Climate and health

From the tropics to the arctic, climate and weather have powerful direct and indirect impacts on human life. While people adapt to the conditions in which they live, and human physiology can handle substantial variation in weather, there are limits.

Marked short-term fluctuations in weather can have serious effects on health:

Extremes of heat and cold can cause potentially fatal conditions, e.g. heat stress or hypothermia, as well as increasing death rates from heart and respiratory diseases.

In cities, stagnant weather conditions can trap warm air and pollutants, leading to episodes of high air pollution with significant health impacts.

These effects can be significant. Abnormally high temperatures in Europe during the summer of 2003 were associated with over 35 000 more deaths than during the same period in previous years.

Other weather extremes, such as heavy rains, floods and hurricanes, also have severe impacts on health. Approximately 600 000 deaths occurred worldwide as a result of weather-related natural disasters in the 1990s; some 95% of these were in poor countries. Some examples:

In October 1999, a cyclone in Orissa, India, caused 10 000 deaths. The total number of people affected was estimated at 10–15 million.

In December 1999, floods in and around Caracas, Venezuela, killed approximately 30 000 people, many living in shantytowns on exposed slopes.

In addition to changing weather patterns, climatic conditions affect diseases transmitted through water and through vectors such as mosquitoes. Climate-sensitive diseases are among the largest global killers. Diarrhoea, malaria and protein–energy malnutrition alone caused more than 3.3 million deaths globally in 2002, with 29% of these deaths occurring in the African Region.

The setting: global warming

About two-thirds of solar energy reaching Earth is absorbed by, and heats, the Earth's surface. The heat radiates back to the atmosphere, where some of it is trapped by greenhouse gases, such as carbon dioxide. Without this "greenhouse effect", the average surface temperature of the planet would be too low for habitability by human populations.

Over the past 50 years, human activities – particularly the burning of fossil fuels – have released sufficient quantities of carbon dioxide and other greenhouse gases to affect the global climate. The atmospheric concentration of carbon dioxide has increased by more than 30% since pre-industrial times, trapping more heat in the lower atmosphere.

According to the Fourth Assessment Report (2007) of the Intergovernmental Panel on Climate Change (IPCC), the effects of the increase in greenhouse gases include the following:

The global average surface temperature has increased by approximately 0.65°C over the past 50 years.

Eleven of the past 12 years (1995–2006) rank among the 12 warmest years since record-keeping began in the 1850s.

The rates of warming, and of sea level rise, have accelerated in recent decades.

Many areas, particularly mid- to high-latitude countries, have experienced increases in precipitation, and there has been a general increase in the frequency of extreme rainfall.

In some regions, such as parts of Asia and Africa, the frequency and intensity of droughts have increased in recent decades.

The frequency of the most intense tropical cyclones has increased in some areas, such as the North Atlantic, since the 1970s.

Global emissions of carbon dioxide are still increasing. Estimates of future population growth and energy use are used as inputs for global climate models, in order to project future climate change. Reviewing outputs from a range of such models, the IPCC has made the following projections for the next century.

Global mean surface temperature will rise by 1.1–6.4 °C, depending partly on future trends in energy use. Warming will be greatest over land areas, and at high latitudes.

Heatwaves, heavy precipitation events, and other extreme events will become more frequent and intense.

Sea level rise is expected to continue at an accelerating rate.

Many countries are working to reduce greenhouse gas emissions under the United Nations Framework Convention on Climate Change. Unfortunately, even with these efforts, past and expected future trends in development and energy use mean that the world will still face significant changes in climate and a rise in sea level in the coming decades.

The effects of climate change on health

To a large extent, public health depends on safe drinking-water, sufficient food, secure shelter and good social conditions. A changing climate is likely to affect all these determinants. Reviews of the potential impacts of climate change by the IPCC suggest that a warming climate is likely to bring some localized benefits, such as decreased winter deaths in temperate climates, and increases in food production in some, particularly high latitude, regions.

Public health services and high living standards would protect some populations from specific impacts; for example it is unlikely that climate change would cause malaria to become re-established in northern Europe or North America.

Overall, however, the health effects of a rapidly changing climate are likely to be overwhelmingly negative, particularly in the poorest communities, which have contributed least to greenhouse gas emissions. Some of the changes that will affect health include the following:

Increasing frequencies of heatwaves: recent analyses show that human-induced climate change significantly increased the likelihood of the European summer heatwave of 2003.

More variable precipitation patterns are likely to compromise the supply of freshwater, increasing risks of water-borne disease.

Rising temperatures and variable precipitation are likely to reduce the production of staple foods in many of the poorest regions, increasing risks of malnutrition.

Rising sea level increases the risk of coastal flooding, and may necessitate population displacement. More than half of the world's population now lives within 60km of the sea. Some of the most vulnerable regions are the Nile delta in Egypt, the Ganges-Brahmaputra delta in Bangladesh, and many small islands, such as the Maldives, the Marshall Islands and Tuvalu.

Changes in climate are likely to lengthen the transmission seasons of important vector-borne diseases and to alter their geographic range, potentially bringing them to regions that lack population immunity and/or a strong public health infrastructure.

Measurement of health effects from climate change can only be very approximate. Nevertheless, a WHO quantitative assessment, taking into account only a subset of the possible health impacts, concluded that the effects of the climate change that has occurred since the mid-1970s may have caused over 150 000 deaths in 2000. It also concluded that these impacts are likely to increase in the future.

Issues of concern in the Eastern Mediterranean Region

Findings of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) indicate that the Eastern Mediterranean Region is one of those that will be worst affected. Climate change will aggravate current water scarcity to unprecedented levels that will seriously challenge water security for people and for food production. A rise in endemic morbidity and mortality due to diarrhoeal disease is expected, and malnutrition due to reduced food production will be exacerbated. A general rise in temperature and an increase in the number, intensity and duration of heatwaves and dust storms is expected, with potential for adverse health impacts. Natural disasters such as flooding and drought are projected to increase with corresponding injuries and death. Change in the distribution of vector-borne diseases such as malaria and dengue is also expected as a result of the changing environment.

WHO’s response

WHO coordinates reviews of the scientific evidence on the links between climate, climate change and health, including supporting the IPCC assessment process. Based on these assessments, WHO considers that rapid climate change poses substantial risks to human health, particularly among the poorest populations. The Organization therefore supports action to moderate human influence on the global climate.

Carefully planned mitigation policies bring direct health benefits. For example, well-designed urban transport systems can reduce greenhouse gas emissions, while simultaneously reducing the major health impacts of urban air pollution and physical inactivity, which kill millions each year. Housing with efficient insulation can cut energy consumption and associated greenhouse gas emissions, reduce deaths from both cold and heat, and in poor countries, reduce the need for burning of biomass fuels and the impacts of indoor air pollution. WHO is stepping up its

efforts to support healthy development, which reduces current environmental risks to health, and at the same time helps to reduce our impact on the global climate.

WHO also recognizes that, given past emissions of greenhouse gases, the world will continue to be faced with a warming and more variable climate for at least several decades. WHO's work in supporting programmes to combat infectious disease, improve water and sanitation services and respond to natural disasters already helps to reduce health vulnerability to future climate change. The Organization has also carried out workshops in the most vulnerable countries to raise awareness of the health implications of climate change and related weather patterns. WHO is increasingly working with partner agencies in the UN to support countries in strengthening the key components of health systems, such as disease surveillance and response and health action in emergencies, that are most needed to protect public health from the impacts of climate change.

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