

MANAGING THE HEALTH EFFECTS OF CLIMATE CHANGE

1 Changing Patterns of Disease and Mortality

Climate change is not just an environmental issue—it is also a health issue. The major health threats due to climate change are caused by changing patterns of disease, water and food insecurity, vulnerable shelter and human settlements, extreme climatic events, and population growth and migration.

The UCL Lancet Commission on Managing the Health Effects of Climate Change

London's leading multidisciplinary university, UCL, has teamed up with the *Lancet*, one of the world's leading medical journals, to launch a joint commission to study and report on managing the human-health effects of climate change. Chaired by Professor Anthony Costello of the UCL Institute for Global Health, the commission's membership includes 24 academics from a wide range of disciplines varying from anthropology to mathematics.

For detail and references, please see 'The UCL Lancet Commission on Managing the Health Effects of Climate Change' published in the *Lancet*, Issue 373, May 2009 (Costello *et al*).

Climate change will affect health directly through a complex set of interdependent relationships. Regional changes in temperature, sea level, precipitation and extreme weather events will cause downstream effects on the environment that lead to adverse health effects. The epidemiological impact of climate change on disease patterns across the world will be profound, particularly in developing countries with existing vulnerabilities related to poor health. The added pressure of climate change will worsen this burden and pose challenging questions for public and global health.

Urban populations are particularly vulnerable to climate change effects, especially heat waves and heat stroke. Rising temperatures are likely to generate heat-related stress, increasing the short-term mortality rate due to heatstroke. Rising urban populations, urban sprawl and poor housing are likely to exacerbate risk. The urban population in developing countries is projected to increase from 2.3 billion in 2005 to 4 billion by 2030. The 2003 heat waves in Europe resulted in up to 70,000 excess deaths, largely due to respiratory and cardiovascular causes.

Rising temperatures will affect the geographical range and seasonality of mosquito and other vector transmission of diseases like malaria. The change in range may expose new populations, who have little or no

immunity to diseases, to malaria. It is likely that mosquitoes will be able to access warmer, higher altitudes and therefore malaria is expected to expand into areas that were once free of the disease. Models accepted by senior researchers predict that as many as 260–320 million more people could be affected by malaria by 2080, as a consequence of new transmission zones.

Dengue is another vector-borne disease that is sensitive to the climate. The change in climate, which causes heavy rainfall and a rise in temperature, broadens the range of the disease to unexposed areas such as regions of Australia and New Zealand, and increases the rate of transmission. By 2080 approximately 6 billion people will be at risk of contracting dengue as a consequence of climate change, compared with 3.5 billion people if the climate remained unchanged.

Water-borne diseases such as cholera and leptospirosis may increase due to a rise in ocean temperatures. It is likely that disease outbreaks will occur after severe disruptions in water levels in communities, based on the experiences after Hurricane Mitch in Central America in 1998 and the flooding in Wisconsin, USA, in 1993. The rise of ocean temperatures produces plankton blooms that provide nutrients for vibrio cholerae, the bacteria that causes cholera in humans.

Changing patterns of illness and new epidemics create challenges to populations unfamiliar with them and exacerbate current problems. These are likely to heighten problems in the rationing of health care, which already presents complex moral and social dilemmas. New disease vectors are not only a difficulty for those who suffer but also for professionals unprepared educationally or clinically to respond. In industrialised countries hospitals lack experience in managing malaria because it remains uncommon, and even infections or parasitic diseases that have emerged in previously colder climates (e.g. dengue), are rarely well-understood by practitioners.

Policy Responses

Climate change effects on disease and mortality will have the greatest impact on impoverished people in settings with few resources. This is because poor people are most exposed to environmental agents of disease, such as inadequate housing and poor water supplies and sanitation, and through greater vulnerability.

The vulnerability of the poor to climate change is manifested in three main ways: exposure, sensitivity and adaptive capacity. First, the world's poor are more exposed to the effects of climate change due to their geographical location. Second, they are more sensitive to the effects because of inadequate socio-economic development. Finally, lower developmental indicators of education, income, health and other contextual factors interact to reduce the adaptive capacity of developing countries. The extent of future vulnerability to the health effects of climate change is as dependent on improving the socio-economic development pathway as on climate change itself.

Gender inequity is an important factor in the relationship between climate change and disease, hence policies should be empowering for women, and gender sensitive. In developing countries women are very vulnerable to climate change. This is because they account for a large proportion of the

agricultural workforce and have fewer alternative income opportunities, which are crucial factors at times when climate variability affects agricultural yields and food security. Efforts to minimise the adverse impacts of climate change should recognise women as powerful agents of change and ensure they are fully integrated into climate change mitigation and adaptation strategies at all levels. Case studies in Senegal, Bangladesh and Ghana demonstrate grassroots women's groups developing coping strategies related to energy and forestry, agriculture, water resources and trade.

