Environmental Determinants of Health

Extreme weather and natural disasters are an increasing threat

CVS caremark™

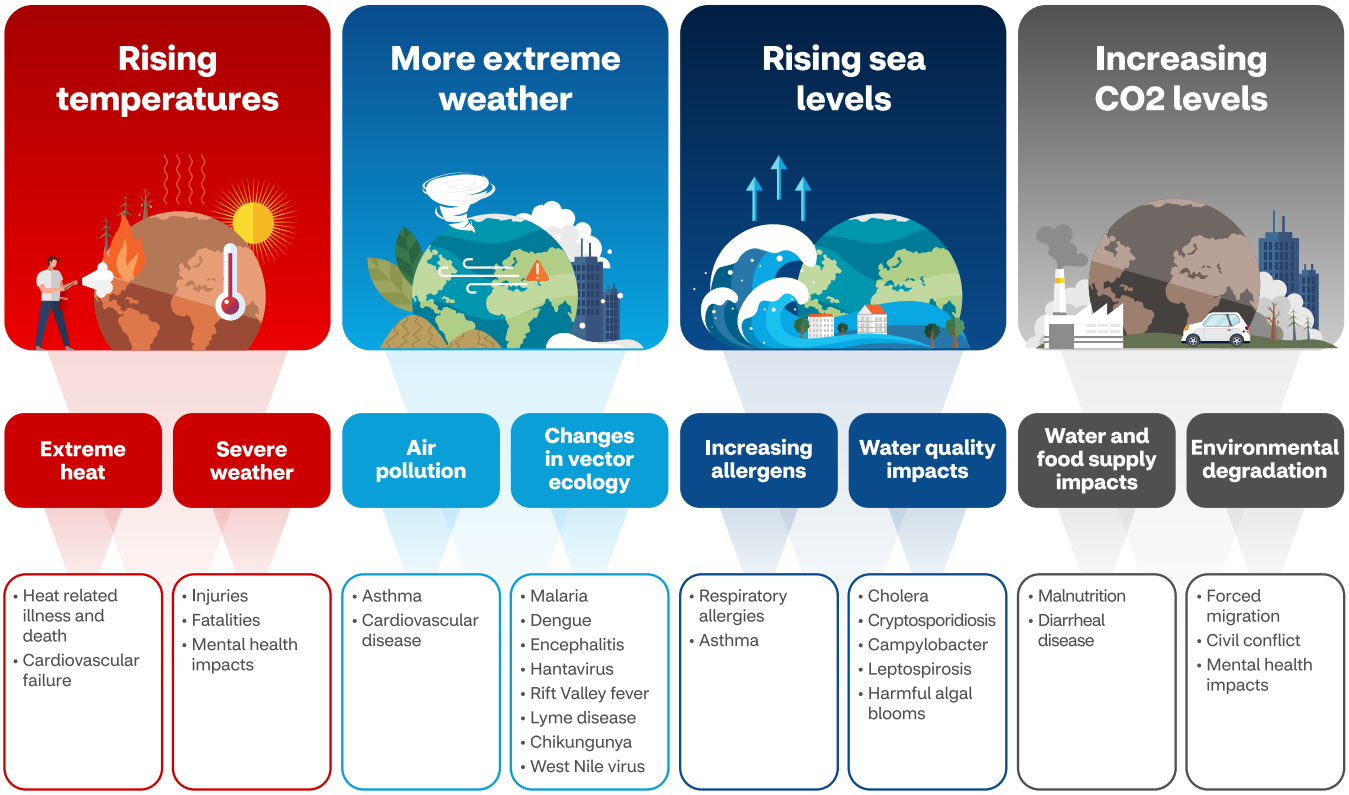
Earth, wind, and fire

It's well documented that health status and life expectancy are driven by things outside of a person's physical and genetic makeup. In fact, some experts assert that up to 60 percent of life expectancy is influenced by non-medical factors. These non-medical factors include such things as education, transportation, access to healthy food, and others, collectively known as social determinants of health, and may account for as much as 20 percent of life expectancy.[1]

Environmental issues can arise naturally or due to human activities and are as significant as physical, emotional, and social determinants of health in affecting health outcomes. Increasingly, an additional set of factors is understood to have a significant impact on health status and life expectancy: environmental determinants of health. These include environmental factors, air quality, clean water, and sanitation, but also heatwaves and severe weather events, harmful exposure to chemicals and radiation, and more.

