

The Influence of Climate Change on Health and the Role for Public Health

Weather Event	Health Effects	Populations Most Affected	Public Health Response
Heat waves	<ul style="list-style-type: none"> ■ Death ■ Heat-related illnesses such as heat stroke, heat exhaustion, and kidney stones 	<ul style="list-style-type: none"> ■ The elderly ■ Diabetics ■ Poor, urban residents ■ People with respiratory disease ■ Athletes 	<ul style="list-style-type: none"> ■ Develop scientific and technical guidance and decisions support tools for development of early warning systems and heat response plans, including appropriate individual behavior. ■ Implement early warning systems and heat response plans. ■ Conduct tests of early warning systems and heat response plans before events. ■ Conduct education and outreach on emergency preparedness for extreme heat events. ■ Ensure that extreme heat preparedness plans include medical services. ■ Improve surveillance programs to collect, analyze, and disseminate data on the health consequences of extreme heat. ■ Monitor and evaluate the effectiveness of systems. ■ Communicate that extreme heat waves are dangerous and conditions can be life-threatening. ■ Inform public of anticipated extreme heat event (EHE) conditions. ■ Assess locations with vulnerable populations such as nursing homes and public housing. ■ Staff additional emergency medical personnel to address the anticipated increase in demand. ■ Shift/expand homeless intervention services to cover daytime hours. ■ Open cooling centers to offer relief for people without air conditioning and urge the public to use them. ■ Provide access to additional sources of information: Toll-free numbers and web sites; Telephone hotlines; and Broadcast and print media.
Poor air quality	<ul style="list-style-type: none"> ■ Increased asthma¹³⁹ ■ Increased chronic obstructive pulmonary disease (COPD) and other respiratory diseases^{140,141} 	<ul style="list-style-type: none"> ■ Children ■ Outdoor workers ■ Athletes ■ The elderly ■ People with respiratory disease ■ The poor 	<ul style="list-style-type: none"> ■ Develop and enforce regulations of air pollutants. ■ Develop decision support tools for air quality early warning systems. ■ Conduct education and outreach on the risks of exposure to air pollutants. ■ Conduct research on treatment options.

Extreme Weather Event	Health Effects	Populations Most Affected	Public Health Response
Hurricanes	<ul style="list-style-type: none"> ■ Death from drowning ■ Injuries ■ Mental health impacts such as depression and post-traumatic stress disorder ■ Increased carbon monoxide poisoning ■ Increased gastrointestinal illness 	<ul style="list-style-type: none"> ■ Coastal residents ■ The poor ■ The elderly ■ Children 	<ul style="list-style-type: none"> ■ Develop scientific and technical guidance and decisions support tools for development of early warning systems and emergency response plans, including appropriate individual behavior. ■ Implement early warning systems and emergency response plans. ■ Conduct tests of early warning systems and response plans before events. ■ Conduct education and outreach on emergency preparedness. ■ Ensure that emergency preparedness plans include medical services. ■ Improve programs to monitor the air, water, and soil for hazardous exposures. ■ Improve surveillance programs to collect, analyze, and disseminate data on the health consequences of flooding and heavy rain. ■ Monitor and evaluate the effectiveness of systems.
Floods	<ul style="list-style-type: none"> ■ Death from drowning ■ Injuries ■ Increased water-borne diseases from pathogens and water contamination from sewage overflows ■ Increased food-borne disease¹⁴² 	<ul style="list-style-type: none"> ■ Residents in low-lying areas ■ The elderly ■ Children ■ The poor 	<ul style="list-style-type: none"> ■ Develop scientific and technical guidance and decisions support tools for development of early warning systems and emergency response plans, including appropriate individual behavior. ■ Implement early warning systems and emergency response plans. ■ Conduct tests of early warning systems and response plans before events. ■ Conduct education and outreach on emergency preparedness. ■ Ensure that emergency preparedness plans include medical services. ■ Improve programs to monitor the air, water, and soil for hazardous exposures. ■ Improve surveillance programs to collect, analyze, and disseminate data on the health consequences of flooding and heavy rain. ■ Monitor and evaluate the effectiveness of systems.
Wildfires	<ul style="list-style-type: none"> ■ Death from burns and smoke inhalation ■ Injuries ■ Eye and respiratory illness due to fire-related air pollution 	<ul style="list-style-type: none"> ■ Residents in the Southwestern U.S. ■ People with respiratory disease 	<ul style="list-style-type: none"> ■ Develop scientific and technical guidance and decisions support tools for development of early warning systems and wildfire response plans, including appropriate individual behavior. ■ Implement early warning systems and wildfire response plans. ■ Conduct tests of early warning systems and wildfire response plans before events. ■ Conduct education and outreach on wildfire preparedness. ■ Ensure that wildfire preparedness plans include medical services. ■ Improve programs to monitor the air, water, and soil for hazardous exposures. ■ Improve surveillance programs to collect, analyze, and disseminate data on the health consequences of wildfires, including air pollution. ■ Monitor and evaluate the effectiveness of systems.

