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**Protect, Prevent and Enhance:
Public health actions in a changing climate**

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Climate Change: A Challenge for Public Health

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Summary

While it is essential that we strengthen the resilience of communities and individuals against the health threats that will be associated with climate change, public health also has critical roles to play in reducing greenhouse gas emissions and thereby preventing the more severe impacts of unchecked climate change, and also in enhancing public health by identifying those climate change policies that provide the greatest ancillary benefits for health.

Global climate change currently contributes to disease and premature deaths across the planet, and these impacts are likely to increase with progressive warming and other changes in climate. Although the health impacts of climate change will be less severe in the United States than in poorer countries, the U.S. public health infrastructure may not be adequately prepared to address the health effects of climate change.

In order to better understand the current state of preparedness for health effects of climate change, Environmental Defense Fund (EDF) collaborated with the National Association of City and County Health Officials and George Mason University to conduct a survey of a representative sample of local health departments from around the country. Most health department directors believed that climate change was an important threat, yet relatively few reported that climate change was a top priority for their health department. Most directors also perceived a lack of required expertise to prepare for climate change impacts.

Because public health can not protect the population from all anticipated climate-related health threats, prevention of the more severe impacts through reduction of greenhouse gas emissions is a health imperative. The public health community has expertise in social marketing and behavioral change that should be called upon to assist the nation in meeting greenhouse gas reduction goals.

Climate change policies can provide immediate and short-term health and economic benefits. Measures that reduce fossil fuel combustion can reduce both carbon dioxide and criteria air pollutant generation at the same time. In addition to air pollution effects, there are other types of health effects associated with options for greenhouse gas reduction policies. Preliminary results of an EDF study of specific greenhouse gas reduction measures suggest the ancillary benefits resulting from just the associated particulate matter reductions could be substantial.

In addition to assisting in adaptation to changes in climate to which the planet is already committed, public health has crucial roles to play in preventing the more severe impacts of climate change and optimizing the policy measures implemented to reduce greenhouse gas emissions. Our work indicates the readiness of the public health community to take on these challenges if given the needed resources.

Introduction

Protect, Prevent and Enhance. This is the bottom line of our report, discussed below, that will be released later this month on climate change and public health. I start with these three words to emphasize that public health has more than one critical role to play with respect to climate change. While it is essential that we strengthen the resilience of communities and individuals against the health threats that will be associated with climate change, public health also has critical roles to play in reducing greenhouse gas emissions and thereby preventing the more severe impacts of unchecked climate change, and also in enhancing public health by identifying those climate change policies that provide the greatest ancillary benefits for health.

Background

Global climate change currently contributes to disease and premature deaths across the planet, and these impacts are likely to increase with progressive warming and other changes in climate.ⁱ The World Health Organization estimates that climatic changes are already causing more than 150,000 deaths and about 5 million disability adjusted life years lost per year due to diarrheal disease, malaria, malnutrition, and flooding. This burden is borne mostly by poor countries in Asia and Africa.ⁱⁱ

Health impacts are usually divided into those that result **directly** from warmer temperatures and extreme weather, like heat stress, and those that result **indirectly** through climate and weather impacts on atmospheric chemistry (like increased ozone air pollution) or other forms of life (like bacterial or insect-borne infectious diseases).

More frequent and severe heat waves,^{iii,iv} hurricanes, wildfires, and floods will cause deaths and injury^v while simultaneously damaging health infrastructure.^{vi} Behavioral^{vii} and emotional^{viii} responses to these disasters, contact with contaminated floodwater,^{ix} and displacement contribute to additional morbidity and mortality.

Warmer temperatures will favor formation of ozone air pollution; higher CO₂ and other climate changes may increase allergenic pollen formation.^{x,xi,xii} These effects are likely to worsen asthma and allergic diseases. Ozone air pollution also has been associated with premature mortality from cardiovascular causes.

Climate-related increases in disasters and warmer ambient temperatures could increase the burden of food- and water-borne diseases (for example infections from *Salmonella*^{xiii}, *Campylobacter*^{xiv}, *Vibrio* species^{xv,xvi}, *Leptospira*^{xvii}, *Giardia*^{xviii}, and *Cryptosporidium*^{xix}).

Some health effects of climate change will be unpredictable. For example, climate change could contribute to the emergence of novel or foreign diseases like the pathogenic fungus *Cryptococcus gattii* that recently emerged in British Columbia.^{xx} In this instance, a lethal fungus that had been confined to Australia killed several people in British Columbia and Washington State after emerging during an unusual period of wetter and then drier weather.

