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Using climate information in the health sector

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Abstract. Many infectious and chronic diseases are either directly or indirectly sensitive to the climate. Managing this climate sensitivity more effectively requires new working relationships between the health sector and the providers of climate data and information. In Africa, where communities are particularly vulnerable, Ministries of Health and National Meteorological Services need to collaborate to reduce the burden of climate-related ill health.

The Ministry of Health and the National Meteorological Agency of Ethiopia have made significant progress towards the development of a climate-informed early warning and response system for diseases such as malaria and other climate-sensitive diseases. An important enabling mechanism is a Climate and Health Working Group, which is a multi-sectoral partnership created to spearhead the use of climate information for health interventions. While this is a work in progress, the key ingredients necessary to sustain such a joint venture are described to encourage similar activities in other countries faced with a growing climate-sensitive disease burden, to facilitate networking and to increase the return from the investment.

1 Introduction

Climate is a key variable in managing the overall burden of disease, particularly in developing countries where the ability to control climate-sensitive diseases constrains the prospects of achieving the Millennium Development Goals. To mitigate its adverse effects, the health sector needs to understand and quantify the specific effects of climate variability and change both on the overall disease burden and on opportunities and effectiveness in the public health response.

This applies equally to future adaptation strategies, and to understanding fully the impact of the climate on the existing disease burden and current interventions. For example, an accurate assessment of the impact of a bed net programme for malaria control depends on knowing the climate trend during the assessment period. In the absence of any intervention, increasingly wet years may well increase the mosquito population resulting in higher incidence of malaria;

while conversely, periods of drought may well decrease the mosquito population and reduce the incidence of malaria. It is also possible that the trend could reverse in certain locations; dry spells favouring transmission when normally running streams leave intermittent pockets of water during drought periods which then become suitable for mosquito breeding. Thus, it is important to understand the environmental context to develop an accurate picture of the efficacy of any intervention strategy.

The health sector can also use climate information very effectively in epidemic early warning systems. Seasonal forecasts of temperature and rainfall, which are useful indicators of the likely occurrence of malaria outbreaks, can be used to implement a programme of heightened epidemic surveillance; while real-time temperature and rainfall estimates can be used to initiate selective interventions and to support early detection of disease outbreaks.



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Climate change is very high on the agenda of public health services worldwide. The recent World Health Assembly¹ reinforced the need for countries to develop health measures and integrate them into plans for adaptation to climate change; to strengthen the capacity of health systems for monitoring and minimizing the public health impacts of climate change through adequate preventative measures, preparedness, timely response and effective management of natural disasters; and for the health sector to effectively engage with all of the relevant sectors, agencies and key partners at the national and global levels in order to reduce the current and projected health risks from climate change. One approach is to build on existing decision-support and other tools, such as surveillance and monitoring, to include the capacity to assess vulnerability and the health impacts of climate change, and to develop new responses as appropriate.

Since the health sector is not usually engaged in climate and environmental monitoring, acquiring and using this type of information successfully depends on developing partnerships between health practitioners and the gatherers and providers of climate and environmental information. In many countries, the collection and provision of climate data and information is the responsibility of the National Meteorological Service, since there are few if any dedicated National Climate Services (Rogers et al., 2008).

Until recently, climate records were collected primarily for the purpose of creating a general climatology rather than meeting the particular needs of a specialized user group, such as the health sector. In Africa, climate observing networks are generally sparse and inadequate for the task. It is recognized that a significant investment is needed in new observations and information systems to provide useful sector-specific climate data and information (IRI, 2007). This challenge has been taken up by the African Union through the creation of ClimDevAfrica, sponsored jointly by the African Development Bank, African Union Commission and the UN Economic Commission for Africa (APF, 2007; Rogers et al., 2008).

From the health sector's perspective, climate information needs to be geographically specific and readily available on the time scales relevant to public health decision-makers. Achieving this depends on a high level of collaboration between environmental and health experts. Institutionally, this will only occur if there is an effective working relationship established between the providers of climate data and information and the Ministry of Health.

