



National Institute of
Environmental Health Sciences

Annual Report

NIEHS-WHO Collaborating Centre for Environmental Health Sciences



2014-2015

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Introduction

The NIEHS vision, presented in the Strategic Plan for 2012–2017, is to provide “global leadership for innovative research that improves public health by preventing disease and disability.” The NIEHS identifies Global Environmental Health (GEH) as a part of its strategic themes, recognizing that because environmental health problems cross national boundaries, conducting studies around the world benefits not just those in areas being studied, but all people who suffer from the same or related environmental health problems. The inclusion of GEH continues a tradition of NIEHS global leadership and collaboration on solving the most pressing environmental health problems and improving the lives of the most vulnerable populations, both in the United States and around the world.

The NIEHS-WHO Collaborating Centre for Environmental Health Sciences (Collaborating Centre) builds on several decades of partnership. Designated September 14, 2013, the Terms of Reference, during 2013-2017, are to assist the WHO:

1. By promoting international cooperation among environmental health research institutes around the world.
2. In promoting global awareness of emerging issues in environmental health.
3. In the preparation of training materials and support education and training efforts in environmental and occupational health sciences.

This collaboration benefits both organizations by fostering coordination among major environmental health institutions around the world and supporting scientific and awareness raising activities on topics of mutual interest.

This annual report describes the Centre’s accomplishments for the period of September 1, 2014 through September 30, 2015, the first full year of operation of the Collaborating Centre. We are pleased to summarize accomplishments organized according to the Centre’s six focus areas:

- Developmental Origins of Health and Disease
- Network of Children’s Environmental Health Collaborating Centres
- Electronic Waste
- Health Implications of Climate Change and Sustainable Development
- Cookstoves and Indoor Air Pollution
- WHO Chemical Risk Assessment Network Support

These programmatic highlights are followed by highlights of the year’s training and capacity building efforts, which cross cut all the focus areas. Lastly, the report lists some of the communications products the Centre employs to raise awareness of global environmental health issues and in an Appendix provides website links to communication materials.

NIEHS Leadership for the Collaborating Centre



John Balbus, M.D., M.P.H., Collaborating Centre Director and lead for climate change and human health

“This Collaborating Centre helps NIEHS achieve its mission by enhancing our ability to develop effective partnerships and provide leadership on global environmental health issues.”

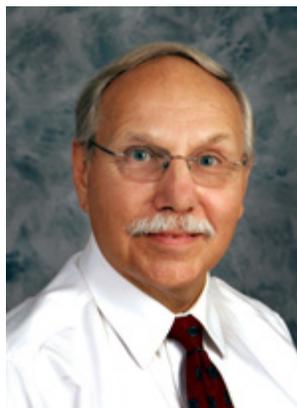
– John Balbus



Kimberly Gray, Ph.D.
Co-lead for children’s environmental health and indoor air pollution



Michelle Heacock, Ph.D.
Co-lead for children’s environmental health and electronic waste



Jerry Heindel, Ph.D.
Co-lead for developmental origins of health and disease



Banalata Sen, Ph.D.
Lead for training and capacity building



William Suk, Ph.D.
Co-lead for children’s environmental health and electronic waste



Claudia Thompson, Ph.D.
Co-lead for developmental origins of health and disease and indoor air pollution



Christopher Weis, Ph.D.
Representative to the WHO Chemical Risk Assessment Network

Focus Areas

DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE

A growing body of scientific evidence suggests that many environmental stressors encountered during critical stages of early development can lead to long-term, and even multi-generational, health consequences. Research supported by NIEHS on the developmental origins of health and disease (DOHaD) is linking exposures to heavy metals, pesticides, and other stressors with a range of chronic conditions, including obesity, type II diabetes, cancer, and cardiovascular diseases. This concept has evolved from epidemiological studies of infant and adult mortality. The Collaborating Centre works to translate scientific understanding of environmental stressors and DOHaD for scientists and decision makers to help combat the growing global rates of these non-communicable diseases.