And although the health impacts of climate change will be less severe in the United States than in poorer countries, the U.S. public health infrastructure may not be adequately prepared to

address the health effects of climate change. The increasing burden of chronic and emerging diseases has added new responsibilities to already-overburdened public health systems,^{xxi} but spending and hiring has not kept pace.^{xxii} The public health infrastructure that will respond to climate-related health threats remains seriously underfunded.^{xxiii}

How well prepared for climate change is the U.S. public health system?

The inadequate public health response to Hurricane Katrina,^{xxiv} for example, raises concerns about our ability to address climate-related increases in the frequency and severity of disasters.^{xxv} A 2007 survey of local health departments on preparedness for public health disasters found that over three-quarters of the departments were not highly prepared, and over half reported that Centers for Disease Control and Prevention (CDC) funding was insufficient to meet the preparedness deliverables required of them.^{xxvi} Between FY2002 and FY2007, CDC funding for all-hazards preparedness declined by nearly 28% from \$918 million to \$665 million.^{xxvii} Many cities at risk of heat waves have inadequate response plans or lack written planning entirely.^{xxviii} Current disease surveillance and response capabilities are likely inadequate to effectively address novel and emerging spread of disease as may occur with climate change.^{xxix}

An updated nationwide climate change health sector assessment in 2006 noted that while the U.S. has a high capacity to respond to climate change, little implementation of adaptive measures has been documented.^{xxx} The Director of the Division of Environmental Hazards and Health Effects at CDC asserted in March 2007 that the “public health effects of climate change remain largely unaddressed.”^{xxxi}

Surveys of public health departments give insight into preparedness for climate change

In order to better understand the current state of preparedness for health effects of climate change, EDF collaborated with the National Association of City and County Health Officials and George Mason University to conduct a survey of a representative sample of local health departments from around the country. Directors of local health departments were asked to discuss their perceptions of climate-related health risks and the status and adequacy of their departments' programmatic activities in response to these risks.

These public health professionals generally recognized the reality of climate change impacts. Nearly 70% believed that signs of climate change had already affected health problems in their jurisdiction, and 78% believed that climate change would have impacts on their jurisdiction over the next 20 years. Roughly 60% believed that climate change would affect health in their jurisdiction over the next 20 years, and slightly over half of the directors felt the climate change was an “important priority”, yet relatively few health department directors surveyed reported that climate change was a top priority for their health department. Only 19% of respondents indicated that climate change was among their department's top 10 current priorities, and only 6% indicated climate change was one of their health department's current top five priorities.

This lack of high prioritization of climate change health impacts was accompanied by a lack of perceived expertise to prepare for them. Seventy-seven percent of local health directors felt they lacked the expertise to assess local health impacts of climate change in their region, and 82% felt they lacked the expertise to craft adaptation plans. Local health directors did not perceive that

much help would come from the state or federal public health agencies. Only 26% felt their state had the needed expertise to assist with adaptation plans, while only 34% believed the CDC had such expertise. In addition to lacking expertise, 77% of the directors felt they lack necessary resources to address climate-related health threats, with additional funding and staff most frequently cited as being needed. The report concludes that additional funding is necessary to increase public health resiliency for climate change, and that the programs needed for climate change effects have synergy and overlap with those needed for other preparedness needs, including bioterrorism, emerging infectious diseases, and existing weather extremes.

Our findings were very similar to those from a survey of local public health officers from the State of California that was released in February of 2008 by the Public Policy Institute. In this survey, 94% percent of local health officers perceived climate change to be a serious threat to public health, with extreme weather events, wild fires, air pollution, vector borne illnesses, and heat stress identified as the climate-related health problems of greatest concern. And yet in California, only 24% of respondents were aware of programs in their departments that were developed with climate change in mind.

Public health has a role in reducing greenhouse gas emissions as well

The American Public Health Association, in its newly revised policy on global climate change, states, “the public health community must communicate the critical importance of primary prevention, namely the mitigation of climate change, in addition to preparing to provide secondary and tertiary prevention of climate change health effects.” This is out of recognition that there are likely to be a number of “tipping points” for climate-related health effects in different parts of the world, beyond which protecting populations will be extremely challenging. The most imminent appears to be triggering and initiating irreversible melting of the Greenland ice sheet, which would ultimately lead to inundation of low-lying coastal areas and massive population displacement with attendant health problems of refugees. Similar tipping points may exist for severe droughts and consequent crop failure, or ecosystem disruption and infectious diseases. Identifying such climate thresholds for public health is extremely challenging, and I was unable to identify any publications in this area. However, the Intergovernmental Panel on Climate Change (IPCC) in its Summary for Policy Makers from Working Group II notes a number of health drivers that either greatly increase in risk with increasing temperature rise, such as species extinctions and significant ecosystem disruption.^{xxxii} In the case of food production, the direction of change is anticipated to go from an increase to a global decrease with temperature increases above 1.5-2.5 degrees C.^{xxxiii} Given the enormous difficulty accommodating coastal flooding and declines in food supply, preventing temperature increases above these thresholds is imperative from a global public health standpoint.