The Ethiopian Ministry of Health (MoH) and the National Meteorological Agency of Ethiopia (NMA) are pioneering such efforts. In the interests of helping other countries to find the practical means to increase access to relevant climate information, this experience is documented here and the key ingredients needed for successful collaboration are synthesized and described.

¹Sixty-first World Health Assembly, 19–24 May 2008

2 Burden of Malaria in Africa

Sub-Saharan Africa has more than 60% of the world's malaria cases and more than 80% of the world's deaths (WHO-UNICEF, 2005). The greatest burden of malaria in Africa is in endemic areas, where the parasite is continuously present in the community. Where control measures are inadequate, the distribution of the disease is closely linked to seasonal patterns of climate and the local environment. Those most at risk from endemic malaria are the very young who have not acquired immunity and pregnant women whose immunity is reduced during pregnancy (Connor et al., 2008).

In contrast, epidemic malaria occurs where the exposure of the population is infrequent and, therefore, they have little acquired immunity. Because immunity is low, all age groups are vulnerable and fatality rates can be high (Kiszewski and Teklehaimanot, 2004). It is estimated that more than 124 million Africans live in epidemic prone areas; consequently, prevention of epidemics is also a major public health issue (Worrall et al., 2004). Epidemics occur when the conditions supporting the balance between the human, parasite and vector populations are disturbed in favour of the latter. This change in equilibrium is often brought about by climate anomalies which temporarily allow sufficient mosquito survival and parasite development.

3 The Ethiopian experience

Epidemic malaria risk is very high in Ethiopia and other densely populated countries in the East African highlands. It is estimated that two-thirds of Ethiopia's population of 77 million are at risk of epidemic malaria (Connor et al., 2008). A first step towards dealing with an epidemic is to ensure that the local health institutions have the capacity to respond adequately and are not overwhelmed by the number of cases. This can be achieved only if there is sufficient lead time for advanced preparation and prevention, which requires early warning of where and when epidemics are likely to occur.

An early warning and response system depends on many things including meteorology, which plays a significant factor in "triggering" malaria epidemics. Recognizing this, the MoH, with support from the Global Fund for AIDS, TB and Malaria, is in the process of building a Climate-Informed Epidemic Early Warning and Response System that comprises seasonal and shorter timescale forecasts, real-time weather observations and early detection of cases (Connor et al., 2008). Each of these indicators informs on opportunities for a particular response; for example, a seasonal forecast of increased epidemic malaria risk will result in opportunities for planning and preparedness, meteorological and environmental/hydrological monitoring offers opportunities for mobilising preventative measures and heightened surveillance; while early detection of cases confirms the scale of the epidemic and may indicate the point at which efforts need to

switch the balance of intervention from prevention to effective case management (WHO, 2004).

Together the MoH and the NMA are in the process of increasing the capacity of the sentinel sites to monitor climate anomalies by adding maximum and minimum temperature measurements to weather stations that previously only monitored rainfall, and by increasing the number of sentinel stations. Funding for the meteorological stations has been provided by the Ministry of Health through the GFATM grant. The stations are maintained by the NMA, which is responsible for making the data available to the general health care system of Ethiopia (Connor et al., 2008).

Rainfall, temperature and relative humidity data is combined to produce maps of the climatological conditions for malaria. These are published in monthly bulletins, which are distributed by the Ministry of Health's National Malaria Control Team to regional malaria control departments. The information is also placed on the RANET (community RADIO-internet) website.

The expectation is that this information will be helpful in planning for the purchase of drugs; in identifying where and when to implement more epidemiological surveillance; in focusing vector control more accurately in space and time; in raising community awareness of epidemic risk; and in warning relevant players of any potential emergency as necessary (Connor et al., 2008).

Although in a relatively early stage of development, the cooperation between the Ministry of Health and National Meteorological Agency can provide a useful guide to others looking to deal more effectively with climate and health issues.

