

George Luber, Ph.D.
Jeremy Hess, M.D., M.P.H.

Climate Change and Human Health in the United States

Editor's note: NEHA strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, we will feature a column from the Environmental Health Services Branch (EHSB) of the Centers for Disease Control and Prevention (CDC) in every issue of the Journal.

EHSB's objective is to strengthen the role of state, local, and national environmental health programs and professionals to anticipate, identify, and respond to adverse environmental exposures and the consequences of these exposures for human health. The services being developed through EHSB include access to topical, relevant, and scientific information; consultation; and assistance to environmental health specialists, sanitarians, and environmental health professionals and practitioners.

EHSB appreciates NEHA's invitation to provide monthly columns for the Journal. EHSB staff will be highlighting a variety of concerns, opportunities, challenges, and successes that we all share in environmental public health.

Worldwide, the effects of climate change are apparent, and there are changing exposures that have significance for human health. Temperature increases and increased weather variability have already brought higher probabilities of Category 4 and Category 5 hurricanes (Webster, Holland, Curry, & Chang, 2005) and higher sea levels (Rignot & Kanagaratnam, 2006), and have contributed to increased forest fire frequency and severity (Westerling, Hidalgo, Cayan, & Swetnam, 2006). Since carbon dioxide (CO₂) emissions persist in the atmosphere for approximately 100 years and CO₂ emissions are continuing to rise, the negative health effects of climate change are likely to accelerate and persist into the foreseeable future. Although our understanding of climate change processes is incomplete, the most significant health-related exposures are relatively well understood (see sidebar on page 44), and our understanding of their expected geographic distributions is quickly evolving.

Because the United States is a wealthy country with a well-developed public health infrastructure, climate change is expected to have less of a health impact here than in the developing world, where changes are likely to be devastating (Patz, Campbell-Lendrum, Holloway, & Foley, 2006). Nevertheless, even in the United States, the health impacts of climate change may be significant:

- Catastrophic weather events will be more frequent and increasingly costly (Greenough et al., 2001).
- The population will age, increasing vulnerability to extreme heat events and sev-

eral other exposures associated with climate change.

- Injury secondary to extreme weather events may advance as a cause of morbidity and mortality.
- The severity of many chronic diseases now responsible for the bulk of mortality in the United States may increase secondary to climate change (Bernard, Samet, Grambsch, Ebi, & Romieu, 2001).
- Outbreaks of vectorborne diseases may become more frequent, widespread, and lengthy (Gubler et al., 2001).
- Mental health stresses from climate change may most affect younger Americans as well as those affected by disasters and economic hardship as a result of ecosystem change (Balbus & Wilson, 2000).

Our neighbors to the south will be dealing with similar ecologic and health impacts, including desertification (Neelin, Münnich, Su, Meyerson, & Holloway, 2006), increased freshwater runoff and associated flood frequency (Scholze, Knorr, Arnell, & Prentice, 2006), and possible food shortages (Gregory, Ingram, & Brklacich, 2005) and water shortages. These stresses may contribute to mass migration and environmental refugees, regional tension, and, potentially, armed conflict.

Anticipating and responding to these challenges is a complex task. Expected significant regional variation in the health burdens from climate change adds further complexity (Patz et al., 2000). The northern latitudes of the United States will experience the largest increases in average temperatures (Kalkstein & Smoyer, 1993); as a result, they will also bear the brunt

Climate Change: Some Health Outcomes of Concern for the United States

- heat stress, direct thermal injury, and exacerbations of associated illnesses
- respiratory diseases, including asthma, chronic obstructive pulmonary disease, and allergic disease
- injuries and other morbidity from extreme weather events and forest fires
- waterborne diseases and effects of harmful algal blooms
- vectorborne infectious diseases
- hunger and malnutrition from disruption of the food supply
- mental health effects
- secondary health effects from conflict over scarce resources, mass migration and population displacement from disasters, and economic disruption (Patz, Campbell-Lendrum, Holloway, & Foley, 2000)

of increases in ground-level ozone and associated airborne pollutants in urban areas. According to our current understanding of the epidemiology of heat-related injury and illness, populations in northeastern and coastal cities will have the highest increases in morbidity and mortality over baseline as heat waves increase in frequency, severity, and duration (McGeehin & Mirabelli, 2001). Concurrently, cold-related mortality in the United States is expected to decrease (McMichael et al., 2006). Coastal regions will experience essentially uniform risk of sea level rise, but different rates of coastal erosion, wetlands destruction, and topography will result in dramatically different regional effects of sea level rise. Vector distributions will widen; ranges of many vectors will extend northward and increase in elevation (Gubler et al., 2001). For some vectors, such as *Rodentia* associated with hantavirus, ranges will extend on the basis of changes in precipitation and vegetation (Gubler et al., 2001). The West coast of the United States is expected to experience significant strains on water supplies as regional precipitation declines and mountain snowpacks are depleted (Gleick & Chalecki, 1999). Forest fires are expected to increase in frequency, severity, distribution, and duration (Westerling et al., 2006).

