# Climate change and health: Temperature and health impacts

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## CLIMATE CHANGE AND HEALTH

Climate change is anticipated to have serious adverse health effects, particularly in developing countries. Impacts will be exacerbated by poor or non-existent social, technological and financial adaptation and/or mitigation measures. In South Africa, climate sensitive health concerns include an increase in the occurrence of heat stroke, skin rashes, non-melanoma skin cancer and dehydration (DEAT, 2004), although the magnitude, and temporal and spatial variability of these effects are not yet known.

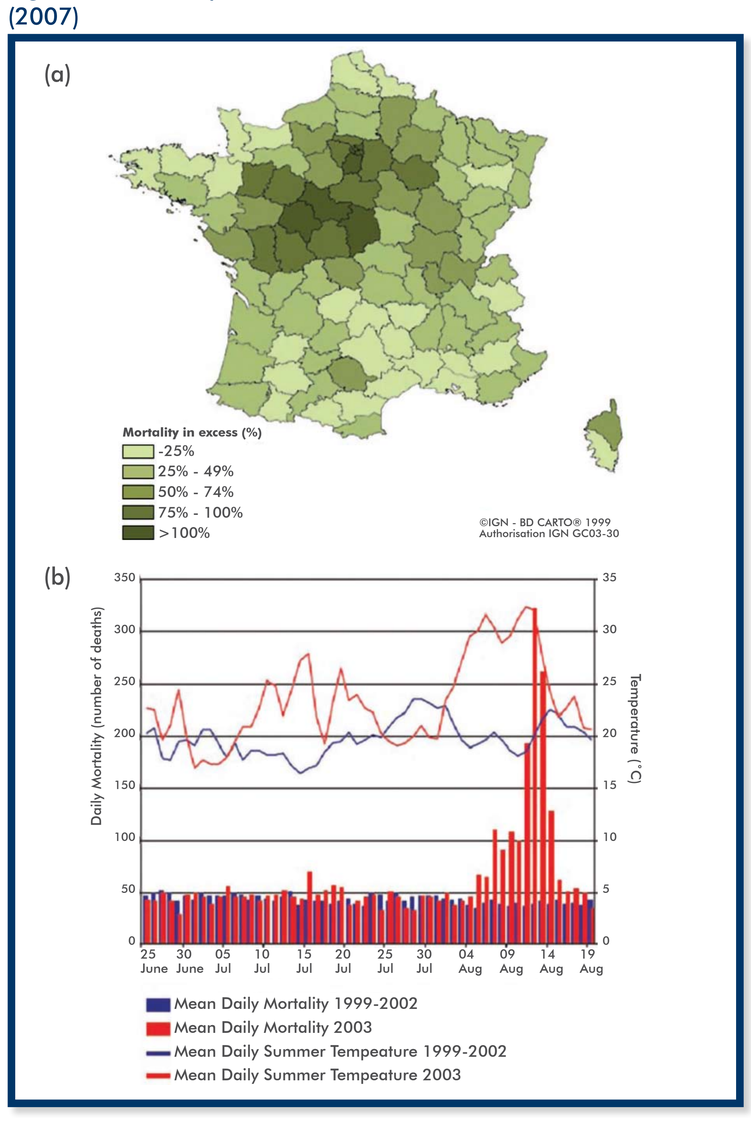
Heat stress is of particular importance given anticipated global temperature increases and limited knowledge about the topic in South Africa. Available evidence suggests the following:

Temperature projections for Southern Africa, based on the A1B scenario indicate mean annual increase of 3.7°C (range: 1.9°C to 5.0°C), which is roughly 1.5 times the global average increase. This will result in more extreme hot days particularly in the months of September, October and November (Christensen *et al.*, 2007).

Extreme temperatures/heat waves are anticipated to increase in frequency and magnitude in the 21st century.

Excessive temperatures lead to excess morbidity and mortality (all cause, respiratory, cardiovascular system mortality). **Figure 1** depicts the impact of summer 2003 European heat wave in which ~35 000 deaths occurred in various countries including Belgium, Czech Republic, Germany, Italy, Portugal, the Netherlands, Spain, Switzerland, and the United Kingdom.