4 What is needed for an effective working relationship between the health sector and meteorological services?

1. It is axiomatic that there is a good public health intervention strategy to cope with climate-sensitive diseases. This strategy must consider the role of climate as well as the other factors affecting disease incidence and preventative health care. Lack of understanding of the relationship between climate and disease often results in health services discounting its importance. In Ethiopia, Ministry of Health personnel understand the importance of the environment in developing and implementing effective health care strategies for climate-sensitive diseases.
2. The solution to the public health problem must be demand-driven, meaning that the health sector must take a leading role in defining the requirements for environmental information. Often the climate community is eager to provide information but is not aware what is exactly needed to inform solutions to problems in the public health sector. This is partly the result of having had little common ground to exchange information on public health issues. The health sector should take the first step to encourage interactions with meteorological services and other relevant organizations.
3. National Meteorological Services must be ready to be flexible enough to address the demand-driven approach to climate information. They must be able to work with the health sector to fully appreciate the problems that need to be solved. In many cases the necessary data won't be available and work will be needed to develop an adequate observing and prediction system to meet the health sectors requirements.
4. Any new climate data gathering, processing and dissemination is likely to be accompanied by a significant incremental cost. It is not reasonable to assume that the National Meteorological Service will be able to provide the products and services demanded by the public health sector without additional resources. It is unlikely that these resources will be directly available to the National Meteorological Service from their own sources, at least in the short-term, since these organizations often do not have a climate service mandate and, even if they do, they are not necessarily funded to meet the specific needs of the public health sector. There are several solutions, including changing the mandate of the National Meteorological Service; relying on the health sector to acquire the resources needed to support the acquisition of the necessary climate data and information; and joint requests for funding, particularly through various programmes focused on developing climate adaptation strategies for public health. In Ethiopia, the MoH acquired the initial funding through a GFATM grant and provided the money to the NMA.
5. The Ministry of Health should explicitly commit itself to working through the National Meteorological Service to acquire climate information. Given that there are many sources of climate information, this step is necessary to help ensure that the supply of climate data and information is sustainable and therefore always available for operational decisions through a government agency. The National Meteorological Service must make sure that it has the necessary staff to respond. Since climate services are relatively new phenomena, many National Meteorological Services will not have sufficient staff and it will be necessary to provide the education and training needed to build capacity in this area quickly.
6. Good project management is essential. Managing an ongoing working relationship between the health sector and national meteorological service is likely to require more than simply a contractual arrangement between two organizations. Understanding the impact of climate on public health is an iterative process, involving health

sector managers, climate service providers and input from the health and climate research communities. It will likely involve other organizations also to include the monitoring of ecological changes and assessments of socio-economic factors that increase disease risk, for example. In Ethiopia the MoH and NMA recently created a climate-health working group to improve project management and provide a focal point for climate and health issues (see below).

7. The effective use of climate information in the health sector ideally requires a dedicated staff within both the health sector and meteorological service with the necessary expertise. Appropriate staff training is at present only available in a few international centres. More effort will be needed to bring this capacity to a larger number of African institutions such that appropriate training can be provided at the volume of throughput required to service climate sensitive sectors such as disease control, agriculture, food security, water resources (all pertinent to better health outcomes). A broader base of more locally trained expertise will also help to offset the inevitable high turnover of staff within government agencies.
8. Climate sensitive diseases do not respect borders and thus collaborative work between National Meteorological Services and Ministries of Health should be implemented throughout the region. There should also be networking among these partnerships to make the maximum out of the information generated. It should also form the basis for cross boarder collaboration on climate-sensitive diseases. The World Health Organization and World Meteorological Organization play a crucial role to ensure that countries buy into this form of collaboration.
9. Climate-Health Working Groups should put in place a mechanism to identify strengths, weaknesses, opportunities and threats to the partnership and periodically review the impact of the information generated. Information generated through the collaborative mechanism should be shared within and outside the country using standardized format (with some degree of flexibility to address the particulars of a certain country) in a manner that is easily understandable and usable.
10. There should be a feedback mechanism and periodic assessment of how useful the information is to the respective sectors.