“Three converging themes brought NIEHS into this area. First, it was always clear that development is a sensitive time for toxicants, as shown in animal models. Second, in the late 1980s and early 1990s, a class of chemicals was described that caused toxicity by acting on hormone receptor systems. Third, and critically, was the development of sensitive methods to detect changes in gene expression that resulted from exposure to endocrine-disrupting chemicals.”

- Jerry Heindel

Leading efforts to understand early exposures

The Collaborating Centre co-sponsored the fourth Prenatal Programming and Toxicology meeting (PPTOX IV), [“Environmental Stressors in Disease and Implications for Human Health,”](#) in Boston, October 27-29, 2014. This international conference provided a forum for interdisciplinary discussions on the current landscape, future directions, and ongoing global implications of environmental hazards during early life and long-term consequences.

NIEHS staff served on conference planning and scientific committees and developed sessions. Two sessions focused on Collaborating Centre interests. The first session, “Developing a Global Definition of Developmental Origins of Health and Disease (DOHaD)” was co-chaired by John Balbus and featured Linda Birnbaum, Ph.D., NIEHS director, and Jerry Heindel. A second session, “Developing a Global DOHaD Network,” was co-chaired by

Claudia Thompson and included a panel discussion with staff from WHO, NIEHS, and non-profit organizations.

Jerry Heindel worked closely with conference chairs to promote research from PPTOX IV. Twelve articles were published in the journal *Endocrinology* (online August 4, 2015), including an introduction "[Prenatal Programming and Toxicity \(PPTOX\) Introduction](#)," an overview of the conference "[Life-long Implications of Developmental Exposure to Environmental Stressors: New Perspectives](#)," and a review focusing on integration of the environmental influences on DOHaD "[Developmental Origins of Health and Disease: Integrating Environmental Influences](#)."

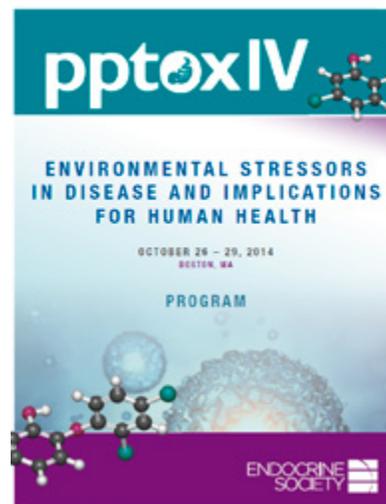
Following the conference, NIEHS coordinated a special meeting for representatives of the International Society for Developmental Origins of Health and Disease, Endocrine Society, WHO, and interested scientists. They explored how to better coordinate efforts to further international understanding of the environmental contributions of early life exposures. Their goal was to guide forward movement for this rapidly growing field.

Advancing understanding of exposures

NIEHS is initiating an analysis of the strength of association between developmental exposures to environmental chemicals and later life disease and dysfunction, which is the first time the field has been examined in detail. Health endpoints will include neurodevelopmental, behavioral, and neurodegenerative outcomes; cancer and respiratory diseases; reproductive disorders; immune dysfunction; and obesity and metabolic syndrome. This analysis will contribute to the WHO's international initiative on DOHaD by providing scientific summaries of the evidence for early life effects.

To help advance understanding of this issue, NIEHS staff co-authored the following peer-reviewed articles:

- "[Developmental Origins of Health and Disease: A Paradigm for Understanding Disease Cause and Prevention](#)"
- "[Elucidating the Links Between Endocrine Disruptors and Neurodevelopment](#)"
- "[Endocrine Disruptors and Obesity](#)"
- "[Estimating Burden and Disease Costs of Exposure to Endocrine-disrupting Chemicals in the European Union](#)"
- "[Evolution of DOHaD: The Impact of Environmental Health Sciences](#)"



