

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 sys- tems and installation of cooling systems in buildings
Changes in precipitation, especially extreme pre- cipitation	contaminated water and food sup- plies with associated gastrointesti- nal illnesses including salmonella and giardia	Likely in areas with out-dated or over-subscribed water treatment plans	Improve insfrastructure to guard against combined sewer overflow; public health re- sponse to include "boil water" advisories
Hurricane and storm surge	Injuries from flying debris and drowning / exposure to contami- nated flood waters and to mold and mildew / exposure to carbon monoxide poisoning from portable generators	Likely in coastal zones of the southeast Atlan- tic and the Gulf Coast	Increase knowledge and aware- ness of vulnerability to climate change; public health adviso- ries 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 stan- dards 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 Califor- nia, the Inter- mountain West, the southwest and the southeast	Public health air quality advi- sories

	Summary and				





The information in this factsheet is drawn from CCSP's Synthesis and Assessment Products 4.6 (Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems) and 3.3 (Weather and Climate Extremes in a Changing Climate).



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Human Health and Welfare in a **Changing Climate** Summary and Findings of the U.S. Climate Change **Science Program**



Climate variability and change challenge even the world's most advanced societies. At a very basic level, climate affects the costs of providing comfort in our homes and work places. A favorable climate can provide inputs for a good life: adequate fresh water supplies; products from the ranch, the farm, the forests, the rivers and the coasts; pleasure derived from tourist destinations and from nature, biodiversity, and outdoor recreation.



Climate not only supports the provision of many goods and services, but also affects the spread of some diseases and the prevalence of other health problems. It is also associated with threats from extreme events and natural disasters such as tropical storms, riverine and coastal flooding, wildfires, droughts, wind, hail, ice, heat, and cold.



limate 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

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 ag-

ing; Older adults, very young children, and persons with compromised immune systems are vulnerable to temperature extremes. This suggests that temperaturerelated 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 will likely 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 and

environmental conditions. The primary climate-related factors that affect these agents, or pathogens, include temperature, precipitation, extreme weather events, and shifts in their ecological regimes. However, the impact of



climate on food- and water-borne pathogens will seldom be the only factor determining the burden of human injuries, illness, and death.

	Climate-Related Impacts								
United States Census Regions	early snow- melt	Degraded Air quality	Urban Heat Island	Wildfires	Heat Waves	Drought	Tropical Storms	Extreme rainfall with Flooding	Sea Level Rise
New England ME VT NH MA RI CT	•	•	•		•	•		•	•
Middle-Atlantic NY PA NJ	•	•	•		•	•	•	•	•
East North Central WI MI IL IN OH	•	•	•		•	•		•	
West North Central ND MN SD IA NE KS MO	•		٠		٠	•		•	
South Atlantic WV VA MD NC SC GA FL DC		•	•	•	•	•	•	•	•
East South Central KY TN MS AL					•	•	•		•
West South Central TX OK AR LA		•	•	•	•	•	•	•	•
Moutnain MT ID WY NV UT CO AZ NM	•	•	•	•	•	•			
Pacific AK CA WA OR HI	•	•	•	•	•	•	•	•	•



Health effects related to climate change will vary by region.

For the continental United States:

- the northern areas are likely to experience the largest • 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 are generally 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 (eg. 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 wellbeing 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), are already 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

Climate change is very likely to accentuate the disparities already evident in the American health care system. Many of the expected health effects are likely to fall disproportionately on the poor, the elderly, the disabled, and the uninsured. The most important adaptation to ameliorate health effects from climate change is to support and maintain the United States' public health infrastructure.

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 locationspecific 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.