5 The Climate-Health Working Group

In order to provide a focus on climate and health issues, Ethiopia has created a Climate-Health Working Group, which brings together all of the actors into a common group.

The structure and purpose of the Working Group are described in detail as a guide to other countries trying to establish similar mechanisms to use climate data and information to improve health outcomes.

The Working Group is chaired and co-chaired by representatives of the MOH and the NMA with a small secretariat organized and maintained by the Anti-Malaria Association (AMA), an Ethiopian Non Governmental Organization. The other members are drawn from UN organizations and other Ethiopian health organizations, including representatives of the United Nations Environment Programme (UNEP), United Nations Children's Fund (UNICEF); World Health Organization (WHO); Ethiopian Public Health Association (EPHA); Center for National Health Development in Ethiopia (CNHDE); and the Ethiopian Health and Nutrition Research Institute (EHNRI). In addition, the activities of the Working Group are helped by the following collaborating organizations: International Research Institute for Climate and Society (IRI); Health and Climate Foundation (HCF); and the Group on Earth Observations (GEO).

The vision of the Working Group is to engender a self-reliant, healthy and productive population through the proper use of climate information to improve health outcomes from climate-sensitive diseases. Its goal is to create a climate informed health sector and beneficiary communities that routinely request and use appropriate climate information to improve the effectiveness of health interventions.

The objectives of the Working Group are to create awareness on the impact of weather and climate on health; to develop effective and functional means for the health sectors and beneficiary communities to routinely use appropriate climate information; to estimate populations at risk of climate – sensitive diseases (where and when – including early warning systems).

The tasks of the Working Group are to:

1. Organize periodic meetings.
2. Review information and data on climate and health.
3. Formulate institutional data sharing system among their sectors and others relevant institutions.
4. Foster research on climate and health.
5. Organize annual workshop on climate and health issues.
6. Organize and present to decision-makers scientific evidence on the impacts of climate variability and climate change on health.
7. Identify gaps and bottlenecks which constrain the routine use of climate information by the health sector and identify and pursue the means to overcome these.
8. Facilitate to access the policies, strategies, systems, tools of climate and weather for the health sector.

9. Establish a web-based resource center for accessing secured climate and health data base.
10. Mobilize resources and assessing possible donors on the issue to join hands and multiply efforts to strengthen this partnership and make it sustainable by institutionalizing it.
11. Enhance the use of early warning systems for malaria, meningitis, acute watery diarrhoea and other climate sensitive diseases.
12. Build the capacity of national, local and community based organizations to widen and strengthen their services in the area.

6 Concluding remarks and recommendations

The health risks posed by current climate variability, and the growing threat of climate change, requires the health sector to take the lead, to bring on board relevant sectors and institutions to ensure concerted effort is made to utilize the available climate data and information to manage climate risk more effectively. The health sector is best placed to lead any effort to reduce the climate-sensitive disease burden, but it cannot do this without the active involvement and collaboration of key partners.

Developing climate networks and deriving climate information is ideally within the purview of National Meteorological Services with whom Ministries of Health can develop effective partnerships. The Ethiopian experience has identified some of the key ingredients needed to sustain this working relationship and it may serve as a model for other countries dealing with the health risks caused by climate and climate change. In particular, a partnership between the Ministry of Health and National Meteorological Service will help to:

- Define the health service requirements for climate data and information.
- Strengthen and sustain national climate observing networks.
- Improve the quality and specificity of climate predictions so that they are useful to the health sector.
- Build climate-informed health early warning and response systems to support and strengthen health interventions.
- Develop an appropriate response to the threat of climate change.
- Increase the capacity and capability of staff to deal with health and climate issues in both organizations.
- Build greater confidence for increased national and international investment in sustainable public health gains.

It is recommended that health sector and meteorological services set up a Working Group or Taskforce at the national level with a structure, mission and objectives similar to the one described here with tasks tailored to specific climate-sensitive health problems of the country. This will help provide a focal point for climate and health issues in the country and spearhead collaborative work beyond national borders to engage, when appropriate, the international community more effectively.

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