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Climate and Health in Africa: Research and Policy Needs

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Climate and Health in Africa

1: Introduction

Climate variability and change can have both direct and indirect influences on human health. In Africa, risks of malnutrition, malaria and diarrhoeal disease are likely to increase as temperatures increase and rainfall becomes more variable (USAID, 2017). Other climate risks include the direct impacts of extreme weather events, UV-related cancers and diseases, heat stress, respiratory disorders related to air quality and access to clean water, with increased transmission of water, vector and food-borne diseases all expected to increase in the future (ACPC, 2011; African Development Bank 2012). This Briefing Note highlights the key health areas on which climate has an impact in Africa, in order to help shape the research and policy agenda.

2: Direct Impacts

Extreme events

Extreme weather events can directly lead to injury, morbidity and mortality (ClimDev-Africa, 2013). Floods can lead to disease, drowning, injury and exposure to pneumonia, and also damage health infrastructure (WHO, 2015). Under climate change, large increases in numbers at risk of flooding from sea level rise and rivers are projected (WHO Climate and health country profiles, 2015). Droughts can undermine economies leading to depleted health resources (WHO, 2015). Thermal stress can occur due to particularly hot or cold periods (ClimDev-Africa, 2013). Heat waves and high ambient temperatures can lead to increased mortality, as can low ambient temperatures (Niang et al., 2014). Heat stress can also lead to decreased worker productivity (Niang et al., 2014) which could

result in lower incomes for workers dependent on crops and livestock (USAID, 2017). It is projected that heat related mortality will increase across Africa with climate change and labour production will decrease (WHO Climate and health country profiles, 2015).

UV and air quality

Changes in surface temperatures, land cover and lightning may affect ozone levels over Africa (Niang et al., 2014) and UV radiation can result in skin and eye damage (ClimDev-Africa, 2013). Cardio-respiratory diseases are related to changes in temperature and air quality (ClimDev-Africa, 2013). Climate and health country profiles by the WHO in 2015 highlight that outdoor air pollution is currently high in many cities, but deaths could be decreased by reducing short-lived climate pollutants. Furthermore, in countries where a very high percentage of the population use solid fuels for cooking around half of respiratory infection deaths are attributable to household air pollution. Air quality depends on the weather and so is sensitive to changes in climate (WHO, 2015). Climate change is expected to affect air pollution sources and the ability for pollutants to be dispersed (Niang et al., 2014).

3: Indirect Impacts

Malnutrition

Food security is dependent on food availability, access, utilisation and stability, and climate change is likely to significantly impact all of these factors (Niang et al., 2013). Temperature and precipitation affect food availability and food access, and therefore nutritional status and malnutrition rates, and it is predicted that production and consumption stress will worsen in food-insecure countries (ClimDev-Africa, 2013). Temperature increases may reduce yields, and high carbon dioxide levels and the increasing use of short-cycle crops may reduce crop nutrients (USAID, 2017). Extreme

events can also lead to undernutrition (USAID, 2017) for example as floods and droughts lead to loss of food production (WHO, 2015). Sea level rise leading to groundwater salinity increases also affect agriculture (WHO, 2015). As the weather can affect food access, dietary quality and stunting, climate change may impact the numbers affected by this (Niang et al., 2014).

Water availability

Over 70% of people in sub-Saharan Africa depend on boreholes and wells for water, and climatic stress may lead to water infrastructure damage and surface water being inundated and polluted, which can lead to water scarcity, contaminated water and the spread of disease (WHO, 2015). Precipitation affects water availability (ClimDev-Africa, 2013) and sea level rise leading to an increase in groundwater salinity which in turn affects drinking water (WHO, 2015).

Disease

Extreme events can lead to disease outbreaks (USAID, 2017) and changes in disease prevalence and patterns (ClimDev-Africa, 2013). Precipitation affects water-borne diseases, and the majority of diarrhoea pathogens are water-borne and will therefore be affected by climate change through water availability and temperature (ClimDev-Africa, 2013). The WHO Climate and health country profiles from 2015 describe how on the whole diarrhoea-related deaths are expected to decrease across Africa over the coming decades, due to socioeconomic development and health interventions, although the proportion attributable to climate change is expected to increase slightly. Cholera is associated with warm events and low precipitation and so may be more likely with climate change (USAID, 2017) and may also change in geographic range (Niang et al., 2014).

Weather and climate affect the geographic range and incidence of malaria, which will be

affected by climate change (Niang et al., 2014). Changing temperature and precipitation patterns may lead to more suitable environments for its spread and emergence, with research suggesting transmission is associated with increased rainfall in dry regions and increased temperatures in high altitude, cool regions (ClimDev-Africa, 2013). Highland areas will experience increased epidemics (Niang et al., 2014), and populations in these areas have less resistance, while lowland areas may see less incidence (USAID, 2017).