Their impact is significant: 24 percent of all estimated global deaths are linked to the environment and 8.5 million out of 13.7 million deaths caused by the environment are due to non-communicable diseases.[2,3]

Environmental health concerns[4]



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Health outcomes due to these determinants can vary by location. While health risks globally include diarrheal diseases and malaria, risks to the U.S. population tend to be associated with such chronic health conditions as:[5]

- Alzheimer's disease
- Chronic obstructive pulmonary disease
- Cardiovascular disease
- Obesity
- Asthma
- Diabetes
- Mental illness
- Disability

Regardless of location, certain populations are especially vulnerable to environmental determinants of health.[6] Globally, the impacts are uneven across age and mostly affect the poor. Children under 5 and adults between 50 and 75 are most affected by the environment, while women bear higher exposures to traditional environmental risks.

Environmental health is a key objective of Healthy People 2030, the U.S. Department of Health & Human Services initiative that aims to improve the health status of the American population by the end of this decade.[7] Program goals include reducing diseases and deaths related to heat.

The costs related to environmental determinants are significant. The world bears estimated annual health costs of $820 billion as a result of air pollution and climate change.[8] We recently conducted a series of interviews with public health, occupational, and environmental health experts to ascertain in more detail the implications of environmental change and population health.

8.5M

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$820B

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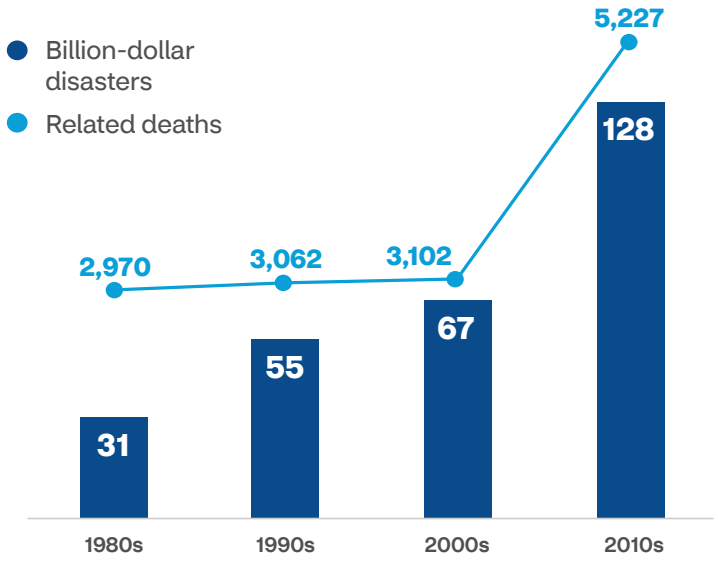
Environmental determinants of health

Due to climate change, extreme environmental events are occurring more frequently. The National Oceanic and Atmospheric Administration (NOAA), part of the U.S. Department of Commerce, uses billion-dollar disaster statistics to convey the impact of significant weather events such as floods, severe storms, and wildfires. NOAA has charted a rise in billion-dollar disasters and related deaths since 1980, showing a steep upward curve even in the past three years.[9]



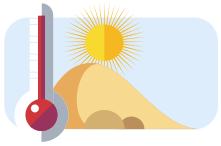
2020–present

60
billion-dollar disasters have caused

1,460
deaths

indicating that the curve will continue its upward trend

Key determinant: heat exposure



Heatwaves and wildfires are increasingly common. The past seven years have been the hottest on record, and there is no sign of this trend abating. These phenomena have significant negative impacts on human health.

Extreme heat is one of the leading causes of weather-related deaths in the United States. Heat stress occurs when the human body is unable to cool itself effectively. Heat stroke is a multisystem, life-threatening illness characterized by elevation of the core body temperature to more than 40°C and central nervous system dysfunction.[10]

On average, there are more than 700 U.S. deaths per year from extreme heat – more than from all other impacts (excluding hurricanes) combined.[11,12] However, some statistical approaches estimate that more than 1,300 deaths per year in the United States are due to extreme heat, compared with about 600 deaths per year in the "underlying and contributing causes" data.[13] Heatwaves are especially deadly for older populations; in fact, heat-related mortality among people over age 65 has increased by 50 percent in the past 20 years and is 50 percent higher than in younger populations.[9] The summer of 2022 was the hottest on record in Europe, with estimates that more than 20,000 individuals died from heatwave-related causes.[14,15]

The most serious health impacts of a heatwave are often associated with high temperatures at night, which is usually the daily minimum. The human body needs to cool off at night, especially after a hot day. If the air stays too warm at night, the body faces extra strain as the heart pumps harder to try to regulate body temperature.

Adjusting for humidity is important because it is more difficult for the body to cool down by sweating when water does not easily evaporate. Health warnings about extreme heat are often based on the "heat index," which combines temperature and humidity.

