCH COMMITTEE

David L. Eaton, Chair

Dean and Vice Provost of the Graduate School, University of Washington, Seattle

Jeffrey R. Brook

Senior Research Scientist, Air Quality Research Division, Environment Canada, and Assistant Professor, University of Toronto, Canada

Francesca Dominici

Professor of Biostatistics and Senior Associate Dean for Research, Harvard T.H. Chan School of Public Health

David E. Foster

Phil and Jean Myers Professor Emeritus, Department of Mechanical Engineering, Engine Research Center, University of Wisconsin, Madison

Amy H. Herring

Sara & Charles Ayres Professor of Statistical Science, Duke University, Durham, North Carolina

Barbara Hoffmann

Professor of Environmental Epidemiology, Institute of Occupational, Social, and Environmental Medicine, University of Düsseldorf, Germany

Allen L. Robinson

Raymond J. Lane Distinguished Professor and Head, Department of Mechanical Engineering, and Professor, Department of Engineering and Public Policy, Carnegie Mellon University

Ivan Rusyn

Professor, Department of Veterinary Integrative Biosciences, Texas A&M University

New Chair of HEI Research Committee



Peter Goldberg

David A. Savitz, a respected epidemiologist with extensive experience in environmental health, became the chair of HEI's Research Committee in the second half of 2018. Savitz is the associate dean for research and a professor of epidemiology in the Brown University School of Public Health, with joint appointments in obstetrics and gynecology and pediatrics in the Alpert Medical School. His epidemiological research has addressed a wide range of important public health issues, including environmental hazards in the workplace and community, reproductive health outcomes, and environmental influences on cancer. He has conducted extensive work on health effects of nonionizing radiation, pesticides, drinking water treatment byproducts, and perfluorinated compounds.

REVIEW COMMITTEE

James A. Merchant, Chair

Professor and Founding Dean Emeritus, College of Public Health, University of Iowa

Kiros Berhane

Professor of Biostatistics and Director of Graduate Programs in Biostatistics and Epidemiology, Department of Preventive Medicine, Keck School of Medicine, University of Southern California

Mark W. Frampton

Professor Emeritus of Medicine and Environmental Medicine, University of Rochester Medical Center

Frank Kelly

Professor of Environmental Health and Director of the Environmental Research Group, King's College London

Jana B. Milford

Professor, Department of Mechanical Engineering and Environmental Engineering Program, University of Colorado, Boulder

Jennifer L. Peel

Professor of Epidemiology, Colorado School of Public Health and Department of Environmental and Radiological Health Sciences, Colorado State University

Roger D. Peng

Professor of Biostatistics, Johns Hopkins Bloomberg School of Public Health

Lianne Sheppard

Professor of Biostatistics, School of Public Health, University of Washington, Seattle

Publications 2017–2018

Workshop Summary

SEPTEMBER 2017

Effects of Fuel Composition on Particulate Emissions

Health Effects Institute

Research Report 193

OCTOBER 2017

Particulate Air Pollutants, Brain Structure, and Neurocognitive Disorders in Older Women

Jiu-Chuan Chen

Request for Applications 17-3

DECEMBER 2017

Walter A. Rosenblith New Investigator Award

Health Effects Institute

Special Report 21

JANUARY 2018

Burden of Disease Attributable to Major Air Pollution Sources in India
GBD MAPS Working Group

Research Report 194

FEBRUARY 2018

A Dynamic Three-Dimensional Air Pollution Exposure Model for Hong Kong
Benjamin Barratt

Special Report

APRIL 2018

State of Global Air 2018: A Special Report on Global Exposure to Air Pollution and Its Disease Burden

Health Effects Institute

Research Report 195

APRIL 2018

Impacts of Regulations on Air Quality and Emergency Department Visits in the Atlanta Metropolitan Area, 1999–2013

Armistead G. Russell



Jay Mallin

Recipients of the Walter A. Rosenblith New Investigator Award include (front row, from left) Kymberly Gowdy, East Carolina University (2015 recipient); Lydia Contreras, University of Texas, Austin (2014); Marie Pedersen, University of Copenhagen, Denmark (2017); Mònica Guxens, Barcelona Institute for Global Health (2016); and (back row, at right) Joshua Apte, University of Texas, Austin (2017). With them are (back row, left) HEI Managing Scientist Annemoon van Erp and (center) David Eaton, who recently completed two four-year terms as chair of the HEI Research Committee.