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- ["Male Reproductive Disorders, Diseases, and Costs of Exposure to Endocrine-disrupting Chemicals in the European Union"](#)
 - ["Manufacturing Doubt About Endocrine Disrupter Science - A Rebuttal of Industry-sponsored Critical Comments on the UNEP/WHO Report 'State of the Science of Endocrine Disrupting Chemicals 2012'"](#)
 - ["Mechanisms Underlying Latent Disease Risk Associated with Early-life Arsenic Exposure: Current Research Trends and Scientific Gaps"](#)
 - ["Obesity, Diabetes, and Associated Costs of Exposure to Endocrine-disrupting Chemicals in the European Union"](#)
 - ["Parma Consensus Statement on Metabolic Disruptors"](#)

CHILDREN'S ENVIRONMENTAL HEALTH

Nearly three million children, mostly in low and middle-income countries, die every year from environmental causes that are largely preventable. The extensive research program in children's environmental health at NIEHS has increased understanding of the unique vulnerability of children to harmful exposures and helped guide development of protective measures. The Collaborating Centre helps coordinate scientific activities and raise awareness of the importance of the environment to children's health.

Founding a network

Many WHO Collaborating Centres address children's environmental health at the local, regional, national, and international levels. However, more coordinated actions across the globe are needed to further raise awareness and reduce risk and vulnerability. Collaboration among different organizations builds greater capacity for preventing disease and injury and promoting children's well-being through healthier environments. To this end, the NIEHS-WHO Collaborating Centre has led the organization of centres working on similar problems affecting children to form a Network of WHO Collaborating Centres for Children's Environmental Health (Network).



Following a successful initial meeting and launch of the [Network](#) in 2014, participation grew from the original eight centres to include two new centres in South Asia. NIEHS provides resources and logistic support to ensure continued collaboration and information sharing. NIEHS coordinated quarterly conference calls among network participants and arranged informal meetings when participants were attending the same international events. As a major accomplishment, to promote each centre in the Network, a set of website pages including a [landing page](#) outlining its goals and [individual pages](#) featuring each centre were developed and posted. The website provides access to basic information including:

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- A brief description of the centre
 - Contact information
 - Chemicals, health effects, and populations studied
 - Training, if applicable
 - Publications relevant to the Network
 - Collaborators

As part of efforts to raise awareness about this collaborative endeavor, the NIEHS Global Environmental Health program developed and promoted a [podcast series](#) about the Network. The podcasts, featuring interviews with William Suk and Amalia Laborde, M.D. of the University of the Republic in Uruguay, described the history of the Network and research priorities, and previewed upcoming activities.

“We’re going to leverage our programs—and link people with programs at other organizations globally—to make sure that the research is translated in a way that benefits kids.”

– William Suk

Convening internationally

Many Network participants attended PPTOX IV in October 2014, described in the previous section. Following the event, Network participants met for an evening of discussion and collaboration. This meeting helped determine the Network plan for 2014-2015.

Additionally, many Network members attended the 16th International Conference of the Pacific Basin Consortium for Environment and Health (PBC), held August 10-13, 2015 in Indonesia. A training workshop was held in advance of the conference that covered the principles underlying the special vulnerability of children and highlighted risks in specific environments. Topics in presentations by Network members about children’s health included the health effects of gold mining, electronic waste, and hydraulic fracturing; environmental exposures; and emerging pollutants. The conference also afforded opportunity for participants to convene informally apart from the main meeting.

Writing collaborative publications

NIEHS staff joined members of other centres in preparing the paper, “[Children’s Health in Latin America: The Influence of Environmental Exposures](#),” which focused on the prevalent and serious hazards of indoor and outdoor air pollution, water pollution, and toxic chemicals. In a basic research study, “[Mechanisms Underlying Latent Disease Risk Associated with Early-life Arsenic Exposure: Current Research Trends and Scientific Gaps](#),” the authors associated inorganic arsenic exposure with cancer development later in life.

