

Fact sheet #2

Climate information for protecting human health

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Not an official record

By the World Meteorological Organization (WMO), with the World Health Organization (WHO) and other international partners

Climate and health are inextricably linked in a number of ways. Climate affects some of the most fundamental determinants of health: air, water, food, shelter and disease. Climate plays a powerful role in the occurrence and spread of diseases worldwide, in regional air quality and in weather extremes that dramatically change day-to-day living.

As the global climate changes, people in many areas are at an increasing risk of vector-borne diseases, such as malaria, West Nile virus and dengue fever. The mosquitoes that carry many of these diseases tend to thrive in warmer, wetter climates. Likewise, scientists are concerned about a heightened risk of water-borne diseases due to warmer temperatures that may change the survival rates of pathogens, coupled with increased rain and flooding, which mobilize contaminants. Warmer ocean water can trigger toxic algal blooms and cholera epidemics, for example, while increased runoff can overtake sewage systems and release pathogens into the water supply.

At the same time, heatwaves and urban pollution events pose air quality risks, particularly to children, the elderly and people with vulnerable immune systems. Many of the climate-change-inducing particles and chemicals emitted into the atmosphere by human activities also

pose severe health risks. Aerosols, such as road dust for example, both absorb heat from the atmosphere and cause respiratory illness. Meanwhile, a warmer climate increases the frequency of sand and dust storms, which trigger respiratory and cardiovascular problems. Other weather and climate extremes, such as droughts, wildfires and floods, are exacerbated by climate change and are very likely to increase in frequency and intensity in the future. Such extremes endanger people's immediate safety, as well as their long-term health through a variety of effects on the food and water supplies.

Looking at selected health issues, the WHO estimated that climate change caused 150 000 deaths in the year 2000 (using 1961–1990 as the climate baseline period). In general, these climate-related health risks have the greatest impact on developing countries and small island states, as well as communities not historically acclimated to warmer temperatures. Established and cost-effective interventions can effectively protect people from climate hazards, but they need both strengthening and more accurate targeting in time and space. Effective use of climate information improves such targeting. Closer collaboration between the meteorological and public health sectors provides communities and health and humanitarian agencies with tools to identify elevated risks, take preventive measures and plan effective responses.



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Fighting malaria with climate information

Botswana has an innovative weapon on its side in the country's fight against malaria. This weapon is not a new drug or mosquito net but rather climate information: an early warning system that integrates a seasonal rainfall forecast with population and health surveillance information. The use of the seasonal rainfall forecasts has added a four-month lead-time over previous malaria epidemic warnings.

The success of the malaria early warning system in Botswana hinges on the well-established link there between malaria and climate variability, particularly rainfall. Although many factors contribute to the spread of malaria in a region, the timing and quantity of precipitation can be particularly important in predicting outbreaks of the disease, as these factors determine both the mosquito migration patterns and rate of parasite development. Scientists have been working to capitalize on that link to establish better warning systems in Botswana since the devastating regional malaria epidemic of 1996.

Headed by the European Centre for Medium-Range Weather Forecasts and the International Research Institute for Climate and Society, the early warning project uses state-of-the-art ocean-atmosphere climate models to predict the likely evolution of climate, as well as the associated uncertainties. The work focuses on the use of data from DEMETER (Development of a European Multimodel Ensemble Forecast System for Seasonal-to-Interannual Climate Prediction). Much of the research was pioneered through the World Climate Research Programme, which is co-sponsored by WMO. Using DEMETER, it becomes possible to see the probable distribution of rainfall in Botswana and to integrate that information into public health planning tools.

The increased lead time provided by the DEMETER rainfall data gives health officials vital extra time to allocate resources, such as mosquito nets, for the prevention of malaria. The early warning system uses the DEMETER data along with vulnerability assessments and other environmental monitoring, following on WHO recommendations for the enhanced control of epidemics.

Activities using climate information to save lives

The malaria early warning project is one of many collaborative efforts to integrate climate predictions and information into public health decision-making. Other recent and ongoing projects to address disease, heatwaves and air quality events include:

WMO-coordinated observational networks, such as the Global Atmosphere Watch (GAW), collect information about ozone, ultraviolet and solar radiation, greenhouse gases and particles from biomass burning and dust storms to better understand human contributions to climate-altering air pollution and to enable responses to protect public health. More than 65 countries actively host GAW stations, which share data through five GAW World Data Centres. A specialized component of GAW called GURME (GAW Urban Research Meteorology and Environment) focuses on monitoring pollution in the urban environment, including monitoring in Latin America, Eastern Europe, Asia and North America.

Malaria Outlook Forums establish dialogue between the public health sector and weather and climate experts to facilitate the development of integrated products for malaria prevention in Southern Africa. Partners include WMO, National Meteorological and Hydrological Services, the Southern African Development Community's Drought Monitoring Centre in Botswana, WHO and the Malaria Early Warning Systems programme, among others.

