

Climate Change: Why Public Health Practitioners Should Care

Changing climates have a wide range of possible public health effects.

Richard Hoskins

After a decade of debate, the vast majority of the scientific community agrees that carbon dioxide and other greenhouse gases, including methane, nitrous oxide, and chlorofluorocarbons, are contributing to a climate change that could lead to disastrous consequences. Reports in 1990, 1996, and 2001 from the Intergovernmental Panel on Climate Change (IPCC), indicate temperatures worldwide will increase by 1 to

5.5°C (2-10°F) in the 21st century; this follows a temperature increase since 1900 of 0.4 to 0.8°C (0.7-1.4°F) (see fig. 1). This increase is greater than at any time in the last 10,000 years.

The developing world will have the heaviest burden, especially in tropical regions where the climate change effect will be most profound.

Threats to public health

On a worldwide basis, the greatest threats may be those threats to the fundamentals of public health: adequate food, water, and shelter, placing additional strains on public health infrastructures.

A sea level rise of 5 to 30 inches with resulting coastal flooding will severely affect the health of near sea level populations. More than half the world lives within 30 miles of the sea. The flooding of coastal communities may cause displacement, forcing families to inland areas where the population may be even more vulnerable to illnesses associated with overcrowding, such as tuberculosis, diphtheria, and diarrhea. Inundation of coastal areas due to sea level rise may also contaminate or damage water and sanitation infrastructure. The rising water table along the coast could also encourage the release of pathogens from septic systems into waterways.

Rising temperatures and the continued combustion of fossil fuels, increasing industrialization, and deforestation will increase air pollution, exacerbating already increasing chronic respiratory and cardiovascular disease and death rates.

Increased severity or frequency of thermal extremes, such as heat waves, could cause a significant rise in illness among the elderly, infants, and people with cardiovascular and respiratory disorders. People with heart problems are especially vulnerable because the cardiovascular system must work harder to keep the body cool during hot weather. The 1995 heat wave in Chicago that killed over 500 people demonstrated the deadliness of an extreme heat event. Many cities throughout the world may experience a greater number of heat-related deaths, resulting in thousands of deaths annually.

Climate change may also affect the transmission of vector-borne diseases. Changing climate conditions, such as temperature, humidity, and precipitation patterns, can change the habitat and life cycles of disease-carrying organisms, especially rodents and arthropods. Warmer temperatures and the enlargement of the Earth's frost-free zone may increase the potential for the migration of insects and rodents that spread warm weather diseases to higher latitudes and elevations. Vector-borne diseases that appear to be most sensitive to climate include Lyme disease, malaria, dengue, hantavirus, yellow fever, and viral encephalitis.

Changes in sea surface temperature could lead to an increase in bacterial contamination of shellfish and waterborne infections such as cholera. Marine phytoplankton and zooplankton can shelter a dormant form of the cholera bacteria when pH, temperature, salinity, and nutrient levels are insufficient to sustain the infectious form. As waters warm or when nutrient levels increase, the cholera bacteria can become infectious again.

In Washington and Oregon almost every weather station has shown a warming trend. Further, it appears that the temperature increase in the Northwest may be more than expected.

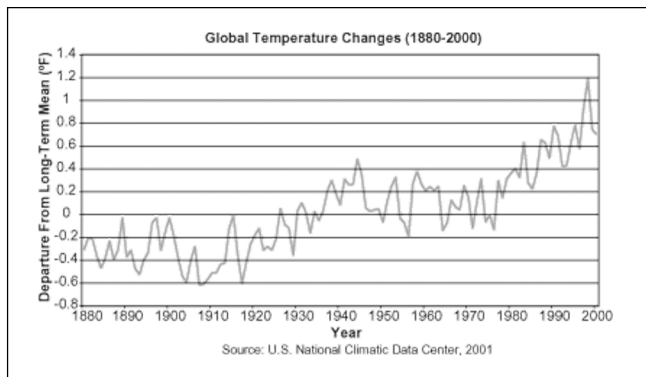


Fig. 1. Global mean surface temperatures have increased 0.7-1.4°F since the late 19th century.

