Reducing greenhouse gas emissions is an urgent priority. While few would argue that action to mitigate the causes of climate change should be led by public health practitioners, public health has a critical role in adaptation efforts. Adaptation seeks to lessen human vulnerability to extreme weather and to increased variability in temperature and precipitation. Climate change as an emerging health issue provides a test case for new approaches to public health: approaches that emphasize both collaboration with other government and private entities and application of innovative legal strategies.

In 1994, the Centers for Disease Control and Prevention (CDC) introduced “10 Essential Services of Public Health.” Rather than focusing upon traditional divisions of public health into branches such as infectious disease, injury prevention, and environmental health, this model focused upon activities such as diagnosing and investigating health hazards in the community and mobilizing community partnerships to solve health problems. This approach subsequently informed national accreditation standards administered by the Public Health Accreditation Board. It can also guide the public health approach to climate change. The emerging concept of “health in all policies” additionally provides a lens to focus on partnerships across sectors and incorporation of legal and policy strategies into adaptation.

A recent article analyzing over 50 studies on climate change and human health summarizes six categories of public health concern: heat-related health problems; respiratory problems; infectious diseases; waterborne diseases; food insecurity; and mental health problems. The most marked increases in morbidity and mortality are predicted to occur within vulnerable populations such as the young, the poor, the medically frail, and the elderly.

Despite these recognizable threats, a study by the National Association of City and County Health Officials (NACCHO) shows that while 8 out of 10 health directors surveyed believe that climate change is occurring, 76% of directors do not believe they have the expertise to assess health impacts within their community, and 87% do not believe they have sufficient resources to address climate change impacts on local residents. These gaps in public health expertise and resources must be filled in order to address serious implications of climate change for human health.

**Classic Public Health: Milwaukee Legionellosis Outbreak**

Some health impacts of climate change may be addressed by the practice of core public health competencies. For example, the assessment and investigation of infectious, vector-borne, and other reportable diseases is one of the essential services of public health. Educating epidemiologists about climate impacts will facilitate their work, but health departments need not add a “climate change program” in order to carry out these investigations. A recent outbreak of legionellosis in Milwaukee provides an apt example.

Between June-September 2013, the City of Milwaukee Health Department (MHD) recorded 58 cases of Legionellosis (Legionnaires disease), a bac-
Adaptation strategies could include providing health department input on revised cooling tower maintenance protocols, in addition to public and health care provider education on environmental risk factors. Legal strategies might include incorporation of voluntary HVAC industry standards into local ordinances, perhaps with adjustments tailored to address specific health threats. The 2013 Legionnaires’ disease outbreak in Milwaukee demonstrates the subtle and indirect effects of climate change on the transmission of environmental-related disease within a community. It also depicts a local health department engaged in adaptation by applying longstanding public health investigation and community education practices in emerging “climate-health” scenarios.

According to the CDC, extreme heat events result in more deaths annually than all other catastrophic weather occurrences combined. Current climate change models project that extreme heat events will be more frequent and of longer duration. For geographic areas and populations not acclimated to extreme heat, more cases of heat-related illness and deaths may result if communities do not prepare. While strategies such as cooling centers are important in emergencies, taking affirmative steps to mitigate temperature fluctuations before heat waves occur could help prevent excess morbidity and mortality associated with such events.

In 2013, Los Angeles passed a building code amendment to require “cool” roofs on all new residences. Cool roofs are more reflective than traditional roofs, reducing both home energy use and outside temperatures. In large quantities, cool roofs could reduce L.A.’s “urban heat island,” in which high concrete and building density make the city hotter than surrounding areas. By reducing temperatures, the city will reduce...
the risk of heat stroke and death among its elderly and vulnerable populations and improve air quality for residents with chronic respiratory conditions. Other jurisdictions such as Philadelphia require cool roofs on some new buildings as well.\(^{12}\)

Local governments are also creating heat vulnerability maps to ensure that resources maximize the public health impact.\(^{19}\) Cities from San Francisco to Toronto to Washington, D.C., to Louisville are mapping both physical and sociodemographic factors within their cities to identify the highest-priority areas for intervention. The following explanation of Milwaukee’s mapping is illustrative.

After heat waves in the 1990s and resultant high mortality among residents, the City of Milwaukee Health Department (MHD) convened a community-based heat health task force. The Task Force has been active in developing notification procedures, activation of cool spots, and alert messaging to high risk individuals and populations.

Leveraging a grant awarded by the CDC to the Wisconsin Division of Public Health in 2012, the MHD decided to develop a heat vulnerability index (HVI).\(^{13}\) The HVI consists of over 20 variables predictive of population heat vulnerability within the categories of population density, health behaviors and outcomes, demographic and socioeconomic factors and built environment, overlaid on a map of the city. Policymakers, health departments, and utilities can use the HVI to target resources such as cooling centers, medical resources, energy assistance, and risk messaging to select populations and neighborhoods in order to reduce heat-related morbidity and mortality.

**Resources**

In an era of strained budgets and competing priorities, paying for functions regarded as “extra” is challenging. As a result, local governments are creative about locating funding and providing incentives for private action. For example, Los Angeles’ water and energy utility offers a rebate for installation of cool roofs, originally funded by a Department of Energy grant.\(^{15}\) The District of Columbia funds its green roofs subsidy through a 5-cent fee on bags used at grocery, convenience, and liquor stores.\(^{16}\) Chicago’s Green Permit Program provides a non-monetary incentive in the form of an expedited process for qualifying projects.\(^{17}\)

The primary federal framework and funding source dedicated to addressing health impacts of climate change is provided by the Building Resilience Against Climate Effects grants from CDC.\(^{18}\) Other funding streams, however, may be flexible enough to support adaptation efforts by public health agencies and partners.\(^{19}\) Existing funding streams potentially amenable to these applications include: transportation, including highway funding; energy, including Weatherization Assistance; community development, including HUD’s Community Development Block Grant (CDBG) program; environmental protection, including Clean Water State Revolving Funds; and public health, including Community Transformation Grants. For example, a recreation center funded by CDBG could be designed with a cool roof and to be a cooling center. In this way, communities can use available funds to achieve climate- and health-related co-benefits.

Health departments may document climate change activities as evidence of engagement with an emerging health issue in applications for accreditation by the Public Health Accreditation Board. Accreditation standards require evidence of developing, updating, and enforcing public health laws and regulations.\(^{20}\) Agencies pursuing national accreditation should not overlook this means of achieving standardization and quality improvement in the climate change realm.

**Conclusions**

Public health officials are in a position to leverage their role, credibility, and existing expertise to address the health impacts of climate change. Some may need to adapt current practices to recognize and treat new illnesses, as in dengue fever or Lyme disease, in areas that have not historically experienced them, or to address familiar illnesses that may become more prevalent as a result of climate change. Public health practitioners can inform their colleagues and the public about health impacts of climate change, along with the health benefits of adaptation measures.\(^{21}\)

Cross-disciplinary collaboration is a hallmark of effective climate change adaptation efforts. To date, climate change action plans and policies have been largely developed by individual states, tribes, and cities. Forums to facilitate sharing of information, practical solutions, funding sources, and legal strategies are nascent, but could contribute substantially to the dissemination, standardization, coordination, and improvement of interventions aimed at preventing climate change and ameliorating its health impacts.

**References**


20. See Public Health Accreditation Board, supra note 2, at 156-176 (Domain 6).

21. E. Malbach et al., Conveying the Human Implications of Climate Change: A Climate Change Communication Primer for Public Health Professionals (Fairfax, VA: George Mason University Center for Climate Change Communication, 2011).