In Ethiopia, the Ministry of Health and the National Meteorological Agency have joined forces to monitor regional climate in support of malaria surveillance and early warning. Maps of climatological data are published in monthly bulletins distributed by the Ministry of Health's National Malaria Control Team, and they are also posted on the RANET (Radio and Internet for the Communication of Hydrometeorological and Climate-Related Information) Website, which provides access to climate and weather information in rural areas of Africa and the South Pacific. The joint project aims to assist in planning malaria surveillance, allocating drugs, controlling mosquito populations and raising public awareness of the issue.

In 2007, the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG), in cooperation with the Jakarta Local Health Office, conducted research on correlating dengue fever with climate to enable local authorities to take measures to reduce the risk of the fever.

The Hong Kong Observatory has been studying the impact of climate on health in Hong Kong, China, with particular focus on thermal stress and the occurrence of infectious and vector-borne diseases. The research findings will form the basis for the development and operation of public health-related weather services and climate assessments in collaboration with all key stakeholders. The Hong Kong Observatory also provides climatological support to medical experts for other climate and health studies in Hong Kong.

The WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) facilitates sand and dust storm forecasting to give advance warning to affected communities, which tend to be in Africa, Europe, the Middle East, South-East Asia and the south-western United States. Approximately 14 Operational Research Dust Forecasting Centres produce daily dust and sand forecasts.

Established in 2004, the French Heat Health Watch Warning System activates a national action plan as soon as dangerous heat threatens the population. The National Health Watch Institute and Météo-France work jointly to provide real-time weather and health data and forecasts, along with guidance to health professionals and the public, to increase safety during heatwaves. WMO and WHO are jointly developing Guidance on Implementation of Heat Health Early Warning Systems to enhance similar joint efforts elsewhere in the world.

The Japan Meteorological Agency (JMA) provides early warning information on extreme temperature events. The information is aimed at forecasting the possibility of the occurrence of significant hot and cold extremes with a one- to two-week lead time. The early warning information is widely used to mitigate the impacts of extreme temperatures on health, as well as other sectors, such as agriculture and energy.

Facts and figures

- Malaria kills 900 000 people a year, over 80 per cent of whom are in sub-Saharan Africa. [WHO]
- It is projected that climate change will have increased the population at risk of malaria in Africa by over 80 million by the middle of the next decade. [Government of the United Kingdom]
- By 2030, the risk of diarrhoea is expected to be 10 per cent higher in some countries due to climate change. Diarrhoea caused 2.2 million deaths globally in 2002. [WHO]
- Temperature increases of 2 to 3 degrees Celsius would increase the number of people who, in climatic terms, are at risk of malaria by around 3 to 5 per cent, which represents several hundred million people. [*The Lancet* via WHO]
- Hundreds of cases of Chikungunya fever, spread by the Asian tiger mosquito, which can also spread dengue and yellow fever, were reported in 2007 in Italy, where only isolated cases of the virus had been seen in the past. [WHO]
- Between 1970 and 1995, the annual number of dengue fever epidemics in the South Pacific showed a positive correlation with La Niña's warmer and wetter conditions. [*The Lancet* via WHO]
- The European heatwave of 2003 caused approximately 70 000 excess deaths across the continent. [WHO]
- The Bulgarian heatwave in 2007 sparked more than 1 500 fires in just four days. [WMO]
- A sandstorm blanketed one-eighth of the People's Republic of China in 2006. [WMO]
- Malaria incidence in Colombia has doubled since 1970 and shows a linkage to climate changes. [World Bank]

WCC-3 will initiate actions to enhance climate services for climate adaptation and the management of climate risks and opportunities around the world.

For more on human health protection:

WHO Website on Climate Change:

<http://www.who.int/globalchange/climate/en/>

Articles on climate and health on the WMO World Climate Programme Web site:

http://www.wmo.int/pages/prog/wcp/article/featureart_en.html

DEMETER:

<http://www.ecmwf.int/research/demeter>

International Research Institute for Climate and Society:

<http://portal.iri.columbia.edu/>

UN Gateway fact sheets on climate change:

<http://www.un.org/climatechange/bg.shtml#facts>

RANET (community Radio-internet):

<http://www.ranetproject.net>

WMO Sand and Dust Storm Website:

http://www.wmo.int/pages/prog/arep/wwrp/new/Sand_and_Dust_Storm.html

GAW Website:

http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html

Japan Meteorological Agency (JMA) early warning information:

<http://www.jma.go.jp/en/soukei/>

Drought Monitoring Centre for the Greater Horn of Africa:

<http://www.icpac.net/>

IRI:

<http://portal.iri.columbia.edu/>

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