Figure 1: The European heatwave 2003. After: Confalonieri *et al.* (2007)




Studies on excessive temperatures and human health are largely confined to America, Europe and East Asia (Confalonieri *et al.*, 2007).

Temperature-mortality thresholds are location specific. For example, Cape Town has a 17°C mortality temperature threshold below or above which every 1°C change increases mortality by ~4% and ~0.5%, respectively (McMichael, *et al.*, 2008).

Temperature-related mortality rates (all cause, cardiovascular and respiratory) are modified by many factors including latitude, socio-economic status, rate of urbanisation, health status, population composition, air pollution and forest fires (Confalonieri *et al.*, 2007).

Everyone is vulnerable to excessive temperatures. However, the elderly (>65 years of age), children, people with mental illnesses, physically active people (manual workers), people who use alcohol or illicit drugs, and people who are immobile, and those with pre-existing diseases are especially vulnerable (Confalonieri *et al.*, 2007).

Coping mechanisms include technological, institutional and social and economic measures. Technological measures include, amongst others, passive cooling technologies, fountains (**Figure 2**, mechanical cooling e.g. air conditioners, retrofitting of building with cooling devices. Institutional measures include, amongst others, climate change policies, greening spaces, improved urban land use planning, and improved emergency services.

Figure 2: Cooling off during a heat wave in Moscow, Russia. Source: Amsterdam, (2007)

Socio-economic measures relate to, the following:

- Heat-health warning systems
- Information dissemination concerning rehydration/dehydration, personal protection, e.g. staying in cool spaces during heat waves or when ambient temperatures are excessively high (**Figure 3**) and wearing appropriate clothing, regular exercise, and seeking medical advice when necessary.

Figure 3: Camping out in Belle Isle, Michigan during the oppressive ambient temperatures (1936). Source: Cantor, (1996)

It is therefore important to understand how the anticipated temperature changes will affect morbidity and mortality patterns for specific localities in the country. The primary objective of this research is to determine the potential impacts of temperature change on mortality, and to identify important mortality risk factors, using eThekwini (a local municipality in Durban) as a case study.

## RESEARCH PLAN

The research approach entails statistical modelling of meteorological, air pollution, mortality and population data to estimate the potential impact of anticipated temperature changes on mortality.

## RESEARCH OUTPUTS

- Determination of temperatures at which mortality rates may increase in eThekwini
- Determination of factors specific to eThekwini which compound the temperature-mortality relationship
- Assistance to policy makers to make informed decision regarding the development and implementation of heat and health warning systems and other strategic climate change response plans
- Generation of awareness of the eminent challenge posed by a changing climate in South Africa, thereby helping the general public to adopt a better attitude towards the environment.

## REFERENCES

McMichael, H.J., Wilkinson, P., Kovats, R.S., Pattenden, S., Hajat, S., Armstrong, B., Valjanapoom, N., Niciu, E., Mahomed, H., kingkeow, C., Kosnik, M., O'Neill, M.S., Romieu, I., Ramirez-Aguilar, M., Barreto, M., Gouveia, N. and Nikiforov, B. (2008). International study of temperature, heat and urban mortality: the ISOTHURM'project. Environmental Epidemiology, 37:1121-1131.

DEAT (2004). A national climate change response strategy for South Africa. Available at: www.saaqis.org.za. Accessed 10/10/2008.

Confalonieri UB, Akhtar MR, Ebi KL, Hauengue M, Kovats RS, Revich B, and Woodwards A, (2007). Human health. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of working group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [ML, Parry, OF, Canziani, JP Palutokof, PJ van der Linden and CE, Hanson, (Eds.)]. Cambridge University Press, Cambrdige, UK 391-431.

Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.-T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr and P. Whetton (2007): Regional Climate Projections. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (Eds.)]. Cambridge University, Press, Cambridge, United Kingdom and New York, NY, USA.

Cantor, G. (1996). Detroit's killer heat wave of 1936. http://apps.detnews.com/apps/history/index.php?id=134. [Accessed 02/02/2009]

Amsterdam, R., (2007). www.robertamsterdam.com [Accessed 02/02/2009]

***Researchers are undertaking statistical modelling of meteorological, air pollution, mortality and population data to estimate the potential impact of anticipated temperature changes on mortality in the eThekwini municipality.***

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