Research Report 196

APRIL 2018

Developing Multipollutant Exposure Indicators of Traffic Pollution: The Dorm Room Inhalation to Vehicle Emissions (DRIVE) Study

Jeremy A. Sarnat

Ongoing Studies and Reports under Review and in Press 2017–2018

ACCOUNTABILITY

Improvements in air quality and health outcomes among California Medicaid enrollees due to goods movement actions, Phase 2.

Ying-Ying Meng, University of California, Los Angeles

AIR POLLUTION CONSTITUENTS AND MIXTURES

Emissions and Exposure Assessment

Scalable multipollutant exposure assessment using routine mobile monitoring platforms.

Joshua Apte, University of Texas, Austin

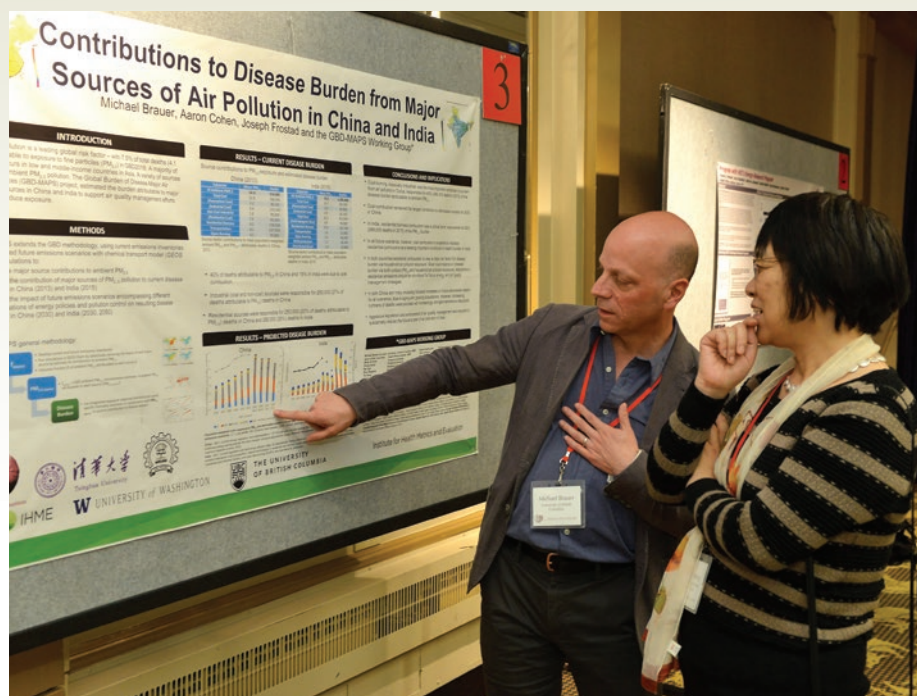
*Enhancing models and measurements of traffic-related air pollutants for health studies using Bayesian melding. *Stuart Batterman, University of Michigan*

*Use of real-time sensors to assess misclassification and to identify main sources contributing to peak and chronic exposures. *Juana Maria Delgado-Saborit, University of Birmingham, UK*

*Characterizing the determinants of vehicle traffic emissions exposure: Measurement and modeling of land-use, traffic, transformation, and transport. *Christopher Frey, North Carolina State University*

Chemical and physical characterization of non-tailpipe and tailpipe emissions at 100 locations near major roads in the Greater Boston area. *Petros Koutrakis, Harvard T.H. Chan School of Public Health*

**Report in the HEI review process as of June 30, 2018*



Mike Brauer, University of British Columbia, Vancouver, Canada, with Ying-Ying Meng, University of California, Los Angeles.

