

# Responding to climate change in southern Africa – the role of research

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Projections show that the effects of climate change in Africa will not be uniform over the region. The region is extremely vulnerable to climate change because of poverty, a high pre-existing disease burden, fragmented health services and water and food insecurity. Despite the consensus that locally relevant information is necessary to inform policy and practice related to climate change, very few studies assessing

the association between climate change and health in southern Africa have been conducted. More comprehensive information is therefore urgently needed for the southern African region to estimate the health risks from projected future changes in climate.

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Evidence is that the southern African region (Fig. 1)<sup>1</sup> is experiencing an increasing frequency of hot days and a decreasing frequency of extremely cold days. Rainfall trends are variable, but evidence points to an increased interannual variability, with extremely wet periods and more intense droughts in different countries. Projections show that changes will not be uniform over the region; the central, southern land mass extending over Botswana, parts of north-western South Africa, Namibia and Zimbabwe is likely to experience the greatest warming of 0.2 - 0.5°C per decade. Frequency of extremely dry winters and springs will increase by roughly 20%, while the frequency of extremely wet summers will double. Warming is also predicted to increase the frequency and intensity of tropical storms in the Indian Ocean.

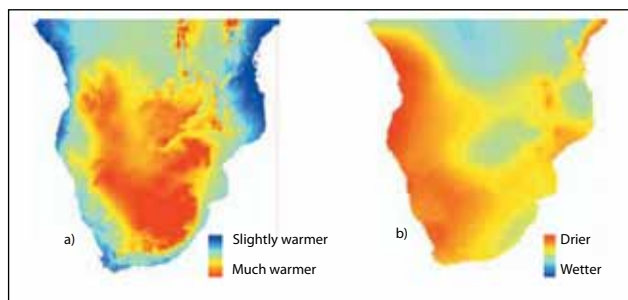


Fig. 1. Projected climate change in southern Africa: HADCM3 climate model projections of changes in (a) temperature and (b) precipitation for 2050 relative to mean conditions over the 1961 - 1990 period, under the IPCC SRES A2 (high emissions) scenario.<sup>1</sup>

The region is vulnerable to climate change because of poverty, a high pre-existing disease burden, fragmented health services, and water and food insecurity. Despite the consensus that locally relevant information is necessary to inform policy and practice related to climate change, very few studies assessing the association between climate change and health in southern Africa have been conducted.<sup>2-4</sup> Existing research focuses on infectious diseases – particularly malaria. Little work has been done on attributing disease burden to climate change in the region. Furthermore, an overview of health considerations in the National Adaptation Programmes of Action for climate change in least-developed countries and small-island states found that health was not seen as a priority, as most activities focused on biodiversity and agricultural activities.<sup>5</sup> Very few institutions specialising in climate change and health were identified.

The health effects of climate change are not uniform and will be influenced by local environmental conditions, socio-economic circumstances, the extent of adaptations implemented to minimise the full range of threats to health, and other modulating factors.<sup>6</sup> The IPCC Working Group 2 report (2007)<sup>7</sup> shows that the health consequences of climate change will fall primarily on low-income, poorly resourced and geographically vulnerable populations. Importantly, planning and action will need to be intersectoral, draw on local data, and involve local and regional authorities and health care providers.

### Framework for responding to climate change

Corrective activities may be grouped into mitigation, adaptation, education and training, and raising awareness. Research is central to all these, as it will inform identification and assessment of effects, comparison of interventions, and determination of best practices.

Regarding mitigation, 5 African countries are responsible for most of Africa’s greenhouse gas (GHG) emissions, with South Africa by far the greatest emitter, responsible for 39% of the continental total – making GHG emissions in the SADC region relatively higher than in other regions of Africa.<sup>8</sup> This issue is a high priority for intervention and will depend on national energy policy.

Adaptation needs to be underpinned by surveillance for climate-related health risks<sup>9</sup> including early adverse weather alerts and disaster preparedness. Beginning with the infrastructural, urban planning and housing design needs to consider climate- and insect-proofing, enhanced infectious disease control includes vaccines, vector control, case detection and treatment. Community partnerships are required to identify and solve health problems, including neighbourhood watch schemes aimed at the elderly and children.