Climate warming models show by 2040 a mean summer temperature increase of 2.6°C (4.7°F), a winter increase of 2.9°C (5.2°F), and precipitation increases of 2% for summer and 9% for winter. These changes would lead to an earlier spring, resulting in decreased snow pack, and rivers and reservoirs would not fill sufficiently or at the right time to meet urban and agricultural needs. Hydroelectric power generation would also be threatened. Aquatic habitat would become even more threatened than it is now, and the threat of wildfire would increase dramatically. With a projected population increase of three to five times the current population, in 40 or more years the Northwest will be a different place, and the changing climate may be a significant factor.

How can public health respond?

How can public health policy makers deal with a potential public health disaster on a global scale? I would offer the following recommendations:

- Continue research that may uncover the relationship of climate and infectious disease using remote sensing and other new environmental sensing technology.
- Increase research in understanding links between *chronic* disease and climate. Respiratory and cardiovascular diseases, mental illness, even cancers, may be more related to climate than we think.
- Expand surveillance programs throughout the world to provide timely, comprehensive data.
- Expand research in climate modeling with health in mind (very little exists now).
- Support the development of vaccines that do not now exist for diseases such as malaria and dengue, and extensively step up delivery of current vaccines to the entire world.
- Implement environmentally responsible vector-control efforts, recognizing the effects we have on millions of other species.
- Support efforts to set aside regions of the world where the ecosystems are left alone, not just for hikers and lovers of wilderness who can afford to get there, but for the health of the planet. The planet may still have a significant capacity to heal itself if given the chance. Without biological diversity, there will be no need to worry about public health issues.
- Support efforts to strengthen water quality throughout the world and to encourage its responsible use. In the U.S. our lawn watering would likely supply the developing world's water needs. The competition for water for

agriculture, power generation, and aquatic habitat will dramatically increase.

- Support initiatives by private industry to reduce the energy burden of their products on the environment, including higher mileage cars, more efficient electricity use (and production and transmission), more efficient manufacturing processes, and environmentally friendly packaging.
- Encourage governments to develop a comprehensive, long-range energy policy that addresses population growth and energy consumption patterns.
- Encourage the developed countries to support efficient and responsible development that will reduce poverty. Unless the populations of developing nations rise from poverty, no public health interventions at any scale will be effective.
- Support initiatives for effective family planning to reduce the effects of population growth on the environment.
- Encourage the U.S. government to support the development of effective and responsible climate change policy. The Kyoto Protocol may not be perfect, but it is a start.

The most important recommendation is to start planning now; we must not wait until the consequences are upon us. Many of these recommendations are far from the traditional realm of public health practice. Public health practitioners have never before needed to rely on such an interconnected matrix of government, industry, academic, and citizen participants.

More information is appearing on the Internet concerning climate change and health, which can supply resource material for workshop development both for citizens and government. It is essential that public health senior management be aware of climate change scenarios in their region and support the development of a long-range plan for adaptation. Practitioners in county health departments must encourage county and state-level authorities and legislators to take climate change seriously and support preparing a response, as they would for any pending potential crisis.

Of course no one knows how any of this will play out, and it seems years away. It is tempting to hope that there will be a technological fix and the problem will disappear. All indications, however, are that climate change is real, and not much can be done to roll it back. Of all professions, public health knows that planning—another side of prevention—must be done long before the crisis arrives. 🐼

The most important recommendation is to start planning now; we must not wait until the consequences are upon us.

Author

Richard Hoskins is the state public health geographer and a senior epidemiologist in the Office of the Assistant Secretary for Epidemiology, Health Statistics and Public Health Laboratories in the Washington State Department of Health. He is also on the clinical faculty in the Department of Epidemiology at the UW SPHCM. Contact him at richard.hoskins@doh.wa.gov.