Potential Adaptation Strategies for Moderating Impacts of Climate Change on Human Health and Welfare

Climate Event	Examples of Possible Impacts on Health	Likelihood of Impacts Given Climate Event Occurs	Potential Adaptation Strategies
More heat waves and extreme high temperatures	Heat stress / stroke Uncertain impacts on mortality	Very likely in Midwest and northeast urban centers	Early watch and warning systems and installation of cooling systems in buildings
Changes in precipitation, especially extreme precipitation	Contaminated water and food supplies with associated gastrointestinal illnesses including salmonella and giardia	Likely in areas with out-dated or over-subscribed water treatment plans	Improve infrastructure to guard against combined sewer overflow; public health response to include "boil water" advisories
Hurricane and storm surge	Injuries from flying debris and drowning / exposure to contaminated flood waters and to mold and mildew / exposure to carbon monoxide poisoning from portable generators	Likely in coastal zones of the southeast Atlantic and the Gulf Coast	Increase knowledge and awareness of vulnerability to climate change; public health advisories in immediate aftermath of storm; coordinate storm relief efforts to insure that people receive necessary information for safeguarding their health
Temperature-related effects on ozone	Ozone concentrations more likely to increase than decrease; possible contribution to cardiovascular and pulmonary illnesses, including exacerbation of asthma and chronic obstructive pulmonary disorder (COPD) if current regulatory standards are not attained	Likely in urban centers in the mid-Atlantic and the Northeast	Public warning via air quality action days; encourage public transit, walking and bicycling to decrease emissions
Wildfires	Degraded air quality, contributing to asthma and COPD aggravated	Likely in California, the Intermountain West, the Southwest and the Southeast	Public health air quality advisories

For more information about human health and welfare in a changing climate, please visit www.globalchange.gov.

Human Health and Welfare in a Changing Climate

Frequently Asked Questions

United States Global Change Research Program

Climate change will result in regional differences in impacts in the United States not only due to a regional pattern of changes in climate but the regional nature of our communities in adapting to these changes.

How Will Climate Change Impact Human Health in the U.S.?

The United States is a highly developed country with a wide range of climates. While there may be fewer cases of illness and death associated with climate change in the United States than in the developing world, we nevertheless anticipate increased costs to human health and well-being. Greater wealth and a more developed public health system and infrastructure (e.g., water treatment plants, sewers, and drinking water systems; roads, rails, and bridges; flood control structures) will continue to enhance our capacity to respond to climate change. Similarly, governments' capacities for disaster planning and emergency response are key assets that should allow the United States to adapt to many of the health effects associated with climate change.

What Are Some Impacts of Climate Change on Health?

It is very likely that heat-related death and illness will increase over the coming decades.
According to the U.S. Census, the U.S. population is aging; older adults, very young children, and persons with compromised immune systems are vulnerable to temperature extremes.

This suggests that temperature-related death and illness are likely to increase. Similarly, heat-related death affects poor and minority populations disproportionately, in part due to lack of air conditioning.

There likely will be an increase in the spread of several food- and water-borne diseases among susceptible populations.
The extent of this increase depends on the survival, persistence, habitat range, and transmission of agents of disease (e.g., bacteria or viruses) under changing climate.

Health effects related to climate change will vary by region.
For the continental United States:

United States Census Regions	Climate-Related Impacts								
	Early Snowmelt	Degraded Air Quality	Urban Heat Island	Wildfires	Heat Waves	Drought	Tropical Storms	Extreme Rainfall with Flooding	Sea-Level Rise
New England CT MA ME NH RI VT	•	•	•		•	•		•	•
Middle-Atlantic NJ NY PA	•	•	•		•	•	•	•	•
East North Central IL IN MI OH WI	•	•	•		•	•		•	
West North Central IA KS MN MO ND NE SD	•		•		•	•		•	
South Atlantic DC FL GA MD NC SC VA WV		•	•	•	•	•	•	•	•
East South Central AL KY MS TN					•	•	•		•
West South Central AR LA OK TX		•	•	•	•	•	•	•	•
Mountain AZ CO ID MT NM NV UT WY	•	•	•	•	•	•			
Pacific AK CA HI OR WA	•	•	•	•	•	•	•	•	•

The northern areas are likely to experience the greatest increases in average temperatures; they will also bear the brunt of increases in ground-level ozone and other airborne pollutants.

- Because midwestern and northeastern cities generally are not as well adapted to the heat as southern cities, their populations are likely to be disproportionately affected by heat-related illnesses as heat waves increase in frequency, severity, and duration.
- The range of many vectors (e.g., insects, rodents) is likely to extend northward and to higher elevations. For some vectors, such as rodents associated with Hantavirus, ranges are likely to expand, as the precipitation patterns under a warmer climate enhance the vegetation that controls the rodent population.
- Forest fires with their associated decrements to air quality and pulmonary effects are likely to increase in frequency, severity, distribution, and duration in the Southeast, the Intermountain West, and the West.

How Is Human Welfare Related to Health and What Are the Impacts of Climate Change?

The terms human welfare, quality of life, and well-being are often used interchangeably. There is a shared understanding that all three terms refer to aspects of life that improve living conditions and reduce chances of injury, stress, and loss.

One of the most significant ways in which social, economic, and natural systems are likely to experience climate change is through a change in weather and climate extremes. Changes in climate extremes (such as extreme rain events leading to flooding, heatwaves, etc.) already are observed to be having impacts.

Communities in risk-prone regions, such as coastal zones, have reason to be concerned about potential increases in severe weather events.
The combined effects of severe storms and sea-level rise in coastal areas or increased risks of fire in more arid areas are examples of how climate change may increase the magnitude of challenges already facing risk-prone regions. Vulnerabilities may be especially pronounced for rapidly-growing and/or larger metropolitan areas, where the potential magnitude of both impacts and coping requirements are likely to be very large. On the other hand, such regions have greater opportunity to adapt infrastructure and to make decisions that limit vulnerability.

Effects of climate change on human settlements are likely to vary considerably according to location-specific vulnerabilities, with the most vulnerable areas likely to include Alaska with increased permafrost melt, flood-risk coastal zones and river basins, and arid areas with associated water scarcity.
The main climate impacts have to do with changes in the intensity, frequency, and location of extreme weather events and, in some cases, water availability rather than temperature change.

Finally, population growth and economic development is occurring in those areas that are likely to be vulnerable to the effects of climate change.
Approximately half of the U.S. population, 160 million people, will live in one of 673 coastal counties by 2008. Coastal areas—particularly those on gently-sloping coasts and zones with gradual land subsidence—will be at risk for sea-level rise, especially related to severe storms and storm surges.