ELECTRONIC WASTE

As electronic devices are damaged or discarded in favor of newer models, a mounting problem of electronic waste, or e-waste, has developed worldwide. Valuable components in e-waste, such as copper, can be extracted, creating a recycling market. However, e-waste processing in many low- and middle-income countries is unsafe and leads to contaminated environments. Substantial exposures and adverse health effects have been documented. The Collaborating Centre plays a leading role in raising awareness of this problem and in helping develop strategies to prevent the harmful effects associated with recovering marketable components.

Investigating ways to reduce exposure

At the previously mentioned PBC meeting, Michelle Heacock co-chaired a symposium titled "Prevention and Intervention Strategies to Reduce Exposure to E-waste." Presenters represented the United Nations Environment Programme called Solving the E-waste Problem (StEP) Initiative, and projects in Sri Lanka, Ghana, India, and China.

Following the PBC meeting, the Collaborating Centre held a separate workshop to explore prevention and intervention strategies to reduce exposure to e-waste. The workshop and its activities were planned with representatives from the StEP Initiative, the U.S. National Institutes of Health (NIH) Fogarty International Center, e-waste experts, engineers, and environmental scientists. The aim was to discuss and develop strategies for reducing exposures, providing tools for surveillance in communities, intervention monitoring, capacity building technologies to improve diagnosis and prevention, and risk communication tactics for workers and their families.



The e-waste workshop featured international experts in public health, engineering, and other fields.

Presenters discussed case studies from Ghana, Uruguay, China, and the Philippines, highlighting successes and lessons learned. Building on the case studies, breakout groups addressed reducing exposures, monitoring the effectiveness of prevention efforts, interventions, and communication strategies. This successful workshop resulted in the development of recommendations for future activities.

“We organized the workshop with the goal of providing practical recommendations. And we incorporated engineering techniques and discussions on strategies, such as how to communicate risk and increase use of personal protective equipment.”

– Michelle Heacock

Communication products

To further develop awareness and understanding of e-waste issues, NIEHS staff worked closely with Network participants to co-author a commentary [“E-waste and Harm to Vulnerable Populations: A Growing Global Problem.”](#) It provides an overview of the scale and health risks of e-waste, reviews international efforts to reduce environmental hazards especially affecting children, and suggests next steps for addressing health issues stemming from e-waste.

Before the e-waste workshop, Pure Earth, an international non-profit based in the U.S., sponsored an acclaimed documentary style video featuring William Suk in which he explains the hazards and health effects of e-waste. This brief video was used to set the stage for workshop discussions and activities. It is available on the Pure Earth website and YouTube for viewing and sharing among interested researchers and organizations.

HEALTH IMPLICATIONS OF CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

Climate change magnifies many health risks in ways that are increasingly being discovered and studied. For most adverse health consequences of climate change, low and middle income countries are far more vulnerable than high income countries, yet many low and middle income countries lack the capacity to identify climate change related risks and develop adaptation plans to lessen those risks. For all countries, measures to reduce combustion of fossil fuel not only reduce contributions to greenhouse gases in the atmosphere, but also reduce levels of lethal air pollution. Other climate change mitigation measures offer the potential for significant health benefits as well. The Collaborating Centre works to advance understanding and awareness of harmful health effects resulting from climate change as well as measures to reduce risks and optimize health benefits of mitigation. Better information about all the health implications of climate change will aid decision making for more sustainable and healthy communities around the world.

“Public health scientists around the world have identified and described the deleterious health effects of climate change. Health professionals are increasingly recognizing that substantial benefits for public health can result from actions to mitigate climate change, even as they articulate the need to strengthen the resilience of the health care sector to reduce risk.”