Identifying the need to reduce greenhouse gas emissions to avoid the most dangerous outcomes is one thing; achieving the necessary modifications in personal behaviors is another. This is one area in which the expertise of public health professionals can assist in preventing more severe climate change. Public health has to tackle complex personal behavior problems as a matter of course. Examples include early efforts at smoking cessation, use of condoms and other changes in sexual practice, and discouraging drug use. This expertise in social marketing and behavioral change should be called upon to assist the nation in meeting greenhouse gas reduction goals.

Climate change policies can provide immediate and short-term health and economic benefits

The recognition that policies that reduce greenhouse gas emissions will have both positive and negative ancillary effects on public health is not new. Because carbon dioxide and criteria air pollutants such as particulate matter, ozone (and its precursors nitrogen oxides and volatile organic compounds) and sulfur dioxide are all produced by fossil fuel combustion, measures that reduce fossil fuel combustion can reduce both carbon dioxide and criteria air pollutant generation at the same time. In addition, technologies designed to separate and capture carbon dioxide will facilitate the separation and removal of toxic air pollutants as well. Several studies estimating ancillary health benefits of climate change policies were released at the beginning of this decade, but there has been relatively little development of this literature since, and this important point has been more or less absent from recent debates regarding greenhouse gas reduction policies. Especially with ongoing discussion of the economic costs of meeting greenhouse gas reduction goals, it is all the more important that the public health community seize the opportunity to identify and assess the ancillary benefits and costs of different greenhouse gas reduction options.

While most analyses have focused on the ancillary benefits related to reductions in toxic air pollution, there are a range of other types of health effects associated with options for greenhouse gas reduction policies. For example, transportation policies that augment the use of public transportation or provide safer and more convenient means for individuals to walk or bicycle provide co-benefits not just related to any reductions in toxic air pollution that may result from reduced personal automobile use, but also co-benefits resulting from the increases in physical activity. With the ongoing epidemic of obesity and diabetes in this country, greater understanding of the potential for such synergies between climate and public health goals is critically needed.

EDF has conducted a preliminary analysis of ancillary health benefits accruing from just the particulate matter reductions associated with greenhouse gas reduction policies. We have looked at specific categories of greenhouse gas reductions, using a “wedge-based” approach similar to that developed by Professors Pacala and Sokolow in their seminal 2004 Science Paper.^{xxxiv} We updated our baseline emissions scenarios to reflect major air pollution reduction rules such as the Clean Air Interstate Rule. Assuming full implementation of these air pollution reductions means that ancillary benefits from further reductions related to climate change policies are far smaller than they would be were air pollution emissions to remain constant into the future. Nonetheless, our preliminary results suggest the ancillary benefits could still be substantial. The total economic benefits in the year 2020 associated with improved fuel efficiency and reductions in projected miles driven for heavy duty vehicles, for example, were estimated at \$8.7 billion. For a cluster of electric utility substitutions for coal-fired power plants, the total economic benefits were estimated to be over \$32 billion. These results are preliminary, and a good deal of additional modeling studies are needed to gain confidence in such numbers, but these health benefits must not be forgotten in the debates over how we go about reducing greenhouse gas emissions. And it must be emphasized that the health benefits associated just with reduced particulate air pollution are not the only significant positive health and economic outcomes associated with greenhouse gas reductions. Health benefits from reductions in other air pollutants and from policy measures that improve physical activity profiles will also be substantial.

Conclusions

The growing threat to public health from climate change is emerging in the context of declining support for public health preparedness in general. Many of the measures needed to improve health resilience for climate change effects are the same as those needed for preparedness for bioterrorism, pandemic influenza and other viral infections, and natural disasters. These include improved modeling and assessment capacity, enhanced and integrated monitoring and surveillance networks, and development of rapid response units. But in addition to assisting in adaptation to changes in climate to which the planet is already committed, public health has crucial roles to play in preventing the more severe impacts of climate change and optimizing the policy measures implemented to reduce greenhouse gas emissions. Our work indicates the readiness of the public health community to take on these challenges if given the needed resources.

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