*Evaluation of alternative sensor-based exposure assessment method. *Edmund Seto, University of Washington*

*Real-world vehicle emissions characterization for the Shing Mun Tunnel in Hong Kong and Ft. McHenry Tunnel in the U.S. *Xiaoliang Wang, Desert Research Institute*

Epidemiology

Susceptibility to multiple air pollutants in cardiovascular disease. *Jane Clougherty, Drexel University*

Air Pollution, Autism spectrum disorders, and brain imaging amongst Children in Europe — the APACHE project. *Mònica Guxens, ISGlobal, Barcelona Institute for Global Health, Spain*

Impact of exposure to air pollution on asthma: A multi-exposure assessment. *Marie Pedersen, University of Copenhagen, Denmark*

Epidemiology at Low Exposures

Identifying the shape of the association between long-term exposure to low levels of ambient air pollution and the risk of mortality: An extension of the Canadian Census Health and Environment Cohort using innovative data linkage and exposure methodology. *Michael Brauer, University of British Columbia, Canada*

Mortality and morbidity effects of long-term exposure to low-level PM_{2.5}, black carbon, NO₂, and O₃: An analysis of European cohorts. *Bert Brunekreef, Utrecht University, Netherlands*

Assessing adverse health effects of long-term exposure to low levels of ambient pollution. *Francesca Dominici, Harvard University*

Epidemiology of Traffic-Related Air Pollution and Noise

Traffic-related air pollution and birth weight: the roles of noise, placental function, green space, physical activity, and socioeconomic status (FRONTIER). *Payam Dadvand and Jordi Sunyer, Barcelona Institute for Global Health (ISGlobal), Spain*

Intersections as hot spots: assessing the contribution of localized non-tailpipe emissions and noise on the association between traffic and children's health. *Meredith Franklin, University of Southern California*

Health effects of air pollution components, noise and socioeconomic status ("HERMES"). *Ole Raaschou-Nielsen, Danish Cancer Society Research Center, Copenhagen, Denmark*

Mechanisms of Health Effects

Understanding the impact of air quality on the chemistry of ribonucleic acids. *Lydia Contreas, University of Texas, Austin*

*Air quality by genomics interactions in a cardiovascular disease cohort. *William Kraus, Duke University*

*Composition and oxidative properties of particulate matter mixtures: Effects of particle phase state, acidity, and transition metals. *Nga Lee (Sally) Ng, Georgia Institute of Technology*

*Understanding the health effects of isoprene-derived particulate matter enhanced by anthropogenic pollutants. *Jason Surratt, University of North Carolina, Chapel Hill*

Photos: Jay Mallin

GLOBAL HEALTH

Contribution of household air pollution to ambient air pollution: Evidence from Ghana — finding the best path forward. *Household Air Pollution–Ghana Working Group*

Impact of shipping sources on air quality and burden of disease in Shanghai, Yangtze River Delta. *China Shipping Working Group*

OZONE

Effects of ozone in human volunteers exposed to low levels of ozone in a laboratory, Part 2. *John Balmes, University of California, San Francisco; Philip Bromberg, University of North Carolina, Chapel Hill; Mark Frampton, University of Rochester*

Scavenger receptor B1 regulates oxidized lipid driven pulmonary and vascular inflammation after ozone exposure. *Kymberly Gowdy, East Carolina University*

Diverse Perspectives Inform HEI's Work



Philip Fine, South Coast Air Quality Management District (California).



Sabine Lange, Texas Commission on Environmental Quality.



Left to right: Jaime Hart, Harvard T.H. Chan School of Public Health, and Robin Puett and Devon Payne-Sturges, both from the University of Maryland School of Public Health.