– John Balbus

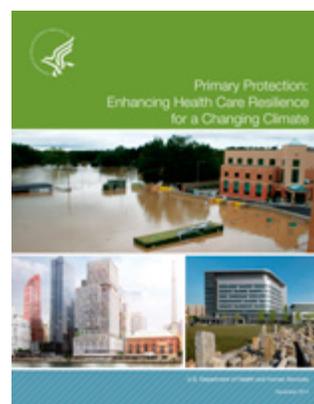
National and international outreach

Climate change presents a global public health problem and is affecting well-being in many ways. John Balbus and Kimberly Thigpen Tart, J.D., M.P.H. are authors of the upcoming report from the U.S. Global Change Research Program ‘The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment’. This report, anticipated for release in final form in early 2016, will build on previous work by reviewing and synthesizing new literature on the effects of climate change on human health in the U.S. While focused on understanding American’s changing health risks, the report will provide useful insights applicable to other parts of the world.

As part of the President’s Climate Action Plan, the Sustainable Climate Resilient Health Care Facilities Initiative within the U.S. Department of Health and Human Services, John Balbus and NIEHS produced a guide and toolkit, [Primary Protection: Enhancing Health Care Resilience for a Changing Climate](#). It is focused on health care infrastructure resilience

before, during, and after extreme weather events. The goal is to assist health care providers, building design professionals, policymakers, and others who must assure the continuity of quality health care. Toolkit checklists and resources will help decision-makers analyze threats and create plans for action.

In addition to supporting continued updates of this toolkit, NIEHS is working with the Pan American Health Organization (PAHO) to translate the document into Spanish to support the PAHO Safe Hospitals Initiative.



NIEHS co-sponsored and was on the organizing and scientific committees for the WHO/PAHO Collaborating Centers workshop, "Climate-Smart and Sustainable Societies: Addressing Public Health Vulnerabilities and Promoting Sustainable Adaptation Now," in Montreal, September 9-11, 2015. John Balbus provided opening comments and later presented about "Sustainable and Climate Resilient Health Care Facilities." NIEHS also helped plan a pre-meeting workshop, "Climate Resilient Health Systems," that brought together experts from around the Americas. They discussed successes and challenges in making health sector facilities and systems more resilient in terms of building site, building envelope, infrastructure, supplies, and flood protection and/or energy resources.

NIEHS participated in "Health and Climate: Realizing the Promise of Co-Benefits," a training workshop held September 14-18, 2015, by the Singapore Environment Institute. Health and environment ministry professionals from all of the Association of Southeast Asian Nations (ASEAN) countries took part. It focused on tools for assessing the health benefits of climate mitigation strategies associated with reductions in conventional air pollutants. John Balbus provided the opening lecture on health effects from climate change and also presented and helped moderate a session on the nexus of urban health and climate change.



Health and environment professionals from across Southeast Asia attended the health and climate workshop in Singapore.

Increasing understanding of how climate affects health

In addition to supporting extramural research on the health effects of climate change, NIEHS staff are actively publishing and presenting on this topic. With a nod to National Children's Health month in October 2014, Linda Birnbaum, NIEHS director, co-authored the commentary "[Protecting Our Children from Climate Change](#)" in the journal *Environmental Health Perspectives*.

John Balbus was first author of "[A Wedge-based Approach to Estimating the Co-benefits of Climate Change Mitigation Strategies in the United States](#)," which presents a new framework for estimating the change in health outcomes resulting from implementation of specific carbon dioxide reduction activities, allowing comparison of different sectors and options for climate mitigation activities. He also delivered several presentations at critical meetings throughout the year, including:

- "Climate Change and Human Health: Impacts, Vulnerability, Protection" at the 2014 NIEHS Worker Training Program [workshop](#)
- "Climate Change, Sustainable Development, and Public Health" at the World Congress on Public Health in Kolkata, India
- "Finding the Sweet Spot: Where Health Meets Sustainability," the keynote talk at the Northwest Environmental Health Conference in Portland, Oregon
- "Improving Global Health in the Americas through NIEHS Science" at the American Public Health Association (APHA) Annual Meeting in New Orleans, Louisiana
- "The Sweet Spot: Where Community Sustainability and Primary Prevention Converge," the 22nd Sewell Distinguished Lecture at Columbia University, New York
- "Vulnerabilities of Children to the Health Impacts of Climate Change" at the Symposium on the Impacts of Climate Change on Children's Health in Sacramento, California