Sustainable development and functioning primary and secondary health systems are needed to reduce poverty and the diseases of poverty. This should be underpinned by a strong public health infrastructure incorporating the following:

- Surveillance and monitoring of diseases.
- Access to low-technological solutions at an affordable cost to the individual or government.
- Access to health professionals and to health centres, particularly in rural areas.
- Sustainable education and training for future health professionals.

Many countries will require more investment and resources to strengthen their health systems. The ability of health systems to respond effectively to the direct and indirect health effects of climate change represents a key challenge worldwide. This is particularly so in many low- and middle-income countries, which suffer from the public health challenges of poor health infrastructure, poverty and inequality that are perpetuated by diseases such as HIV/AIDS, tuberculosis and malaria. The threats to health posed by climate change also highlight the vital requirement for improved stewardship, population-based planning and the effective and efficient management of scarce resources.

The limited capacity for research and structural adaptation in low- and middle-income countries is likely to deepen the inequality in climate change health impacts. It is important therefore to redress financial constraints in the public sector and to improve national infrastructure and human capacity.

A fundamental requisite for health adaptation to climate change will be to improve the monitoring and surveillance of disease and mortality in sensitive regions. The challenge is to incorporate a strong public health infrastructure and empower communities to achieve effective disease surveillance. Recent reports have highlighted the urgent need for improved surveillance systems and technologies, particularly for infectious diseases in the developing world and to increase cooperation between states in the identification and public health response to outbreaks and epidemics.

Satellite mapping and geographical information systems (GIS) are useful analytical tools for local, regional and national surveillance to project future health outcomes. For example, using these tools for malaria in the developing world could allow healthcare professionals to reallocate resources and prevent predicted future outbreaks. However, maximising the effect of this technology requires accessible finances, knowledge and expertise in poorer countries.

Health Early Warning Systems (HEWS) are particularly important in the context of heat stroke, extreme weather events and disease outbreaks, for both developing and developed countries. The effectiveness of HEWS is dependent on past and current disease monitoring and surveillance as well as accurate and reliable meteorological and climatic forecasts. The use of HEWS is a win-win strategy that reduces the risk of disease while also increasing adaptive capacity, which is essential in the context of developing countries.

The international community must research and develop vaccines for climate sensitive diseases like malaria and dengue, and ensure they are made accessible to the most vulnerable. Large-scale vaccination programmes in the developing world will require a strong public health infrastructure, knowledge, finance and political will. A sustainable and ethical solution to the trade related intellectual property rights (TRIPS) agreement must be found to allow developing countries to buy medical supplies without placing substantial burdens on the budgets of the poorest.

Low-cost and low-tech solutions, such as mosquito nets and water filters, provide effective public health prevention to combat the health effects of climate change.

New technologies that alleviate health effects (e.g. air conditioning to avoid heat stroke) should aim to be carbon neutral, inexpensive and easily manufactured across the world to avoid contributing to climate change.

Conclusions

- Climate change adaptation and mitigation are central to overall development policy across government departments and should be taken into consideration for all governance actions.
- Changing patterns of illness create challenges to populations unfamiliar with them and new epidemics present serious problems. Developing Health Early Warning Systems (HEWS) is especially important.
- Urban populations are particularly vulnerable to climate change and are at risk of heat waves and heat stroke.
- Rising temperatures will affect the geographical range and seasonality of dengue, malaria and other vector transmission diseases. Low-cost and low-tech solutions, such as mosquito nets and water filters, can effectively combat this risk.

- Water-borne diseases such as cholera and leptospirosis may increase due to more intense El Niño-type extreme events and a rise in ocean temperatures.
- Accountability mechanisms are crucial. New funding and networks are required to monitor what is happening in government, civil society, academia, local government and communities, especially in the most vulnerable populations. Individuals, organisations and governments all have a vital role to play in advocating for and implementing change at a variety of levels.
- Global task forces, research and advocacy groups need to adequately represent and involve those who will be most affected by climate change.
- Health issues can play a crucial role in strengthening carbon mitigation debates and targets.
- A fundamental requisite for health adaptation to climate change will be to improve the monitoring and surveillance of disease and mortality in sensitive regions. Satellite mapping and geographical information systems (GIS) are useful analytical tools for local, regional and national surveillance to project future health outcomes.
- A comprehensive solution to the health problems associated with climate change will need to move beyond responses internal to health systems. Health systems must not simply act as a platform for the delivery of clinical services, but also provide the foundation for an effective public health response to the many climate-induced threats to health.

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Managing the health effects of climate change: Changing patterns of disease and mortality

Managing the health effects of climate change: Food

Managing the health effects of climate change: Water and sanitation

Managing the health effects of climate change: Shelter and human settlements

Managing the health effects of climate change: Extreme events

Managing the health effects of climate change: Population and migration

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