Other diseases affected by climate include dengue fever, the spread and emergence of which may be affected by changing temperature and precipitation patterns (ClimDev-Africa, 2013). Leishmaniasis may increase in incidence and geographic range due to climate change (Niang et al., 2014). Weather and climate may affect the natural reservoirs necessary for Hantavirus and also its geographic range (Niang et al., 2014). Climate change may reduce the geographic range of the tsetse fly (Niang et al., 2014). Rift Valley fever epidemics in the Horn of Africa are associated with altered rainfall patterns, with epidemics linked to heavy rainfall, and climate change and increased variability could increase the incidence and spread of the disease (Gikungu et al., 2016). The geographic areas of schistosomiasis may increase as temperature and precipitation patterns change (Niang et al., 2014). Meningococcal meningitis has a strong seasonal link with climate including the dusty Harmattan winds associated with disease onset (Perez et al., 2014; Niang et al., 2014).

Benefits of mitigation on health

Climate change mitigation can have benefits on health globally, as described in the WHO climate and health country profiles, 2015.

These include

- reducing emissions from transport leading to reduced injuries and reduced deaths from physical inactivity



- reducing electricity generation from fossil fuels thereby decreasing pollution levels
- reducing pollution deaths from household solid fuel use
- reducing agricultural emissions by reducing red meat consumption and encouraging the use of local and seasonal crops, leading to improved diets and reduced associated diseases
- the development of low carbon energy solutions for healthcare systems improving the quality and reliability of energy services

4: What is needed for health protection

The following summarises the key research and policy needs discussed in the grey literature.

Research needs

Climate change impacts on health

In general, links between climate change and human health are under-researched (ACPC, 2011), especially in developing countries, with a lack of quantitative studies (Hosking and Campbell-Lendrum, 2012).

- Data

Reliable health and meteorological data is needed to better understand the links between health and climate (Sogoba et al., 2014). Surveillance and data collection needs improving (USAID, 2017). In particular there is a lack of community-based health data in Africa and therefore little empirical evidence about climate change effects on population health (Byass, 2009). More primary data could help improve the evidence base linking disease occurrence and climate change in the southern African region (Amis et al., 2014). Governments should make hydrometeorological data more accessible so it can be used in planning (ACPC, 2011). High quality climate and health datasets are necessary for model development and validation (Githeko et al., 2014), and data on health and non-climatic factors could help inform impact modelling and vulnerability and

risk assessments (Government of South Africa, 2013).

Improving regional and local climate change modelling could lead to more reliable predictions of health impacts (ClimDev-Africa, 2013; ACPC, 2011; Amis et al., 2014). Models cannot currently robustly predict climate change at national and local levels (ACPC, 2011). Higher resolution model simulations are necessary to study diseases such as malaria and its spread to the highlands (Niang et al., 2014).

- Climate impacts on health

There is a need to better understand the mechanisms of how climate impacts disease and incidence trends (Thomson et al., 2014). It is important to detect changes in the geographic range and seasonality of diseases and attribute these changes to climate variability and change, and to track emerging and re-emerging diseases (Githeko et al., 2014). Research on disease outbreaks, concurrent disease burdens, land use change and drug resistance are also required (USAID, 2017). Furthermore, research is needed to determine correlations and causations between risk factors and health impacts (Government of South Africa, 2013), including the mapping of climate-related health risks to identify hotspots (USAID, 2017; Githeko et al., 2014).

More specifically, there is a need to understand better how climate change affects crop yield (ACPC, 2011) and contributes to malnutrition (ClimDev-Africa, 2013). Food security should be addressed for example through improving agricultural production (ACPC, 2011). Githeko et al. (2014) describe that for East Africa adaptation will include increased irrigation, but this will need to take into account the development of strategies to minimise the transmission of malaria and schistosomiasis, both of which are associated with irrigation schemes.

It is also necessary to develop understandings of how climate change affects vector and water-borne disease (USAID, 2017). Other specific areas requiring research (focussing on East Africa) include determining changes in the geographic range of malaria and Rift Valley fever, surveillance and modelling of changes in cholera, understanding how dengue fever vectors are affected by climate variability and change, and understanding how risks of leishmaniasis may increase with increasing drought frequency (Githeko et al., 2014).

Also it would be useful to map the populations at risk from diseases in time and space (Thomson et al., 2014). Research could also investigate how indigenous communities coped with health risks in the past (ACPC, 2011). Kula et al (2013) highlight the need to understand the benefits to health of many of the actions necessary in order to reduce GHGs.

