

Adapting to minimise the health impacts of climatic changes

Context

The earth is getting warmer. In the last 130 years its temperature has risen by approximately 0.85°C, with each of the last three decades hotter than the one before.^[1] Models predict this will rise by a further 2–3°C by the end of the century,^[2] which could have disastrous consequences for human lives and global health.

Rising global temperatures damage ecosystems, endanger coastal areas and increase the risk of extreme weather, affecting many of the social and environmental determinants of health (e.g. clean air, safe shelter, a nutritious food supply and access to safe drinking water). Changes in climatic conditions can also alter the incidence, transmission and distribution of infectious diseases. As well as adversely impacting morbidity, it is estimated that climate change — long-term changes in the earth's average weather patterns that are primarily caused by human activities (e.g. the burning of fossil fuels) and natural processes (e.g. solar irradiation and volcanic eruptions)^[3] — will cause 250,000 additional deaths per year between 2030 and 2050.^[4]

While everyone will be affected, some populations are more at risk than others. Such groups include: those living in coastal or mountainous regions and megacities; children, elderly people and those with pre-existing medical conditions; and those living in countries with lower socio-economic development and weaker health infrastructures. Paradoxically, the regions that are most vulnerable to the negative impact of climate change — sub-Saharan Africa and South Asia — are also those that have contributed least to its cause.^[1]

Mosquito-borne diseases

Climate change and variability — short-term deviations due either to internal processes within the climate system (e.g. El Niño and La Niña) or natural external factors^[3] — can both directly and indirectly impact the transmission of vector-borne diseases through effects on the life cycles of vectors, as well as the pathogens (i.e. parasites) that they carry.^[5,6]

Malaria is one of the most climate-sensitive of these diseases. Warmer temperatures may speed up *Anopheles* mosquitoes' life cycle (i.e. the time it takes an egg to mature to an adult mosquito) and increase the development rate of *Plasmodium* parasites in the vector by shortening the time it takes for mosquitoes to become infectious and potentially increasing rates of transmission and infective bites.^[7,8] Warmer temperatures in higher altitudes could also lead to geographical expansion in malaria transmission risk (e.g. outbreaks in areas with previously low or no transmission) and introduce the disease into areas where the population has low immunity.^[9]

Similarly, increases in rainfall and extreme weather — such as floods or droughts — may increase the number and range of breeding sites for *Anopheles* mosquitoes and, in turn, cause malaria epidemics.^[10] The associated humidity may also lengthen these mosquitoes' lifespan and, therefore, increase their transmission potential.

The same is true for the *Aedes* mosquito species, which breeds in small pools and rain-fed containers and transmits **chikungunya**, **dengue** (that infects an estimated 390 million people annually),^[11] **yellow fever**, **Zika** and several other viruses that pose public health threats. Changes in climatic conditions could affect the geographic distribution and seasonality of these diseases, as well as increase the likelihood of them presenting in new or previously transmission-free regions.^[12]

Although uncertainty remains as to how exactly climate change will affect particular health outcomes and there is a range of other factors that contributes to the development and distribution of disease (e.g. vector control measures, social behaviours, migratory patterns, ecological changes, land use, population growth and drug resistance), increases in short-term temperature rises can significantly increase the risk for transmission and exposure to both *P. falciparum* and *P. vivax* malaria parasites.^[13,14] Estimates suggest that climate change could increase the population at risk of acquiring malaria by 5–7 percent across Africa by 2100 and result in 60,000 additional malaria deaths per year between 2030 and 2050.^[4,15]

Our position

As a leading technical organisation specialising in the prevention, control and treatment of malaria and other communicable diseases, we recognise that climate change has the potential to affect health and disease outcomes for people across the countries in which we work. Therefore, we continuously strive

Strengthening malaria surveillance

Surveillance — the systematic and ongoing collection, collation, analysis, interpretation and timely dissemination of data/information to decision makers^[16] — is a crucial component of a resilient health system. It facilitates the early detection of outbreaks and enables all levels of a health system to monitor disease situations over time so they can adapt their interventions to the prevailing conditions.

We are supporting the Government of Uganda to strengthen its malaria surveillance system for improved data-informed decision making. Districts in the north of the country are now able to easily identify significant deviations in routinely collected data and raise the alarm about impending malaria upsurges due to abnormal climatic events, as well as identify hotspots for targeted interventions.

We have also previously monitored changes in the abundance of malaria vector species and their habits under various conditions in selected sites in Ethiopia and Uganda. Our comprehensive entomological and epidemiological monitoring study — which also collected meteorological data — sought to understand these changes in the context of implemented interventions and, thus, support both countries' adaptations of their malaria control policies and strategies.^[17]

to incorporate responses to climate-related risks into our programmes, based on the following overarching approaches.

- Whole systems approach: we fully support the holistic, system-wide response advocated by the World Health Organization. Efforts to build countries' capacities to identify, monitor and manage the direct and indirect impacts of climate-related health risks should be integrated within existing efforts to strengthen all levels of the health system district, regional and national.
- Healthcare capacity development: developing health workers' capacity and skills to recognise and respond to the different effects of climate change on health is essential to building countries' and communities' related resilience. Training should be informed by needs assessments, incorporated into existing health systems strengthening activities and available to all health staff, in both private and public facilities.

- Vulnerability assessments: as climate-related changes are likely to put particular population groups at a greater risk of exposure to disease and ill health through disruptions to environmental and social conditions, it is crucial that countries map these determinants, identify at-risk populations and document weaknesses and gaps across different levels of the health system so they can build and appropriately resource a targeted, context-specific and needs-based response.
- Surveillance and monitoring: integrating real-time meteorological data into national and sub-national malaria monitoring and surveillance systems is necessary to track and anticipate how climatic changes may influence disease exposure and transmission and, thus, enable health services to effectively mitigate and manage these risks.
- **Research and evidence:** building resilience to climaterelated health risks requires a more comprehensive understanding of the region-specific effects of climate change, and the present and future ability of communities to recognise and mitigate these risks. As such, greater investment in quality research — including health services preparedness evaluations and operational studies that seek to provide practical, context-specific solutions to local climate-related challenges — is urgently required.
- **Cross-sectoral collaboration:** a coordinated, multisectoral response is required to effectively target the multiple drivers of climate-related disease outcomes. Mainstreaming climate-health risks into the policies and plans of all health-determining sectors/departments (e.g. agriculture, disaster management, environmental health, vector control and surveillance, and water, sanitation

and hygiene) would facilitate the development of more effective, efficient and integrated adaptive responses and maximise health protection.

- **Community engagement:** sensitising communities to the region-specific impacts and risks of climate change on health is essential to allow for the development and improvement of local resilience capacities. Awareness campaigns shaped by local knowledge, attitudes and practices surveys and designed in collaboration with community leaders that highlight ways in which communities can protect themselves should be developed and disseminated within existing community structures and networks.
- **Tools and technology:** efficient supply chain management of essential items (e.g. medicines and diagnostic tools) and regular assessment of their capacity to withstand and respond to unexpected disruption (e.g. water and electricity supplies) are integral to ensuring health facilities' climate resilience. Investment in new, locally appropriate and sustainable technologies specifically designed for building climate-health resilience may also help build a more timely and targeted response to anticipated health risks.
- **Financing:** adequate resources must be allocated globally, nationally and locally to mitigate and manage the health-related impacts of climate change. This is particularly important in regions where the risk of extreme weather events may intensify the incidence and spread of disease and place additional pressure on already-stretched health systems.

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