Key determinant: air quality

Climate change has led to an increase in wildfire season length, wildfire frequency, and burned area.[16] Wildfires bring about negative health effects through direct and indirect exposure pathways.

Wildfire smoke is an increasing threat to the health of at-risk people, especially in the Western United States. Wildfires emit fine particles and ozone precursors that increase the risk of premature death and adverse chronic and acute cardiovascular and respiratory health outcomes.[17] Air pollution also has implications for preterm birth and maternal health.

Air quality is another significant environmental determinant of health. Every year, 107,000 premature U.S. deaths are associated with air pollution and its precursors, which include wildfire smoke.[18]

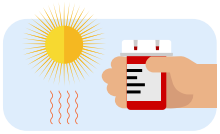
Common respiratory health outcomes have been tied to poor air quality and increasing temperature and include:[19,20]

- Asthma exacerbations
- Chronic obstructive pulmonary disease
- Worsening cardiovascular disease
- Rhinosinusitis
- Respiratory tract infections

Environmental determinants can affect mental as well as physical health. Exposure to traumatic events caused by extreme weather can result in distress, grief, behavioral health disorders, social impacts, and reduced resilience. Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.[21]

107K
premature U.S. deaths per year associated with air pollution + precursors[18]

Environmental determinants + medications



The interplay between these environmental phenomena and human health is twofold:

Certain medications can increase people's vulnerability to heat events, while natural disasters and climate events can disrupt their access to those very medications.[22]

People on certain medications or with chronic conditions are at higher risk for heat stroke or death. These include heart disease, mental illness, poor blood circulation, and obesity.[23]

Medications also may impair the body's ability to thermoregulate through different pathways. The elderly population is especially at risk because they often have multiple chronic conditions and are more likely to be on medication.[24]

Many specialty medications can be costly and sensitive, with a short shelf life and special storage conditions. Symptomatic flares can be exacerbated by environmental impact, and those who are dependent on continuous medication can end up in an emergent situation if medication access is disrupted.

Types of medication and how they impact thermoregulation[10]

ACE inhibitors: Increase risk of dehydration, impact kidney function, limit body's ability to redirect blood flow

Anticholinergic drugs: Inhibit sweating, reduce blood flow to skin, increase risk of heat-related illness during exercise

Antidepressants (e.g., SSRIs): Increase sweating, increase risk of dehydration

Antipsychotic drugs (e.g., neuroleptics): Combined anticholinergic and central thermoregulatory effects

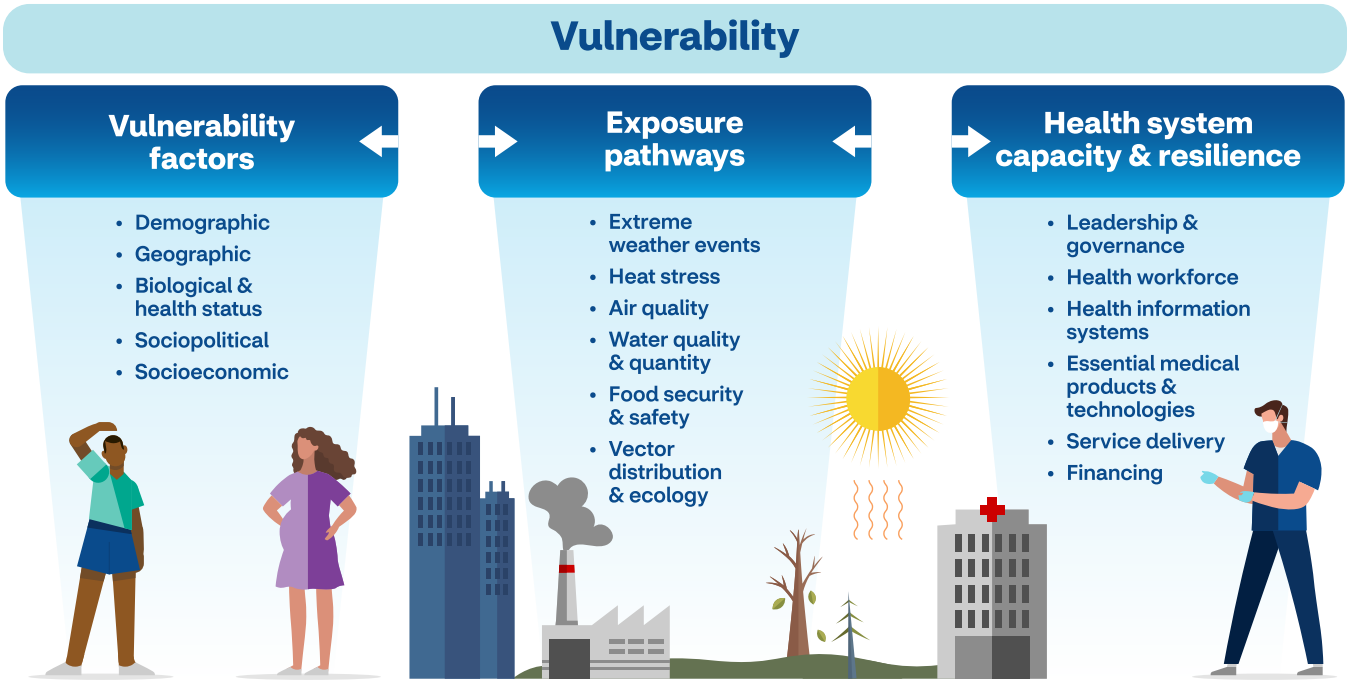
Beta blockers: Decrease heart rate and contractility

