# Climate Change and Health: An Overview

### *“Protecting health from global environmental change requires management at many levels, from the social and economic drivers of environmental change, to the resulting hazards and exposures for human populations.”*

###  – WHO, 2005

Climate change is the long-term statistical shifts in multiple weather parameters, including changes in average temperature and precipitation, seasonal onset, and the distribution and frequency of extreme or anomalous weather events. There is a large and growing body of evidence that human activity, especially the combustion of fossil fuels, has caused major and persistent change in global climate. The Intergovernmental Panel on Climate Change (IPCC) predicts an average global temperature increase of 1.5-5.8 degrees Celcius, and increased occurrence of extreme weather events including heat waves, floods, and droughts.

All the basic requirements for human survival are affected by climate change: clean air, safe water, sufficient food, and adequate shelter. These effects manifest themselves in a multitude of ways, from food insecurity and famine, to increased risk of chronic diseases, to direct health morbidities caused by extreme temperatures. Additionally, many communicable diseases increase in transmission and severity as a result of global warming.

In addition to the immediate health effects of climate change, increased burden of disease and food insecurity also have wide-ranging impacts on the social and economic systems necessary for societal function and community health, particularly in developing nations. Socioeconomic development can be effectively delayed or halted in worst-case scenarios; poverty and stress on underdeveloped health infrastructure compounds the severity of health effects in poorer regions.

Climate change in the context of health policy is challenging because of the high level of variance in the effects experienced by different nations, and even within nations. The ability to implement preventative public health measures and reduce greenhouse gas emissions also vary between nations, so the health community faces a tall task in achieving the cooperation needed to protect global populations from the consequences of climate change. Engagement with non-health sectors, such as the meteorological sector, water and sanitation, and food, energy, and housing is necessary to achieve multi-pronged, comprehensive solutions to address this topic.

## Questions to Consider

* How can governments, corporations, non-governmental organisations, and other UN agencies contribute to the mitigation of climate-related health consequences?
* What support can the WHO or other UN agencies provide to vulnerable regions with limited health infrastructure to resist consequences of climate change?
* What projects are currently underway to address climate change and human health? How can these projects be replicated or modified to act on a larger scale?

## Essential Reading

* [Current WHO climate change and health policy](https://www.who.int/globalchange/health_policy/wha_eb_documentation/en/)
* [Climate change and health toolkit](https://www.who.int/globalchange/resources/toolkit/en/)
* [Climate and health country profiles project](https://www.who.int/globalchange/resources/countries/en/)
* [Atlas of health and climate](https://www.who.int/globalchange/publications/atlas/report/en/)

# I. Communicable Diseases

### *“Vector-borne diseases continue to contribute significantly to the global burden of disease, and cause epidemics that disrupt health security and cause wider socioeconomic impacts around the world.”*

###  – Campbell-Ledrum et al., 2015

Described by the WHO as diseases caused by microorganisms that can be spread, directly or indirectly, from person to person, communicable diseases are diverse in their effects and transmission, and have dealt major consequences to human health for as long as humans have existed. The link between climatic conditions and infectious disease have been well known by societies long before an understanding of infectious agents was developed; in summer, Roman aristocrats and South Asians retreated to the hills and ate strongly curried foods to avoid malaria and diarrhoeal diseases, respectively.

Infectious agents include viruses, bacteria, protozoa, and parasites, and their modes of transmission are generally categorised as direct or indirect anthroponoses and direct or indirect zoonoses. Humans, via microbial evolution, act as the primary reservoir for microbes that spread anthroponoses, such as TB, HIV/AIDS, and dengue fever. In contrast, infectious agents for zoonoses use non-human species as their primary hosts, causing diseases such as rabies, bubonic plague, and Lyme disease. Both anthroponoses and zoonoses can be caused through direct or indirect transmission: from host species to human, or via carriers such as insects.

Vectors, pathogens, and hosts all survive and reproduce within a range of optimal climatic conditions, most strongly determined by temperature and precipitation. Climate-change related alterations to these conditions can have strong impacts on the localisation of diseases endemic to one area and increase the geographic region vulnerable to them. Rising temperatures increase the growth and survival of heat-adapted microbes, while rainfall can influence the spread and dissemination of infectious agents.

Climate change also acts by influencing habitats. Loss of habitat drives zoonotic hosts towards human habitats, increasing interactions. Deforestation also contributes to increased breeding sites of vectors and possible immigration of susceptible human populations. Urbanization and urban crowding are concerns in both developed and developing nations, due to greatly increased human-to-human interaction, as well as the potential for rodent proliferation, water contamination and compromised sanitation and hygiene.