- Interdisciplinary, African research

Developing a cross-disciplinary research agenda would enhance understanding of climate and health (Kula et al., 2013; Byass, 2009). Multidisciplinary teams could help understand the complexities of interactions between disease, ecosystems and climate (Githeko et al., 2014) and generate understanding of the relationships between climate and disease under different environmental conditions for better climate change risk assessment in the health sector (Sogoba et al., 2014).

There is a need to increase Africa's capacity to research the impacts of climate change and health (Sewankambo, 2009). In southern Africa, the majority of the models that have been used to predict the impact of climate change on diseases were not developed and tested in the region, whereas locally-driven initiatives could integrate the local context in understanding (Amis et al., 2014). Capacity building could help the application of models and increased research funding would support the development of models for

prediction and for monitoring of climate risks and disease (Githeko et al., 2014). Research is generally supported by bilateral and multilateral organisations, resulting in research agendas driven by the donors and limited involvement from scientists from the countries involved (Sogoba et al., 2014). More investment in human resource capacity building could strengthen local researchers' ability to respond to health policy needs (Sogoba et al., 2014). Local researchers should carry out more policy relevant research that can be applied in the health sector, rather than simply published in academic journals (Githeko et al., 2014).

Early warning systems

Developing early warning systems can lower the cost of reducing climate change impacts by intervening before a disaster occurs (Githeko et al., 2014). There is a need to invest in systems which link weather and climate forecasting to health early warning (USAID, 2017), particularly for heat and flood health warnings (Kula et al., 2013) along with disease outbreaks. Meteorologists can work with health services to create more timely and integrated warning systems that reflect the multiple risks affecting human health, coordinating the many sectors involved such as agriculture and water (Rogers, 2011).

Sharing research with policymakers

As well as carrying out the research described above, Amis et al. (2014) describe the need to share the results with policymakers, streamlining communication to improve uptake. Barriers to uptake of such information by policymakers in southern Africa currently include limited access to research outputs, the quality of which can be poor, poor dissemination skills by researchers and a lack of central points to access information, with no platform for collaboration or formal communication channels for the dissemination of research outputs (Amis et al., 2014).



Policy needs

Climate change in health policies

There is a need to incorporate understanding about climate change in health policies, but this is not being done currently. The potential public health impacts of climate change need mainstreaming in national policies (Sogoba et al., 2014), with strong political support also needed to mainstream health considerations into climate change issues (Amis et al., 2014). In southern Africa, while most countries have health policies, they have not incorporated climate change considerations into their implementation or developed strategies for managing the health impacts of the climate change, and few countries in the region have national climate change health response strategies (Amis et al., 2014). In Central Africa, there is a lack of national climate change policy, and health practitioners and communities have limited understandings of the effects of climate change on health (Sogoba et al., 2014).

In southern Africa, it is reported that climate change policies do not clearly identify strategies, leading to a small pool of climate change-related research and policies which are not based on strong evidence (Amis et al., 2014). Similarly in East Africa there are currently no policy guidelines on priority research areas for adapting to the impacts of climate change (Githeko et al., 2014). There is a need for more coordinated adaptation planning taking into account future uncertainties, and for an understanding of the cost of climate change adaptation in the health sector (Amis et al., 2014). Integrating research findings into policies could strengthen health systems, improve understandings on climate change impacts on health, and strengthen community climate change adaptation strategies (Sogoba et al., 2014).

However this involves challenges such as a lack of experience among health professionals around incorporating climate change

considerations, help needed to prioritise considerations in the early stages of health project designs and the need for decision support tools to understand what to prioritise, based on the information available (USAID, 2017). Capacity building among health experts is required for them to be able to understand climate change related science to then apply the research findings, and guidelines are needed on how climate information is used in the health sector (Githeko et al., 2014).

Collaboration between sectors

In most countries across Africa, health and environment are in different sectors, do not work together and lack coordination in both research and policy (WHO/UNEP, 2015). Reporting on Central Africa, Sogoba et al. (2014) describe how ministries, sectors and institutions carry out research separately rather than collaborating, unaware of each other's projects. In East Africa there is a lack of interaction between the local research institutions and the users of the outputs in the ministries of health (Githeko et al., 2014). In general, health ministries may not be represented on climate change committees, and have limited history of working with meteorological services and other sectors such as water, agriculture and energy (USAID, 2017). There is a need for cooperation across these sectors as they can influence health (USAID, 2017) and taking climate change into account when planning infrastructure can ensure its resilience (ACPC).

