

# Climate Change: The Health Impacts

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**H**uman generated greenhouse gas emissions are warming the earth's climate. The threats to health posed by climate change are multiple, and increasingly severe.

Warming generates more frequent and intense heat waves, extreme weather events, shoreline loss, flooding and drought, air and water pollution, and agricultural losses. These in turn have health consequences: heat-related illness and death; storm-driven mortality and injuries; allergies, asthma, and other conditions exacerbated by pollution; insect and water borne diseases; poorer nutrition and lessened food security, and greater mental and emotional stress.



*Researchers have found that climate change may lead to more asthma-related health problems in children, and more emergency room (ER) visits in the next decade.*

## HEAT WAVES

In most years, heat waves are the leading killer among extreme weather events in the U.S. Extreme heat events are rising in frequency, duration, and magnitude.

- ▶ Effects of extreme heat range from cramps to exhaustion and stroke. Heat stroke can result in delirium, convulsions, coma, and even death.
- ▶ In the 2003 European heat wave, an estimated 45,000 to 70,000 people died due

to heat-related illness. In 2010 a Russian heat wave killed an estimated 56,000. 2013 brought severe and record-breaking heat waves and drought to many U.S. regions and around the world.

- ▶ Increasing heat levels and humidity are making outdoor work, play, and sports riskier to health.

## EXTREME WEATHER EVENTS AND RISING SEA LEVELS

As the climate heats up, storms and floods are becoming more frequent, widespread, and intense.

- ▶ Severe storm surges on coastal areas can be devastating. Hurricane Katrina displaced over 1 million people and caused over 1,800 deaths. Hurricane Sandy inundated parts of New York City, flooding subways and cutting off power. Over fifty health care facilities evacuated their patients during Sandy.
- ▶ Thermal expansion and melting polar ice raise sea level, endangering people, animals, and crops in coastal areas worldwide. The city of Miami now has regular sewer backups with high tide and a full moon.
- ▶ 2012 and 2013 together saw 21 U.S. weather and climate disaster events that cost more than \$1 billion. The 2013 Moore, Oklahoma, tornado measured among the strongest tornadoes ever.
- ▶ Extreme weather disasters not only cause event-related death and injury, but due to loss of homes, infrastructure and jobs, markedly worsen social determinants of health. For example, poverty levels rose significantly after Hurricane Katrina and have not returned to baseline eight years later. These effects are much worse on those who are poorer at the time of the event.

## AIR POLLUTION

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Higher temperatures increase ground-level ozone, a dangerous air pollutant. Almost half of Americans live in urban areas that already fail to meet the health standards for ozone.

- ▶ Ozone exposure can reduce lung function, permanently damage lung tissue, provoke new cases of asthma, and aggravate other chronic lung diseases. Ozone also affects the cardiovascular system and can increase the risk of dangerous heart arrhythmias. Further, ozone exposure increases the number of low birth-weight babies, currently the leading cause of infant mortality. Exposure to ozone in the first and third trimesters of pregnancy can cause 20% intrauterine growth retardation.
- ▶ Climate change is increasing the extent, intensity, and frequency of wildfires. The smoke contains particulates and toxic gases which aggravate health problems, including heart and lung diseases, infections, and emergency department visits.
- ▶ The allergy season will grow longer as ragweed and other pollens spread. Urban heat islands, pollutants, and allergens will combine to aggravate asthma.

## WATERBORNE DISEASES

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Increases in heavy rainfall, especially when interspersed with periods of drought, can contribute to flooding and contaminate water supplies. Dangerous waterborne diseases include hepatitis, giardiasis, cryptosporidiosis, and *Naegleria fowleri* – the brain-eating amoeba.

- ▶ Flooding can cause sewer overflows, with potential increases in infectious diseases. Flooding can also cause injuries and deaths, mold, psychological effects, and an increase in the populations of rats, mosquitoes and other disease-bearing hosts. In 2013, a thousand-year flood in Colorado caused \$2 billion in damage.
- ▶ Infectious diarrhea is one of the most prevalent waterborne diseases globally. Severe diarrhea may be life-threatening, particularly in young children and the

malnourished. Climate change is expected to worsen this.

## VECTOR-BORNE DISEASES

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Rising temperatures and changes in precipitation expand the habitable areas for disease-carrying animals, including birds, rodents, snails, and insects. This can increase the spread of such diseases as yellow fever, Schistosomiasis, Lyme disease, tick-borne encephalitis, and hantavirus pulmonary



*Only forty-six percent of people in Africa have safe drinking water.*

syndrome.

- ▶ Mosquitoes carry malaria, dengue fever, West Nile Virus, and other diseases. Higher temperatures boost their reproductive and biting rates, lengthen their breeding season, and accelerate the maturation rate of the malarial pathogen. Dengue or bone-break fever is now present in Texas and Florida, as mosquitoes capable of carrying the disease move north.
- ▶ According to the World Health Organization, in 2010, 219 million people around the world were infected and 660,000 died from malaria. As global warming continues, as many as 90 to 200 million additional people may be at risk of malaria by the latter half of this century.

## AGRICULTURAL LOSSES

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Climate change threatens food supply through severe storms, flooding, heat, drought, water evaporation, decreased pollination, and sea level rise.

- ▶ Every 1.8°F increase in global average surface temperature yields an estimated 10% decline

in the world's major grain crops. If we continue burning fossil fuels at our current rate, global temperatures may rise as much as 5.4° to 9°F by the end of the century, with 30% to 50% declines in crop production.

- ▶ Weather and rising temperatures can damage livestock and fisheries as well as crops. Rapid warming will force farmers to keep changing what they grow as agricultural zones migrate rapidly.

Higher food prices resulting from diminished food security will reduce the capacity of people, especially the poor, to consume nutritious diets.

- ▶ Nearly one-third of the world's land surface may be at risk of extreme drought by 2100.



*Thirty percent of Russia's wheat crop was lost to fire in 2010.*

## COMPLEX AND COMPOUND HEALTH EFFECTS

Climate effects are likely to combine with a range of other factors to magnify health problems, possibly catastrophically. These include loss of infrastructure such as hospitals and housing, rising medical costs, shortages of food, clean water and productive farmland, greater levels of mental and emotional stress, regional conflicts and population migration, ocean acidification, and an inhospitable earth. The challenges of managing these costs while protecting

human health will climb drastically.

In the short term we can adapt to climate change, applying technologies like barriers on coastlines and pumps to avoid sewer backup. But as the climate heats up, the consequences will become catastrophic. The latest IPCC climate report warns that adaptation alone is not possible.

We must address the cause. To slow climate change, we must slash fossil fuel combustion and transition swiftly to clean, safe renewable energies which will also reduce water and air pollution. Healthier lifestyles such as bicycling and eating less meat and palm oil will also help.

## FOR FURTHER READING

An overview: McMichael AJ. 2013. Globalization, Climate Change, and Human Health. *NEJM* 368:1335-1343.

[[nejm.org/doi/full/10.1056/NEJMra1109341](http://nejm.org/doi/full/10.1056/NEJMra1109341)]

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[[aafp.org/afp/2011/0801/p271.html](http://aafp.org/afp/2011/0801/p271.html)]

Extensive U.S. resource: NCADAC ("National Climate Assessment and Development Advisory Committee"). 2013, Jan 11. Draft Climate Assessment Report. Chapter 9, Human Health.

[[ncadac.globalchange.gov/](http://ncadac.globalchange.gov/)]

Intergovernmental Panel on Climate. 2014.

<http://www.scribd.com/doc/215381835/IPCC-Working-Group-II-Summary-for-Policymakers>

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