



Climate Change and Health

Climate change threatens human health and well-being in many ways, including through more extreme weather events and wildfires, decreased air quality, and diseases transmitted by insects, food, and water.¹ Vulnerable populations, including the poor, the elderly, children, those already in poor health, the disabled, and indigenous populations, are most at risk.² Climate change can be caused by both human-made and natural factors, including the development of land, destruction of forests, and burning of nonrenewable resources.³ The following health impacts of global climate change can be separated into direct and indirect effects. Direct impacts stem from extreme events such as heat waves, floods, droughts, windstorms, and wildfires, while the indirect effects may arise from the disruption of natural systems, causing infectious disease, malnutrition, food and water-borne illness, and increased air pollution.

Heat and UV Radiation

Heat accounts for the greatest number of weather-related deaths in the United States.⁴ Young children, older adults, and the poor are more vulnerable than others to heat-related illnesses.⁵ Extreme summer heat is increasing, and climate projections indicate that extreme heat events will be more frequent and intense in coming decades.⁶ Increases in heat waves will increase the number of deaths and illnesses occurring from heat stress, heatstroke, cardiovascular disease, and kidney disease.⁷ The heat island effect in urban areas can amplify temperatures as much as 12°C.⁸ Low-income families are especially vulnerable to elevated temperatures, as they are less likely to have access to heat-adaptive features such as insulation or air-conditioning. African Americans are disproportionately affected, as they are twice as likely to live in urban heat islands as compared to whites and twice as likely as non-African Americans to live in poverty.⁹

The stratospheric ozone layer absorbs most of the harmful UV radiation emitted from the sun, but that amount of absorption has decreased since ozone-depleting substances, which are also powerful greenhouse gases, caused the thinning of the ozone layer. Warmer temperatures due to climate change may encourage people to spend more time outdoors, with likely consequences for increasing new cases of skin cancer.¹⁰ Children burn from sun exposure easily, putting them at increased risk of skin damage from UV radiation.¹¹ Furthermore, severe

sunburns in childhood and adolescence increases risk for developing skin cancer.¹²

Floods, Droughts, & Wildfires

Sea level rise is already putting low-lying coastal populations at risk, and intense rainfall events are projected to increase with climate change. This increases the risk of flooding, which can introduce chemicals, pesticides, and heavy metals into water systems and increase the risk of water-borne disease outbreak. Droughts, which are expected to become more common in the United States, can destroy crops and grazing land, reduce the quantity and quality of water resources, and increase risk of fire. Furthermore, the increase in the frequency and intensity of wildfires that has occurred over the past few decades is very likely to continue. In addition to destroying homes and property, these wildfires can cause eye and respiratory diseases. Strong tropical storms, like Hurricane Katrina in 2005, are also likely to become more common with climate change,¹³ the trauma of which can lead to post-traumatic stress disorder, grief, depression, anxiety disorders, somatoform disorders, and drug and alcohol abuse.¹⁴

Air Pollution and Aeroallergens

Higher temperatures cause ground-level ozone to increase; short term exposure to ozone heightens the rate and severity of asthma attacks, causes nasal and eye irritation, coughs, bronchitis, and respiratory infections. Since children have developing lungs and very rapid breathing rates, they are more vulnerable

to these effects than adults.¹⁵ In addition, rising temperatures in combination with increasing levels of atmospheric carbon dioxide can affect pollen production. Higher pollen concentrations and longer pollen seasons can increase allergic sensitizations and asthma episodes, and diminish productive work and school days. For example, Ragweed pollen season length has increased in central North America between 1995 and 2011 by as much as 11 to 27 days in parts of the U.S. and Canada in response to rising temperatures. Health-related costs of the current effects of ozone air pollution exceeding national standards have been estimated at \$6.5 billion.⁶

Vector-borne Disease

Climate change may cause vector-borne diseases to shift in geographic distribution as well as affect vector development, reproduction, behavior, and population dynamics.

Malaria: By 2080, an estimated 260-320 million more people around the world will be affected by malaria as a result of climate change.¹⁶ Furthermore, most malarial deaths occur in infants and young children.¹⁷

Dengue fever/DHS: Over 2.5 billion people are at risk of contracting dengue fever globally. The disease can be found regularly in more than 100 countries spanning across almost every continent, a dramatic increase from only 9 countries which had experienced severe dengue epidemics before 1970. An estimated 500,000 people with severe dengue require hospitalization each year, a large proportion of whom are children.¹⁸

West Nile Virus, Rift Valley fever, and Chikungunya fever: Have demonstrated shifts related to higher temperatures and increased precipitation from climate change.¹⁹

Tick-borne Disease: Climate change will increase the new cases and geographic distribution of tick-borne diseases such as encephalitis and Lyme disease. Children are particularly susceptible to tick bites because they play outside and are closer to the ground, where the vector gathers.²⁰

Hantavirus: A virus spread by rodents causing several forms of human disease. Climate change could lead to anticipated changes in the size and

frequency of hantavirus outbreaks, the spectrum of hantavirus species, and geographic distribution of their rodent hosts.²¹

Food and Water-borne Disease

Increases in temperature and rainfall are expected to contribute to increased outbreaks of cholera, diarrhea, *Salmonella*, *Campylobacter*, enteric infections, and rotavirus. Harmful algal blooms can form, which produce toxins that can affect water supplies and can be passed up the food chain to humans.²² Children are especially vulnerable to food and water borne-diseases because they are more likely to die from dehydration, diarrhea, and vomiting. Minority children and children of lower socioeconomic status in areas that lack adequate capacity to provide food and water supplies are at the greatest risk.

Malnutrition and Resource Scarcity

A total of 842 million people, around 1 in 8 of the global population, were undernourished 2011-2013. Of this group, 826 million live in developing countries where 14.3% of the total population receives less than adequate daily nutrition.²³ Predictions of climate change's effect on agriculture include increasing global food insecurity. As temperatures rise and rainfall patterns fluctuate, crop productivity will decline, particularly in developing countries, leading to scarcity for both livestock and humans. In the United States in 2012, there were a reported 49 million food-insecure households. Households that had higher rates of food insecurity than the national average included those with children, Black non-Hispanic households, and Hispanic households.²⁴ Child malnutrition is expected to increase by 20% by 2050 due to climate change; the United States would need to invest over \$7 billion to increase calorie consumption to counter climate change's effects on children's health.²⁵ Based on the global population rise, a predicted 9 billion people by 2050 will require 12,400 km³ of water, nearly twice as much as used today. As water demand increases, irrigation will be the first major area to lose water, affecting hunger, poverty, ecosystems, and food production.²⁶ Threats of food and water scarcity can result in war, political instability, poverty, substance abuse, crop or catch failure, rising consumer prices, and the disruption of social structures.

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The goal of the **Health & Environment Program** is to advance environmental knowledge among health professionals to improve the public's health with a special emphasis on children and underserved populations.



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