Financial Summary 2017–2018

HEI made significant progress in fiscal year 2018 toward the objectives of the Health Effects of Air Pollution program with ongoing research on possible health effects from low levels of exposure and examining the potential effects of traffic exposure in its broader context. We have also made progress in expanding our efforts in Global Health Science. These activities were made possible by funding from our core government and industry partners with additional funding from government, industry, and foundation sponsors. Separate funding has also allowed us to move forward with our Energy Research Program. The significant balance in Temporarily Restricted Net Assets ensures we will have funds to continue and expand our current targeted research initiatives in future years.

STATEMENTS OF FINANCIAL POSITION

	June 30	
	2018	2017
Assets		
Cash and cash equivalents	\$3,117,536	\$1,074,243
Restricted cash	147,535	147,390
Contributions receivable	326,049	62,779
Unbilled incurred costs on grants	3,910,656	2,531,924
Prepaid expenses	3,739	52,835
Office equipment, office furniture and fixtures, and leasehold improvements, net	130,669	123,535
Total assets	\$7,636,184	\$3,992,706
Liabilities and Net Assets		
Liabilities:		
Contracted research payables	\$338,824	\$935,654
Accrued contracted research	1,233,093	1,179,300
Deferred revenue	802,691	0
Deferred rent payable	51,185	36,019
Other accounts payable and accruals	515,064	401,617
Total liabilities	2,940,857	2,552,590
Unrestricted net assets	560,151	512,692
Temporarily restricted net assets	4,135,176	927,424
	4,695,327	1,440,116
Total net assets	4,695,327	1,440,116
Total liabilities and net assets	\$7,636,184	\$3,992,706

The HEI Financial Statement and the Mayer Hoffman McCann P.C., Tofias New England Division Auditors' Report may be obtained by contacting Jacqueline C. Rutledge at jrutledge@healththeeffects.org.

STATEMENTS OF ACTIVITIES

	Years Ended June 30	
	2018	2017
Changes in unrestricted net assets:		
Revenues and support:		
EPA grants for the Health Effects of Air Pollution Program	\$4,478,732	\$5,124,999
Other industry contributions	4,830,262	4,363,502
Other non-federal grant and contract revenue	511,309	803,573
Energy Research Program grant	875,000	275,000
Other revenues	47,459	54,957
Total revenues and support	10,742,762	10,622,031
Expenses:		
Research programs:		
Research studies	2,606,274	4,368,564
Research planning and study selection	415,896	408,956
Scientific study management	247,693	251,971
Scientific study review	230,255	223,964
Scientific publication and communication	679,210	760,489
	4,179,328	6,013,944
Special scientific projects:		
Energy Research	527,538	363,441
Traffic Studies Review	36,878	---
Global Health Science	819,652	1,074,810
	1,384,068	1,438,251
Total scientific expense	5,563,396	7,452,195
Administration	1,924,155	1,935,194
Total expenses	7,487,551	9,387,389
Net increase (decrease) in net assets	3,255,211	1,234,642
Net assets at beginning of year	1,440,116	205,474
Net assets at end of year	\$4,695,327	\$1,440,116

Sponsors 2017–2018

CORE SPONSORS



Sherri Hunt, U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency

Office of Research and Development

National Center for Environmental Research

National Health and Environmental Effects Research Laboratory

National Center for Environmental Assessment

Office of Air and Radiation

Office of Air Quality and Planning Standards

Office of Transportation and Air Quality

Office of Atmospheric Programs

Office of Radiation and Indoor Air

Photos: Melissa Ostrow

Motor Vehicle Industry

BMW of North America, LLC

Caterpillar, Inc.

Cummins Engine Company

Daimler AG

Detroit Diesel Corporation

FCA Group

Ford Motor Company

General Motors Corporation

Hino Motors, Ltd.

American Honda Motor Company, Inc.

Hyundai America Technical Center, Inc.

Isuzu Motors, Ltd.

Jaguar Land Rover North America, LLC

KIA Motors America, Inc.

Mazda Motor Corporation

Mitsubishi Motors Corporation

Nissan Motor Company, Ltd.

PACCAR, Inc.