Table I. Research directions for preventing adverse health consequences of climate change

Research task	Proposed epidemiological studies for SADC region with examples
Clarify relationships between background climate variation and health outcomes	Incidence of heat-related illness in outdoor workers in plantation agriculture <sup>11,12</sup> Effect of background climate variation on food security and health (e.g. malnutrition and diarrhoeal disease in under-5s) using existing secondary or primary meteorological, agronomic data and health data
Estimate, statistically, current burden of disease attributable to climate change	Using available secondary data (SADC burden of disease data exist and are currently being updated) to perform a comparative risk assessment of the burden of disease from climate change <sup>13-16</sup>
Seek evidence of actual current health impacts	Perform a study of deaths from diarrhoea among under-5s in relation to the change in climate (e.g. drying) Examine the incidence of heat-related illness in outdoor workers in plantation agriculture in relation to extreme heat events as measured by the wet bulb globe temperature (WBGT) <sup>11,12</sup> Use estimates of risk obtained from ecological and from more detailed epidemiological studies to model the impacts of various climate change scenarios over time. Consider the roles of different predictors of the health outcome in complex regression models taking into account mediated and direct effects <sup>16</sup> Predictors include the ability of the health system to detect and respond to increased adverse health outcomes
Develop scenario-based modelling to project future risk (including handling complexity & uncertainty)	Use scenario planning methods for high-level modelling and prediction of likely futures
Estimate health co-benefits of actions to avert/reduce further environmental change	Planting drought-resistant crop strains may have beneficial effects through a reduced need for agrichemicals Public transport systems may be more energy efficient than private motorised transport; promote cycling and walking
Evaluate health-protecting ('adaptive') actions	Evaluate the result of introducing a drought-resistant staple crop on rural malnutrition and child health outcome
Monitor for unintended consequences of adaptation	Study the effects of a new drought-resistant strain of staple crop on whether more chemical hazards to agricultural workers and residents emerge, or whether unintended adverse nutritional effects ensue, or whether the new strain may displace existing staples with negative overall nutritional impacts

Mitigation and adaptation interventions should be monitored and evaluated for effectiveness and efficiency.

Climate change and health should be incorporated as part of undergraduate and postgraduate public health education curricula, and appropriate training packages developed. Special efforts should be made to recruit trainees from areas at greatest risk from the health effects of climate change.

Awareness should be raised through informing, educating and empowering the public at large, along with policymakers and all relevant stakeholders about the health risks of climate change as well as primary and secondary prevention strategies which can reduce the impact.

### Research in support of adapting to climate change

Research should aim to facilitate the reduction of both global and local climate change health risks via aetiological studies, risk assessments, scenario planning of likely future health risks, and evaluation of adaptive interventions. More comprehensive information is needed for the southern African region to estimate the health risks from projected future changes in climate. Epidemiological studies are needed to identify climate-health relationships, to quantify them, and to identify high-risk groups or communities. Table I provides a framework for research provided by McMichael.<sup>10</sup>

To gain a more complex understanding from epidemiological modelling, it is important to incorporate confounding or interacting, non-climate variables. Scenario planning should incorporate information about trends in other determinants of health outcomes for which future extrapolations are considered feasible (e.g. demographic trends in age structures); likely future contextual conditions (e.g. uptake of domestic air-conditioning by 2050); the advent of relevant vaccines and likely consequent population immunity levels; and deliberate 'adaptive' changes (e.g. mosquito control programmes, heat-wave warning systems, flood protection measures).

The health sector itself requires research attention as a result of the environmental effect of resource use and waste generation, and the need for sustainable health sector practices. Health economic analysis of climate-related health impacts, along with research into

communication strategies for climate-related health issues, is an important research focus.

Pressing action and research priorities include the assessment of the climate-related burden of disease in southern Africa, and the identification of appropriate adaptations for which there is existing evidence of effectiveness and cost-efficiency elsewhere, particularly parts of the globe with similar climate-change scenarios.

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