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Dr. William J. Martin,
National Institute of Environmental Health Sciences
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Re: Comments of the Health Effects Institute on the NIEHS Global Environmental Health Workshop Report

Dear Dr. Martin:

I am pleased to submit the comments of the Health Effects Institute (HEI) on the NIEHS Global Environmental Health Workshop Report. As a research institute with long term activities fostering environmental health research and science capacity building on four continents, especially through our *P*ublic Health and *A*ir *P*ollution in *A*sia (*PAPA*) Program, HEI welcomes NIEHS' initiative in this important area and looks forward to working with you as you move to implement your vision.

Overall, we found the Workshop report to provide a thoughtful and well-organized summary of key research needs in the areas of maternal, child, and adult health. It was especially useful to identify a number of innovative areas where new techniques and approaches may help our efforts in global environmental health, and we were pleased to see the attention paid to air pollution as a source of environmental exposure throughout the document. The Report was also clear about some of the barriers and challenges facing such a global initiative.

From our active experience working with scientists in the developing world we did, however, identify three broader cross-cutting issues which, although implicit in the report, could be usefully brought out in a revised version to better inform future research investment and priorities. These are:

- The rapid ***urbanization*** occurring in much of the developing world;
- The need to better understand the full range of ***indoor and outdoor exposures*** which can result in environmental stresses on health; and
- The value of integration of a clear understanding of ***poverty***, and its implications for underlying health status and environmental health impact, throughout the effort.

Rapid Urbanization Much of the developing world is experience a rapid trend toward urbanization; in Asia, for example, the United Nations projects that over half of the region's

population will be living in urban areas as soon as 2030.[1] This has vast social, cultural and economic implications, but equally important implications for population environmental exposure and health. This shift from a largely rural, agrarian society to a largely urban one is bringing with it dramatic shifts in diet and nutrition, sources of environmental exposure (e.g. from naturally occurring, waterborne organisms to a mix of waterborne diseases and airborne industrial and traffic pollutants), and pathways of disease transmission (e.g. animal-to-person to increased population density and enhanced opportunities for person-to-person transmission).[2]

Given the relatively long lead time for most scientific discovery and validation, 2030 is very soon; global environmental health efforts will need to anticipate this, identify settings where this transition is already advancing (e.g. the megacities of Asia), and invest an increasing portion of resources in research in those settings designed to probe the most significant environmental exposures and disease pathways to inform future environmental policy decisions as urbanization proceeds. We would suggest that the Workshop Report could benefit from a contextual introduction that highlights this demographic trend and a set of recommendations about how future research can best anticipate and address the growing questions raised by rapid urbanization.

Exposure Addressing the health effects of air pollution on a global scale necessitates addressing major sources of both indoor and outdoor air pollution. Since most people spend most of their time indoors, the bulk of exposure to air pollution is experienced indoors. However, indoor exposures include *both* pollution from both indoor sources and pollution from outdoor sources that penetrate into the indoor environment. Indoor air pollution from the use of solid fuels for cooking and heating remains a major source of air pollution exposure, particularly in rural areas of developing countries. At the same time, with rapid urbanization taking place on a global scale, the proportion of exposure attributable to outdoor sources of air pollution continues to increase. The Workshop Report could usefully call out this need to examine the combination of indoor and outdoor exposures in the design and conduct of effect research in the developing world.

Poverty Despite economic growth in many areas of the world, over 2.7 billion of the world's population live today in poverty, with income of less than $2 per day.[3] In response to the persistent need to address this massive challenge, the United Nations in 2000 adopted its Millennium Development Goals to systematically and comprehensively approach solutions:

- *Halve Extreme Poverty And Hunger*
- *Achieve Universal Primary Education*
- *Empower Women And Promote Equality Between Women And Men*
- *Reduce Under-five Mortality By Two thirds*
- *Reduce Maternal Mortality By Three quarters*
- *Reverse the Spread Of Diseases, especially HIV/Aids And Malaria*
- *Ensure Environmental Sustainability*

[1] Health Effects Institute, *The Health Effects of Air Pollution in Developing Countries of Asia: A Review of the Literature*, p. 25, Boston, MA April 2004
[2] ibid. pp. 26-29
[3] Global Economic Prospects: Trade, Regionalism and Development 2005. Washington DC: World Bank, 2004

- *Create A Global Partnership For Development, With Targets For Aid, Trade And Debt Relief*[4]

Although these goals represent a wide-ranging set of interventions that reach far beyond the scope of NIEHS and global environmental health, at least three of these goals – regarding under-five mortality, maternal health, and environmental sustainability – are directly and/or indirectly linked to environmental health. Issues of better understanding, for example, environmental links to diseases of poverty such as tuberculosis, and to exacerbation of major sources of child mortality such as acute lower respiratory infection, are central to any effort in global environmental health. While issues of this nature are identified in places in the draft workshop report, more explicit discussion of this overarching issue could be usefully integrated into both the workshop report and NIEHS' strategies moving forward.