Extreme Weather Event	Health Effects	Populations Most Affected	Public Health Response
Droughts	<ul style="list-style-type: none"> ■ Disruption in food supply ■ Water shortages ■ Food- and water-borne disease ■ Vector-borne disease ■ Malnutrition¹⁴³ 	<ul style="list-style-type: none"> ■ The poor ■ The elderly ■ Children 	<ul style="list-style-type: none"> ■ Develop scientific and technical guidance and decisions support tools for development of early warning systems and drought response plans, including appropriate individual behavior. ■ Implement early warning systems and drought response plans. ■ Conduct tests of early warning systems and drought response plans before events. ■ Conduct education and outreach on drought preparedness. ■ Improve programs to monitor the water for hazardous exposures. ■ Improve surveillance programs to collect, analyze, and disseminate data on the health consequences of droughts, including malnutrition and infectious diseases. ■ Monitor and evaluate the effectiveness of systems. ■ Improve surveillance and control programs for the detection of disease outbreaks. ■ Develop methods to ensure watershed protection and safe water and food handling. ■ Sponsor research and development on rapid diagnostic tools for food-and water-borne pathogens. ■ Sponsor research on treatment options. ■ Develop and disseminate information on signs and symptoms of disease to guide individuals on when to seek treatment.
Increased average temperature	<ul style="list-style-type: none"> ■ Increased food-borne disease, such as Salmonella poisoning ■ Increased vector-borne disease such as West Nile virus, equine encephalitis, Lyme disease, Rocky Mountain spotted fever, and hantavirus 	<ul style="list-style-type: none"> ■ Children ■ Outdoor workers and others engaging in outdoor recreation 	<ul style="list-style-type: none"> ■ Improve surveillance and control programs for early detection of disease outbreaks. ■ Sponsor research and development on rapid diagnostic tools for food- and water-borne pathogens. ■ Sponsor research and development on treatment options. ■ Develop and disseminate information on signs and symptoms of disease to guide individuals on when to seek treatment. ■ Provide scientific and technical guidance and decision support tools for development of early warning systems. ■ Conduct effective vector (and pathogen) surveillance and control programs (including consideration of land use policies that affect vector distribution and habitats.) ■ Develop early warning systems for disease outbreaks, such as West Nile Virus. ■ Develop and disseminate information on appropriate individual behavior to avoid exposure to vectors. ■ Conduct research on vaccines and other preventive measures. ■ Conduct research and development on rapid diagnostic tools. ■ Provide vaccinations to those likely to be exposed. ■ Conduct research on treatment options. ■ Develop and disseminate information on signs and symptoms of disease to guide individuals on when to seek treatment.

Extreme Weather Event	Health Effects	Populations Most Affected	Public Health Response
Increased temperature and rising carbon dioxide levels	<ul style="list-style-type: none"> ■ Increased allergies caused by pollen ■ Increased cases of rashes and allergic reactions from exposure to toxic plants such as poison ivy, stinging nettle, and other weeds 	<ul style="list-style-type: none"> ■ People with respiratory disease ■ Children ■ Outdoor workers and others engaging in outdoor recreation 	<ul style="list-style-type: none"> ■ Improve surveillance and control programs for early detection of disease outbreaks, such as asthma. ■ Sponsor research and development on treatment options for respiratory disease. ■ Develop and disseminate information on signs and symptoms of respiratory disease to guide individuals on when to seek treatment. ■ Provide scientific and technical guidance and decision support tools for development of early warning systems. ■ Conduct research and development on rapid diagnostic tools. ■ Conduct research on treatment options. ■ Develop and disseminate information on signs and symptoms of disease to guide individuals on when to seek treatment.

Source: The information presented in Appendix A -- except where noted -- is adapted from three primary sources. The information listed under "Health Effects" is from Karl, T.R., J.M. Melillo, and T.C. Peterson, eds. *Global Climate Change Impacts in the United States*. New York, NY: Cambridge University Press, 2009, p. 89-98. The information listed under "Populations Most Affected" is from Frumkin, H., J. Hess, G. Luber, J. Malilay, and M. McGeehin. "Climate Change: The Public Health Response." *American Journal of Public Health* 98, no. 3 (2008): 435-45. Finally, the information listed under "Public Health Response" is from Ebi, K.L., J. Balbus, P.L. Kinney, et al. "Chapter 2: Effects of Global Change on Human Health" in *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems*. Washington, D.C.: U.S. CCSP Synthesis and Assessment Product 4.6, September 2008, p. 69-71.