Supporting training and capacity building

NIEHS, the Fogarty International Center, and other U.S. and Canadian agencies jointly fund the [NIH Global Environmental and Occupational Health \(GEOHealth\) program](#). This program provides grants to support regional centers of excellence for research and training in environmental health in low- and middle-income countries. Centers in South Asia, South America and Africa plan to include activities on climate change and health. These efforts are important to the Collaborating Centre's ongoing research translation and networking activities.

COOKSTOVES AND INDOOR AIR POLLUTION

Using wood, coal, or dung as fuels, traditional cooking methods can produce household air pollution that contributes to nearly four million deaths each year.¹ NIEHS actively funds researchers around the world who study the related health effects from cookstoves and indoor air pollution. The challenges are great, but the potential to save millions of lives through research advances and interventions is greater.

“A number of health effects are associated with smoke from cookstoves, including respiratory illnesses, pneumonia in children, asthma, and cardiovascular disease. There may be effects on neurodevelopment and cancer later in life. And our most vulnerable populations —women and children—are disproportionately affected.”

– Claudia Thompson

Supporting international research

In June 2015, NIEHS and PAHO organized a workshop on cookstoves for decision-makers in Latin American and Caribbean countries. This event, hosted in Honduras, brought together policymakers from countries in the Americas to explore the potential for changes to stoves and cleaner fuel. NIEHS secured speakers for a scientific session that focused on health effects and evidence-based solutions.

Also in 2015, NIEHS partnered with Fogarty International Center, other U.S. government agencies, and the Global Alliance for Clean Cookstoves, to develop an implementation science network. This network is comprised of extramural and federal scientists, NGOs, and others with experience in improving adoption and uptake of interventions in high-burden countries including, but not limited to, improved cookstoves. Products from this network include a series of papers on regional case studies and a summary of best practices for both researchers and implementers. This project will help the WHO in implementing its new Indoor Air Quality Guidelines.

NIEHS participated in developing an NIH [funding opportunity announcement](#) for the Household Air Pollution Health Outcomes Trial, which will fund clinical trials across three or more low- and middle-income country settings to test improved stove and fuel interventions on health outcomes in exposed populations.

¹ <http://www.who.int/mediacentre/factsheets/fs292/en/>

The NIEHS Global Environmental Health program developed a [podcast series](#) about cookstove research. Two podcasts, released in March 2015, featuring Claudia Thompson and Kalpana Balakrishnan, Ph.D., of Sri Ramachandra University, described current efforts to research the health effects of cookstoves. A [Global Environmental Health newsletter](#) article also highlighted NIEHS grantee research on cookstoves.

WHO CHEMICAL RISK ASSESSMENT NETWORK SUPPORT

NIEHS supports training and capacity building in low- and middle-income countries through its participation in and support for the [WHO Chemical Risk Assessment Network](#). The network, founded in 2014, is organized by the WHO International Programme on Chemical Safety. Christopher Weis serves as the NIEHS liaison to the network. To expand participation in the network, Weis has presented network activities and materials at major international conferences including the Society of Toxicology Annual Meeting, EuroTox, and AsiaTox.

NIEHS support for the network dates back to 2012, when staff participated in the second WHO Meeting on Global Collaboration in Chemical Risk Assessment. NIEHS has provided support to the network Secretariat through participation in steering committee calls and document reviews. NIEHS provides meeting support and assists WHO with the development of quarterly network newsletters, website content, and other communication products.



NIEHS' Chris Weis, a meeting co-chair, addresses the audience.

NIEHS actively supported the [first in-person meeting](#) of the network October 2014 in Paris, which was attended by 55 chemical risk assessment institutions from 29 countries. Christopher Weis served as a [meeting co-chair](#). The meeting's keynote speaker was Kenneth Olden, Ph.D., former NIEHS director and current director of the U.S. Environmental Protection Agency National Center for Environmental Assessment. Working groups developed collaborative plans to address biomonitoring, identify high priority needs in research and method development, increase and coordinate training efforts for risk assessors, and establish communication among participants.