Diuretics: Impact fluid balance in the body

Weight loss supplements: May increase metabolic heat production

Health equity considerations

Environmental changes disproportionately impact vulnerable communities in the United States and negatively affect health equity efforts.[25]



Factors affecting people's ability to prepare for and respond to the impacts of environmental changes on health include:[26]

- Living in areas vulnerable to severe weather events (e.g., coastal communities)
- Coping with higher levels of existing health risks when compared to other groups
- Living in low-income communities with limited access to health care services
- Limited access to quality health care
- Limited availability of information and resources in people's native language
- Limited ability to relocate or rebuild after a disaster

Certain populations are at higher risk from the impacts of climate change, including:[26]

- Communities of color, who can suffer cumulative exposure to multiple pollutants as a result of living in risk-prone areas
- Older adults, whose vulnerability increases during extreme weather events that cause power outages or require people to evacuate
- Children, who are at higher risk of heat stroke and illness than adults
- Low-income communities, who incur risk of physical and mental illnesses during flooding and in crowded shelter conditions
- People with limited mobility or other physical disabilities

A business problem

Environmental health challenges are not just a social problem, but also a business problem. Natural disasters and extreme weather events can impact individual businesses by driving absenteeism, presenteeism, disrupted operations, and continuity issues. American workers in the agricultural, manufacturing, and service sectors lost nearly 1.1 billion work hours due to extreme heat between 2000 and 2018.[27]

Climate change can reduce worker productivity through its effects on mental health. During and after major floods, hurricanes, or wildfires, job-related stresses (particularly for first responders) and personal and financial losses can increase the incidence or severity of symptoms related to substance abuse, depression, post-traumatic stress disorder, and other serious conditions that can drive upswings in absences from work.[28]

The changing environment also brings increasing risks to employees' physical health. Changes in temperature, rainfall, and extreme weather patterns can intensify existing workplace safety and health hazards, particularly for workers who spend a portion of their time outdoors or operate a vehicle as part of their role. It can also introduce new economic hardships for low-wage workers who already struggle to pay for essentials such as food and medical care due to economic instability resulting from job or income loss.[29]

Viewing environmental conditions as key inputs to operational processes and clinical programs can preserve or improve health outcomes and maintain business continuity.

2000—2018

~1.1B

work hours lost in U.S. agricultural, manufacturing, and service sectors due to extreme heat[27]

Mitigating environmental determinants of health

Many initiatives are underway around the world to mitigate extreme weather and natural disaster effects. At this time, it's difficult to predict how successful they will be, but we know what will happen if they aren't: Under a warming scenario of 2.0°C above preindustrial levels by 2050, 1.4 billion people could be exposed to severe heat stress; and 800 million people could be living in urban areas under severe water stress.[30]

It's critical to view environmental threats with the same urgency as highly communicable diseases that can cause epidemics and pandemics.

Weather data is available from a variety of credible sources and can be used to inform proactive steps to address environmental determinants and safeguard human health during extreme weather events, natural disasters, and wildfires.

Communication efforts targeting people in affected areas can help to lessen or avoid negative health effects, ensure continued access to medication, and educate and empower at-risk and vulnerable populations. These communication efforts can be enabled by digital tools and facilitated by digital connectivity.

By 2050

1.4B
people could be exposed to severe heat stress[30]

800M
could be living in urban areas under severe water stress[30]

Proactive awareness of and planning for extreme weather and natural disasters are crucial for mitigating the negative effects of environmental determinants of health.

To learn more about the health effects of climate change, **read our blog post**.

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