Tropical and subtropical regions are typically most strongly affected by communicable diseases, and major areas of concern are the regions immediately bordering them. As unstable diseases spread beyond their current endemic zones, human populations lack protective immunity and are prone to epidemics. El Niño and La Niña bring warmer and wetter conditions to areas that are normally less susceptible to communicable diseases.

The per capita mortality rate due to vector-borne diseases is nearly 300 times greater for developing nations than developed nations. The effects of climate change and infectious disease are less obvious in the context of developed nations, where greater protection from vectors, increased sanitation, and higher-quality healthcare mitigate some climate-associated risks. However, cooler regions such as Canada and Europe that traditionally are absent of many vector-borne zoonoses are particularly susceptible to warming, as it can greatly amplify the survival of their carriers. Travel to subtropical and tropical countries is also a cause for concern. Water-borne diseases and extreme weather events continue to affect both developed and developing nations. Importantly, the combination of infectious diseases and increased natural disasters can severely impact economic and social development in developing nations, in addition to public health effects.

Current models suggest that climate change may already have an effect on human health today, with changes in disease transmission being one of the major consequences. Infectious diseases know no borders; cooperation and cross-disciplinary action will be necessary to defend against them in the coming years.

## Questions to Consider

* What are the current methods of assessing and surveilling communicable diseases?
* What communicable diseases are immediate public concerns? What diseases should we be looking to prevent the spread of in the future?
* How can we address the unique challenges of developing vs. developed nations in dealing with communicable diseases?
* What programs does the WHO already have in place to build nations’ capacity to protect vulnerable populations from climate-related communicable disease increase?
* What preventative actions can we take to strengthen our defences against potential future epidemics?

## Helpful Resources

* [Developing responses to climate change](https://www.who.int/globalchange/summary/en/index11.html)
* [WHO Africa: Communicable disease portal](https://www.afro.who.int/health-topics/communicable-diseases)
* [Vector-borne diseases and climate change](https://royalsocietypublishing.org/doi/10.1098/rstb.2013.0552)
* [Climate change and infectious disease in North America](file:///C%3A%5CUsers%5Craiss%5CDownloads%5CClimate%20change%20and%20infectious%20disease%20in%20North%20America)
* [Information, capacity building, and research](https://www.who.int/globalchange/capacity/en/)

# II. Food Insecurity

### *“If we are to achieve a world without hunger and malnutrition in all its forms by 2030, it is imperative that we accelerate and scale up actions to strengthen the resilience and adaptive capacity of food systems and people's livelihoods in response to climate variability and extremes.”*

###  – Joint statement released by the FAO, IFAD, UNICEF, WFP, and WHO

The second of the seventeen Sustainable Development Goals set by the UN is “Zero Hunger”. As a part of this goal, the UN has committed to, by 2030, end all forms of malnutrition, make strides in decreasing the rates of malnutrition-related childhood stunting and wasting, and ensure food access for poor and vulnerable populations. Despite a decade-long decrease in global undernourishment, the UN’s 2017 edition of *The State of Food Security and Nutrition in the World* provided projections that suggested a reversal of this trend between 2014-2017, returning to an absolute number of undernourished people of nearly 821 million. This is a prevalence level unseen in almost a decade.

Although factors such as conflict contribute to global food insecurity, the UN Food and Agricultural Organization (FAO) has identified climate change as among the leading causes of undernutrition. Food insecurity, defined by the FAO as “the outcome of food system processes all along the food chain … on all components of global, national, and local food systems”, is exacerbated at all levels by climate change. Elements such as increased occurrence of extreme weather events, land erosion, desertification, and drought have impacts on the essential underpinnings of food security, from immediate food availability and access, to food utilization and long-term food stability.

Populations that rely on agricultural systems that lack resistance to rainfall and temperature variability and climate extremes are particularly susceptible to food production failure. Changes in frequency, intensity, and seasonality of rainfall can be disastrous to smaller producers which rely on established rainfall patterns for livestock and crops. Production of major crops including corn, rice, and wheat is already crippled in tropical and temperate regions due to rising temperatures, and this is a trend expected to worsen as temperature changes become more extreme.

Climate-related disasters, such as extreme heat, floods, droughts, and tropical storms, have come to account for 80% of internationally reported disasters, with the number of these events having doubled since the 1990s. Drought is particularly damaging to agriculture, causing 80% of losses in livestock and crop production. Fishing industries are heavily affected by tsunamis and storms. The 2015-2016 El Niño event, which brought upon climate variations and extremes and rising undernutrition in affected areas, serves as a short-term model of potential effects of long-term climate change.