Renault SAS

Subaru Research and Development, Inc.

Toyota Motor Corporation

Volkswagen of America, Inc.

Volvo Cars of North America, LLC

Volvo Powertrain North America



Timothy French, Truck & Engine Manufacturers Association.

OTHER SPONSORS

Bloomberg Philanthropies

CONCAWE (Conservation of Clean Air and Water in Europe)

John Deere and Company

ExxonMobil

William and Flora Hewlett Foundation



Bruce Copley, ExxonMobil.

REPORT CREDITS

Writing

Anne Frances Johnson

Art Direction/Design

Glenn Ruga

Project Management and Editing

Hope Green

Cover photography

Center (handshake) by Glenn Ruga; lower left (cookstove) by Ajay Pillarisetti; lower right (at Noble Energy's training facility in Greeley, Colorado) by Kathryn Liziewski; and stock photo services.



Printing

DS Graphics, Lowell, MA

Digitally printed on 100% post-consumer reclaimed paper.

HEI Staff and Board of Directors 2017–2018

OFFICERS AND STAFF

Daniel S. Greenbaum

President

Robert M. O'Keefe

Vice President

Rashid Shaikh

Director of Science

Jacqueline C. Rutledge

Director of Finance and Administration

April Rieger

Corporate Secretary

Hanna Boogaard

Consulting Senior Scientist

Aaron J. Cohen

Consulting Principal Scientist

Maria G. Costantini

Principal Scientist

Philip J. DeMarco

Compliance Manager

Hope Green

Editorial Project Manager

Kathryn Liziewski

Research Assistant

Lissa McBurney

Science Administrative Assistant

Allison P. Patton

Staff Scientist

Hilary Selby Polk

Managing Editor

Lindy Raso

Executive Assistant

Anna S. Rosofsky

Staff Scientist

Robert A. Shavers

Operations Manager

Annemoon M.M. van Erp

Managing Scientist



Melissa Ostrow

HEI welcomed two distinguished members of the medical and scientific communities to its Board of Directors in 2018: Homer A. Boushey, a world-renowned expert on asthma at the University of California, San Francisco, and a former HEI Review Committee chair; and Alan I. Leshner, who for much of his career has held top-level scientific posts, including CEO of the American Association for the Advancement of Science. Pictured (standing, from left) are Board members Jared Cohon, Richard Celeste (chair), Leshner, and Henry Schacht; (seated, from left) Boushey, Enriqueta Bond, Stephen Corman, and Michael Clegg. Not shown: Sherwood Boehlert, Jo Ivey Boufford, and Linda Rosenstock.

Donna J. Vorhees

Director of Energy Research

Katherine Walker

Principal Scientist

BOARD OF DIRECTORS

Richard F. Celeste, Chair

President Emeritus, Colorado College

Sherwood Boehlert

Of Counsel, Accord Group; Former Chair, U.S. House of Representatives Science Committee

Enriqueta Bond

President Emerita, Burroughs Wellcome Fund

Jo Ivey Boufford

President, New York Academy of Medicine

Michael T. Clegg

Professor of Biological Sciences, University of California, Irvine

Jared L. Cohon

President Emeritus and Professor, Civil and Environmental Engineering and Engineering and Public Policy, Carnegie Mellon University

Stephen Corman

President, Corman Enterprises

Linda Rosenstock

Dean Emeritus and Professor of Health Policy and Management, Environmental Health Sciences and Medicine, University of California, Los Angeles

Henry Schacht

Managing Director, Warburg Pincus; Former Chairman and Chief Executive Officer, Lucent Technologies

Archibald Cox

Founding Chair, 1980–2001

Donald Kennedy

Vice Chair Emeritus, 1980–2003; Editor-in-Chief Emeritus, Science



HEALTH EFFECTS INSTITUTE

75 Federal Street, Suite 1400

Boston, MA 02110-1817

USA

Phone: + 1 617 488 2300

Fax: 1 617 488 2335

www.healtheffects.org