There is therefore a need to share skills, technology and information between stakeholders such as governments, private sector and academics (ACPC, 2011), including sharing about what works in adaptation to upscale this to other challenges (USAID, 2017) and promoting stronger alignment between the different sectors working to understand climate change impacts (Amis et al., 2014). This requires the creation of knowledge management platforms to share information, skills and technology between the different

stakeholders (ClimDev-Africa, 2013). National subsidiary bodies of technical advice could help close the gap between researchers and policymakers to identify research needs and evaluate them for inclusion in policy (Githeko et al., 2014). There needs to be more intersectoral collaboration and partnerships between ministries, with coordinated national health and environment research agendas and surveillance systems (WHO/UNEP, 2015). Developing health forecasting and early warning systems between the meteorological service and the health service could facilitate communication and coordination between the stakeholders involved in climate and health issues, such as the agriculture and water sectors (Rogers, 2011).

Public health investment

There are currently inadequate public health and health care systems across Africa, with inadequate human and financial health resources (Niang et al., 2014). This includes inadequate technical and institutional capacity and limited funds, alongside weak health systems and weak inter-sectoral collaboration (WHO, 2015). There is therefore a need to invest in public health infrastructure.

More clinics and health professionals are required to provide and explain drugs and other preventative measures (ClimDev-Africa, 2013; ACPC, 2011; Sogoba et al., 2014). Comprehensive drug therapy could both cure and prevent diseases, alongside other preventative measures such as mosquito nets and sterilisation tablets (ClimDev-Africa, 2013; ACPC, 2011). Improved medication provisions could help reduce the impact of potential increases in infectious disease transmission (Kula et al., 2013). Health system capacity needs expanding, as the countries expected to experience greatest increases in climate-driven health outcomes are also those with the lowest capacity health systems currently (USAID, 2017). Increased capacity of health care services and human resources is needed to cope with the additional disease

burden due to increased frequencies of extremes such as heatwaves and floods (Kula et al., 2013). Health facilities and supply chains also need developing so they are more resilient (Kula et al., 2013).

There is also a need to improve physical infrastructure, such as sewerage, sanitation and water infrastructure, in order to reduce the health impacts associated with extreme events (ClimDev-Africa, 2013; USAID, 2017) and provide access to safe water and improved sanitation (Niang et al., 2014). These investments will require finance. However Sogoba et al. (2014) described the lack of funding allocated to health research by governments in Central Africa due to scarce resources. They highlighted a need for national and international funding for vulnerability assessments, risk monitoring, risk reduction activities and disaster management institutions. There is also a need for joint funding allocations for health and environment and more financial resources to develop intersectoral coordination (WHO/UNEP, 2015). The ACPC (2011) also highlight the need for climate finance allocation to address health impacts.

Community level

At the local level, parents and children should be informed of the risks of climate change such as heat stress and how to cope with these risks (UNICEF, 2011). There is also a need to promote communication strategies for better awareness and understanding of climate change health risks at community level (Sogoba et al., 2014). Furthermore, community-based organisations should be strengthened to develop locally-owned, sustainable climate change adaptation strategies, taking into account local knowledge (Sogoba et al., 2014). Community health interventions could include promoting clean household energy, improving housing and pest management (WHO, 2015). It is key to develop locally applicable, affordable and sustainable disease prevention and control strategies (Githeko et al., 2014).

Focussing on central Africa, Sogoba et al. (2014) describe how women are particularly vulnerable to climate change, as they account for a large proportion of the agricultural workforce. There is therefore a need to promote gender-sensitive approaches to climate and health interventions in both disaster risk reduction and preventative health strategies (Sogoba et al., 2014).

National policy responses

The national policy responses assessed in the WHO climate and health country profiles to track progress in developing and implementing efforts on health adaptation and mitigation on climate change are:

- Identify a national climate change focal point in the Ministry of Health
 - Approve a national health adaptation strategy
 - UNFCCC documents include health implications of mitigation
 - Implement projects on health adaptation to climate change
 - Build institutional and technical capacities on climate change and health
 - Include climate information in integrated disease surveillance and response and EWSs
 - Increase climate resilience of health infrastructure
 - Plan costs to implement health resilience to climate change from domestic and international funds
- Include consideration of health implications in National climate change mitigation strategies,
 - Value co-benefits of health implications of climate mitigation policies

5: Conclusions

African countries face multiple challenges to prepare adequately for health emergencies, control disease burdens, provide coverage of basic healthcare and public health services, manage inequity, and use resources in a cost-effective way. Accelerating climate change will exacerbate these challenges in the future across a range of interacting subsystems (Lancet Planet Health 2017; 1: e316–27), including meteorology and extreme weather; agriculture and food security; disaster preparedness, and individual & population health systems. This Briefing Note has highlighted the key health areas on which climate has an impact in Africa and underlines the need to strengthen the evidence base and urgently develop physical and human infrastructure for positive health outcomes. This is vital for the long-term development of health adaptation strategies that enable communities to anticipate, absorb and reshape in relation to extreme weather events.



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