There are, of course, many approaches and opportunities to address the intersection of these issues; one example is the project on *Air Pollution, Poverty and Health* which HEI is currently implementing in cooperation with the Asian Development Bank's Poverty Reduction Fund in Ho Chi Minh City, Vietnam. This project, described in attachment 1, combines Vietnamese-led epidemiologic and exposure research at the nexus of environmental exposure, poverty, and potentially-disproportionate health impact with intensive, hands-on capacity building for Vietnamese scientists in both academia and a range of governmental setting (including Departments of environment, health, and social welfare). Opportunities abound to pursue such integrated scientific and capacity building efforts into this nexus of a variety of environmental stressors and disease, especially in Asia and Africa, and we would hope that NIEHS' strategy for global environmental health would give them high priority going forward.

In closing, we are excited by NIEHS' enhanced interest in global environmental health and believe that strategic investment in the types of priorities identified in the workshop report, placed hopefully more effectively in the context of these broader crosscutting issues of *urbanization, exposure, and poverty*, can make a significant contribution to advancing environmental health. HEI would be pleased to bring its hands-on experience conducting global environmental health research and capacity building to assist NIEHS as it finalizes the current report – and crafts and adopts a vision and strategic plan for its efforts in this important area.

Sincerely,

Dan Greenbaum
President

[4] United Nations, http://www.un.org/millenniumgoals/ Last Accessed July 31, 2007

ATTACHMENT 1 SUMMARY OF THE AIR POLLUTION, POVERTY, AND HEALTH IN HO CHI MINH CITY PROJECT (APPH)

The Air Pollution, Poverty, and Health in Ho Chi Minh City Project (APPH) has two main objectives: 1) to estimate the health impact of air pollution among the poor in HCMC; and 2) to characterize the exposures of the poor in HCMC to air pollution from multiple sources. These objectives are being achieved via two discrete, but related, components.

Hospital-based study of acute lower respiratory infections

Routinely collected data on air quality at district and city-wide levels, and hospital admissions are being integrated to estimate the effect of short-term exposure to air pollution on hospital admissions for acute lower respiratory infections (ALRI) in young children (<5 years) in Ho Chi Minh City from 2003 to 2005). Effects of exposure will be estimated using two statistical methods: case-crossover and Poisson regression. The magnitude of the effect of air pollution on poor children versus other children will be compared, using individual and group-level indicators of socio-economic position (SEP).

The effects of increased exposure to air pollution on hospitalization for ALRI will focus on the effects of daily average exposure to particulate matter with diameter less than 10 microns (PM10). The effects of other pollutants will be addressed in secondary analyses.

Household-based study of air pollution exposure among the poor

This study is assessing the relationship between personal and district/city-wide ambient exposures in HCMC. The poor may experience higher actual exposures to air pollution relative to the ambient city-wide values reported by the air monitoring stations than the non-poor. In addition, the relative contribution of different sources of exposure is likely to differ by socio-economic position. Thus, there is a need to assess the extent to which localized sources may contribute to exposure error arising from the use of ambient monitoring site data for health impact assessments, particularly for different sub-groups. For example, a person using solid fuels for cooking who spends a larger proportion of time in close proximity to traffic would likely have daily average ambient exposures that are several micrograms higher than someone living in a more affluent household.

Systematic daily differences in exposure – major sources and levels - across socio-economic status will be assessed by comparing more precise estimates of individual personal exposure with estimates based on the ambient monitoring stations. Household surveys are being integrated with repeated (longitudinal) measurements of personal exposures to provide a finer grained look at how exposure patterns vary by age, sex, and socio-economic position. Information on how personal exposures experienced by different sub-populations differ from measured background ambient concentrations will aid in the design and interpretation of the interpretation of air pollution epidemiologic studies, including the hospital-based component of this project.

The household-based study will also provide an opportunity to address two additional issues. The prevalence of chronic respiratory symptoms among adults in the selected households will be evaluated via questionnaire, as will their perceptions of local air quality.