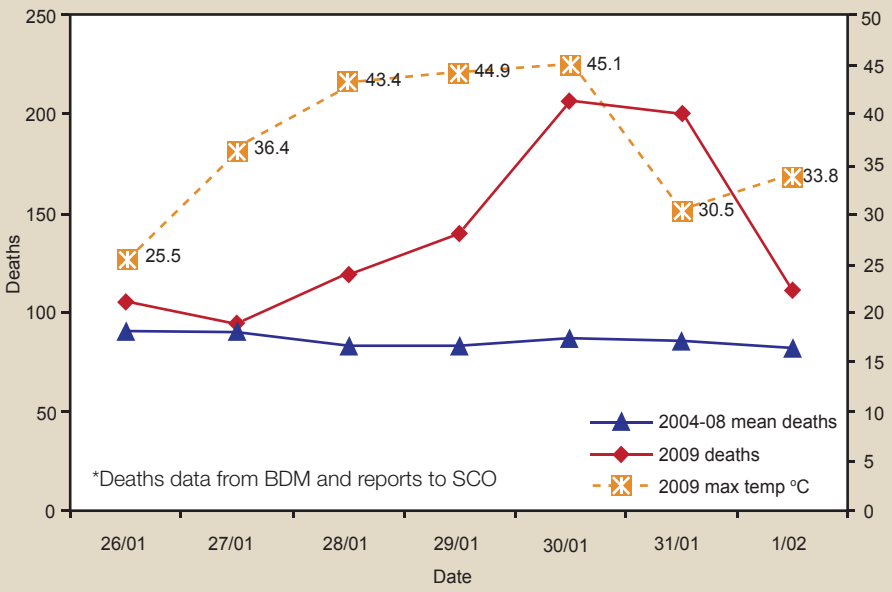
Key findings:

Heatwaves: The southern Australian experience of 2009



Deaths in Victoria between 26 Jan and 1 Feb: Mean deaths in 2004-08 vs 2009
Image: © Department of Health, Victoria

The event

During the summer of 2009, south-eastern Australia experienced an extreme heatwave between 27 January and 8 February. In the context of previous heatwaves, the event registered as one of the nation's most severe episodes of high temperatures over an extended period of time.

As many as 500 people died as a result of the 2009 heatwave in Adelaide and Melbourne. Financial losses, mainly as a consequence of power outages, transport service disruptions and response costs, have been estimated at $800 million. Governments, councils, hospitals and emergency response organisations and the community were largely under-prepared for a heatwave of this magnitude.

Scale of the disaster

Maximum daytime temperatures during the event in South-eastern Australia were 12°C-15°C above average. Similar historical events occurred in 1908 and 1939, however in 2009 the following records were broken:

Melbourne: Three consecutive days of temperatures at or above 43°C (the first occurrence since records began);

Adelaide: On 28 January the temperature reached 45.7°C (the hottest day for 70 years), 29 January experienced the hottest night on record (minimum night-time temperature 33.9°C).

Characteristics that resulted in the damaging impacts of the event

The insidious nature of heatwaves in general, the severity of this event and its co-occurrence with an emerging bushfire threat, meant that this event caught many communities underprepared and without full emergency service support.

The following features contributed to the dramatic impacts:

- Prolonged high temperatures 25 January to 7 February;
- 7 February saw a new daily maximum temperature record for many locations in Victoria, Tasmania, and South Australia;
- Prolonged high night-time minimum temperatures;
- Low diurnal temperature range meaning no remission from heat stress;
- Low atmospheric humidity: relative humidity measured in single figures;
- Changing morphology of cities: few green spaces and large areas of concrete and tarmac enhance urban heat-island effects.

Adaptation: during and after the event

Coping during the heatwave was the result of reactive competence and capacity rather than proactive planning. Reactive management of human health impacts was relatively good in some areas (e.g., emergency and medical services).

In many health related areas basic incident response, management and escalation process procedures

were already in place. Since the event, planning and preparation for heatwave events has been undertaken, incorporating the lessons learnt in 2009. South Australia has implemented clearer communication, escalation and coordination processes, developing a whole of Government 'all hazards' approach to manage future events. Victoria has developed a "bottom up" plan dependent upon Local Governments to develop localised plans.

Some community agencies are also actively improving listing/contact/monitoring procedures for vulnerable groups.

Vulnerability: pre and post event

The event highlighted the vulnerability of the electricity supply (asset failures due to heat), transport (trains in particular) and ports (melting of bitumen surfaces). In addition to infrastructure and services, the event also highlighted the vulnerability of various 'at risk' groups (e.g. the very young, those with pre-existing medical conditions and the elderly).

The study found that post-event actions taken will most likely result in only marginal improvements in resilience to such events. It is likely that public education will have improved population preparedness in some jurisdictions. However, the lack of a structured response has impeded any major improvements to reduce vulnerability.

In addition, power utilities and transport (especially rail) companies find it difficult to invest in adaptation because of regulatory barriers (they are unable to recoup their investments through pricing, for example) – limiting their potential to enhance their adaptive capacity.

Lessons learnt

The heatwave highlighted the reality that the consequences of heatwave events can increase exponentially with marginal increases in duration and temperature. This demonstrates the need for integrated weather prediction products over a wide spectrum of time and space scales to forecast and monitor such events. In addition, compounding influences (i.e. urban heat-islands, thermal mass, building typologies) need to be better understood to robustly quantify risk at the fine spatial scales required.

The 2009 heatwave highlighted the problems associated with demographic changes in Australia, including the ageing population. Clearer definition and understanding of vulnerable groups, and effective coping and adaptation strategies, are needed to increase their resilience.

Issues relating to current forms of development, urbanisation and housing typologies need to be further explored.

In the short term catastrophe and stress modelling of key infrastructure needs to be carried out to identify vulnerabilities and interdependencies to inform adaptation and management strategies, while in the long term strategies such as climate responsive design of both public and private spaces need to be developed.

It is also clear that an 'all hazards' approach to heatwave management will provide the best opportunity to satisfactorily manage such events through clear control and coordination protocols. It is recommended that this approach is adopted nationwide.

Managing the event: successes and failures

Successes:

- Emergency services - Individual agencies and services managed the impacts of the heatwave professionally – emergency and health services in particular;
- Impact management - load shedding with power - controlled system management prevented further, potentially system-wide failure.

Failures:

- Communication - No clear public information or warning strategy, no clear thresholds for initiating public information campaigns, no clear thresholds to invoke emergency management or incident response. This resulted in mixed messages to the media and public;
- Cause of death will not be linked to heatwave, making it difficult to assess magnitude of the impact on mortality;
- Critical infrastructure and services interdependencies were exposed (e.g. loss of electricity affecting traffic lights and trains);
- Necessity for power load shedding.

About this study

This study is one of a suite of Historical Case Studies of Extreme Events conducted under Phase I of the NCCARF Synthesis and Integrative Research Program.

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The study will be available online at www.nccarf.edu.au

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