“The production and use of chemicals continues to increase worldwide, making it essential to better evaluate, and minimize, exposure to toxic chemicals. This global network will join forces to fine-tune chemical risk assessment, working to safeguard human health and train new researchers.”

– Christopher Weis

Training and Capacity Building

Training and capacity building is a crosscutting theme of the Collaborating Centre. There is a need to train and build capacity among a wide range of professionals, researchers, health care practitioners, and government leaders at all levels in the prevention, diagnosis, and management of health problems linked to environmental risk factors.

"I have long advocated for partnerships, education, training, and outreach for researchers and scientists from low-income and middle-income countries. Global partnerships also serve to improve communication about innovative research."

– Bono Sen

BUILDING CAPACITY IN CLIMATE CHANGE

NIEHS is working to build capacity in India and South Asia for understanding climate change impacts. This initiative was launched in New Delhi at the September 2015 workshop ["Understanding Climate Health Associations in India."](#) The workshop, sponsored by NIEHS and organized by TARU Leading Edge, Ltd., focused on three core frameworks in dealing



NIEHS staff collaborated with organizers in India to host a training workshop. (Photo courtesy of Nitish Dogra)

with climate and health issues: vulnerability, adaptation, and co-benefits. It also covered policy research, skill building, and networking. The overall goal was to build capacity of early- and mid-career academicians, researchers, practitioners, and students toward enhancing resilience of the health sector in India. Leading representatives of Indian government and academic institutions participated in the event, as well as representatives from the U.S. Embassy in New Delhi, the National Oceanographic and

Atmospheric Administration (NOAA), the Indian Council of Medical Research, and the WHO South East Asia Regional Office (SEARO).

Training materials developed by SEARO were demonstrated during the workshop. Bono Sen gave a presentation on community-based participatory research. John Balbus provided the opening keynote address and a lecture on the use of epidemiology and risk assessment to understand health effects from climate change.

The training workshop kicked off a multi-year effort to build a Community of Practice (CoP) composed of governmental and nongovernmental experts, decision-makers, academicians, researchers, practitioners, and students. This CoP will develop a Web-based, mentored community of researchers and practitioners to move this interdisciplinary field forward. Participants in the CoP will help build India's capacity to address health impacts of climate change. By leveraging Indo-U.S. and in-country collaborations, the organizers hope that the CoP will be well positioned to raise awareness about climate and health issues through knowledge-sharing and training efforts; gathering local evidence through research; informing adaptation strategies through early warning systems and health-related action plans; and influencing policy through advocacy.



John Balbus participates in a lamp lighting ceremony to open the workshop. (Photo courtesy Nitish Dogra)

RISK ASSESSMENT TRAINING

A major focus of the WHO Chemical Risk Assessment Network is to train researchers in risk assessment and to build capacity for researchers in low- and middle-income countries to understand and perform risk assessments. In addition to publicizing the network's [training database](#), NIEHS is supporting a series of webinars to increase awareness and understanding formal systematic review. Speakers will highlight uses of systematic review in risk assessment to build capacity for researchers to conduct their own reviews.

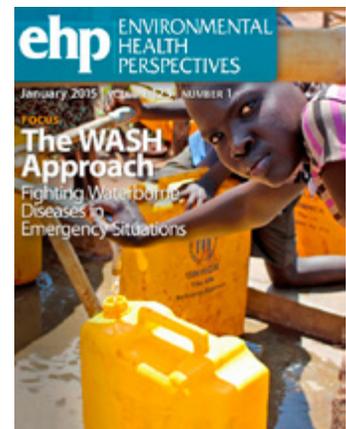
Collaborating Centre Communications

The Collaborating Centre shares scientific updates and information on global environmental health through a number of NIEHS communication media and channels.