Reported in the 2018 edition of *The State of Food Security and Nutrition in the World* are recent trends of rising undernutrition and extreme food insecurity in all subregions of sub-Saharan Africa except Eastern Africa. Although South America has a relatively low overall prevalence of undernutrition, these values are trending upwards, potentially a reflection of recent economic decline. In previous years, the Asian region has seen enormous progress in the decline of undernutrition, but this trend has been slowed by adverse climate conditions in South-eastern Asia and subsequent effects on food availability and prices. Prevalence of undernutrition in the European and North American regions is minimal. Developing and poorer nations, regions of conflict, and regions of rapid population growth are particularly susceptible to undernutrition.

The Food Insecurity Experience Scale (FIES) was developed by the FAO as an alternative to prevalence of undernutrition to measure food insecurity. This is particularly effective in identifying vulnerable subpopulations and gradations in food insecurity, especially in developed nations where malnutrition can manifest in more subtle ways. Poorer subpopulations of low-, middle-, and high-income countries alike have been documented to experience high levels of moderate food insecurity. Food insecurity in this context is associated with higher risk of obesity, due to a lack of physical or monetary access to nutritious, healthy foods. Obesity can lead to exacerbated chronic disease risk and increased healthcare costs on both an individual and systemic level. Stunting, anaemia, and poor maternal and natal health are other concerns of malnutrition in all regions to varying degrees, regardless of economic stature.

## Questions to Consider

* What are the socioeconomic and geographical barriers to food access? How do these factors manifest differently in developed and developing regions?
* What effects do food insecurity have on existing health and agriculture infrastructure?
* How can we approach the unique food insecurity concerns of developed and developing regions in a comprehensive manner?

## Helpful Resources

* [*The state of food security and nutrition in the world*](https://www.who.int/nutrition/publications/foodsecurity/state-food-security-nutrition-2018/en/)
* [IPCC Special Report on Climate Change and Land - Food Security](file:///C%3A%5CUsers%5Craiss%5CDownloads%5CIPCC%20Special%20Report%20on%20Climate%20Change%20and%20Land%20-%20Food%20Security)
* [WHO portal for nutrition and health topics](https://www.who.int/nutrition/topics/en/)

## Sources

Campbell-Lendrum, D., Manga, L., Bagayoko, M., & Sommerfeld, J. (2015). Climate change and vector-borne diseases: what are the implications for public health research and policy? *Philosophical Transactions of the Royal Society B: Biological Sciences, 370*(1665). doi: 10.1098/rstb.2013.0552

Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development, United Children’s Fund, World Health Organization, & World Food Programme. (2018). *The State of Food Security and Nutrition in the World: Building climate resilience for food security and nutrition.* Rome: Food and Agriculture Organization of the United Nations.

Greer, A., Ng, V., & Fisman, D. (2008). Climate change and infectious diseases in North America: the road ahead. *CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne*, *178*(6), 715–722. doi:10.1503/cmaj.081325

Interdepartmental Working Group On Climate Change. (2008). *Climate change and food security: A framework document.* Rome: Food and Agriculture Organization of the United Nations.

Mbow, C., Rosenzweig, C. (2019). *Special Report on Climate Change and Land – Chapter Five: Food Security.* New York: Intergovernmental Panel on Climate Change.

McMichael, A. J., & Corvalan, C. F. (2003). *Climate change and human health - risks and responses: summary*. (WHO, Ed.). Geneva: World Health Organisation. Retrieved from <https://www.who.int/globalchange/publications/cchhsummary/en/>

Ogden N.H., Gachon P. (2019). Climate change and infectious diseases: What can we expect? *Can Commun Dis Rep 2019, 45*(4):76–80. doi: 10.14745/ccdr.v45i04a01

United Nations Sustainable Development Goals. (2017). *Goal 2: Zero Hunger - United Nations Sustainable Development*. Retrieved from https://www.un.org/sustainabledevelopment/hunger/.

World Health Organisation, & UN Framework Convention on Climate Change. (2015*). Climate and Health Country Profiles: A Global Overview* (2015 ed.). Geneva: WHO Press.

World Health Organisation, & World Meteorological Organisation. (2012*). Atlas of Health and Climate*. Geneva: WHO Press.

Wu, X., Lu, Y., Zhou, S., Chen, L., & Xu, B. (2016). Impact of climate change on human infectious diseases: Empirical evidence and human adaptation. *Environment International, 86,* 14–23. doi: 10.1016/j.envint.2015.09.007