The expected health effects of climate change present a novel public health problem with unprecedented scope, timeline, and complexity. It is important to recognize, however, that specific exposures resulting from climate change are not themselves categorically novel. Instead, familiar exposures will shift and widen in distribution, increase in frequency, and intensify in magnitude. Currently rare events may become common and anomalous events usual. These changes will unfold over decades. Therefore, climate change will act as a general stressor on the public health infrastructure, and gaps and weaknesses in our ability to respond to health threats must be identified and ameliorated.

To respond to these challenges, in January 2007, CDC convened a workshop of experts on climate change to discuss the public health response to climate change. Participants, including representatives from federal, state, local, and international agencies, academia, non-governmental organizations, and the private sector, discussed “framing” climate change in public health terms and identified priority areas for public health action. Drawing from the meeting discussions, CDC has developed a policy statement and has identified 11 priority health actions for climate change (see <http://www.cdc.gov/nceh/climatechange/>).

The shift of public dialogue on climate change to the mainstream underscores the need to frame its projected impacts as a public health issue as well as an economic, environmental, and social issue. Public health must take a leadership role in preparing for the consequences of climate change. An effective public health response will require a new, synergistic approach that can accommodate the complexity of the exposure interactions and engage a variety of stakeholder groups in efforts to develop adaptation measures. 🐼

Corresponding author: George Luber, Epidemiologist, Health Studies Branch, Division of Environmental Hazards and Health Effects, National Center for Environmental Health, CDC, 4770 Buford Highway, N.E., M.S. F-46, Atlanta, Georgia 30341. E-mail: gluber@cdc.gov.

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continued on page 46

Breaking through barriers has been a recurrent theme in national CARE conference calls, in which grantees share notes and practical solutions. At the root of such problems are lack of trust and credibility, sometimes compounded by other issues, such as language and cultural barriers. Government regulation and licensing requirements are often misunderstood or seen as hindrances. "Informal" approaches such as casually meeting business owners and workers on their turf, speaking in their native language, and forming business and worker focus groups, have yielded better results.

During one national call, one grantee described unsuccessfully trying to engage unpermitted auto dismantlers operating "under the radar" of regulatory enforcement. Engaging these shops on best practices and healthy workplaces, as well as simply offering assistance in becoming permitted, presented special challenges for this community. The Safe Shops Project of the Boston Public Health Commission shared its suc-

cessful approach with other CARE grantees on the call. Initially, Safe Shops was also shut out of many businesses. With time and community effort, its staff were able to develop the kind of trust that opens doors and makes welcome their important P2 and public health message. For example, Safe Shops initially relied on the Boston Inspectional Services Department to refer shops with a history of non-compliance to participate in a Safe Shops "Tail Gate Training." During the first training, a neighboring shop owner walked in and asked if Safe Shops staff could visit his shop next. It was not long before many other shop owners and workers were recognizing Safe Shops staff and partners as a resource for gaining access to health care, safer alternatives to toxic chemicals, and personal protective equipment.

Safe Shops also offers other incentives, including a 40-foot Public Health Van used to visit one shop each month for a free Health Day for employees, their families, and the surrounding community. Flyers advertise

the shop as the "sponsor." The workers in the shop value the Health Day—they are working with hazardous chemicals and often have no other access to family health care. Of course, the Health Day is also an excellent opportunity to informally discuss pollution prevention and ways of minimizing workplace risk.

The lessons in community P2 are not just about the importance of having the right message and the technical resources for toxic source reduction, but are also—equally important—about fostering the trust that opens doors. 🐼

Corresponding Author: Harry Lewis, Attorney Advisor, Community Action for a Renewed Environment Program, Office of Pollution Prevention and Toxics Pollution Prevention Division, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. E-mail: lewis.harry@epa.gov. Web site: www.epa.gov/care.

Direct from CDC
continued from page 44

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