The [NIEHS Global Environmental Health Newsletter](#) is the Collaborating Centre's primary means of communication. This open access, online newsletter regularly reports on Collaborating Centre activities. It includes a feature article about current international events or research findings, "science spotlight" articles about research funded by NIEHS, a section that describes training and capacity building efforts, and links to new podcasts or videos when available. The new "Voices from the Field" section, added in 2015, strives to increase awareness and understanding of both the challenges and rewards experienced by scientists who are engaging communities and collecting data in the field. These stories are intended to inform and promote the development of best practices in global, community-engaged environmental health research.

The [Global Environmental Health Chat podcast series](#) provides interviews with leading international researchers about recent research, opportunities, and policies. Podcasts are free worldwide through the NIEHS website and iTunes®. The NIEHS and NIH Twitter and Facebook social media accounts actively promote news, events, and publications associated with the Collaborating Centre. NIEHS' monthly newsletter, Environmental Factor, frequently runs stories about staff participation at international meetings such as WHO and PAHO events. Specific programs within NIEHS produce and manage their own newsletters and social media accounts, which help promote awareness of environmental health and highlight their international efforts relevant to the Collaborating Centre.

[Environmental Health Perspectives \(EHP\)](#) is an open access, peer-reviewed journal of research and news published monthly with support from the NIEHS. This independent journal operates a robust international program and publishes a Chinese edition each month. Selected EHP content is translated for republication in *Salud Pública de México* (published by the Mexican National Institute of Public Health), *Ciencia y Trabajo* (published by the Chilean Foundation of Science and Technology, Chilean Security Association), and *Ciência & Saúde Coletiva* (published by the Brazilian Association of Public Health). EHP is teamed with *Mali Médical* and with *Annales Africaines de Médecine* (published by the University of Kinshasa Faculty of Medicine) as part of the African Journal Partnership Program. Additionally, EHP devotes a section to children's environmental health issues.



Summary

The NIEHS-WHO Collaborating Centre builds on a tradition of collaboration between the two institutions that dates back to 1982. This year, the Collaborating Center is proud of many major accomplishments including:

- Planning the meeting and leading sessions for the fourth Prenatal Programming and Toxicology conference
- Building the Network of WHO Collaborating Centres for Children's Environmental Health with membership across five continents
- Developing and hosting a workshop on Reducing Exposures to Electronic Waste in Indonesia
- Planning and conducting the Understanding Climate Health Associations in India training workshop in India
- Supporting communications and training efforts for the Chemical Risk Assessment Network
- Publishing many collaborative papers and reports, involving more than 55 co-authors
- Encouraging studies of household air pollution and health outcomes

In alignment with its goals, the NIEHS-WHO partnership has increased global awareness and encouraged innovative research in established and emerging environmental health areas. Efforts are underway to translate this research into practices. Capacity building efforts support education and training partnerships. There is increased international cooperation in all of the focus areas for the Collaborating Center.

The NIEHS thanks its global partners, with whom it shares a common mission of discovering how the environment affects the health of people to promote improved public health, with the goal of reducing or preventing disease and disability caused by environmental exposures.

Appendix: Connect with Global Environmental Health at NIEHS

Global Environmental Health Newsletter:

http://www.niehs.nih.gov/research/programs/geh/geh_newsletter/index.cfm

Global Environmental Health Chat podcasts:

<http://www.niehs.nih.gov/research/programs/geh/podcasts/index.cfm>

NIEHS-WHO Collaborating Center for Environmental Health Sciences Webpages:

<http://www.niehs.nih.gov/research/programs/geh/partnerships/index.cfm>

NIEHS Environmental Factor Newsletter:

<http://www.niehs.nih.gov/news/newsletter/previousissues.cfm>

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<https://twitter.com/niehs>

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<https://www.facebook.com/NIH.NIEHS>

Cover photo courtesy of the U.S. Geological Survey.

