

An analysis of human fatalities and building losses from natural disasters in Australia



bushfire&natural
HAZARDSCRC

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Risk Frontiers

Who is most at risk? Why? What are they doing?
How have vulnerability and exposure trends changed over time?

What can we learn about the circumstances of these deaths?
This information will assist agencies with planning, resourcing and community education.

METHOD

- Update data in RFs' PerilAUS database on natural hazards
- Consult Coroner reports to better understand environmental/ social circumstances around fatalities
- Analyse statistics to assist in EM policy, practice and resource allocation & risk reduction strategies

FLOOD

Age - high-risk groups are children and young adults (< 29 years).

Gender - 79% males

Activity prior to death: Most men and women died crossing a bridge or flooded road. 2nd-highest for women & 3rd-highest for men was activity not near a usual watercourse, e.g. driving through town, or in their home and unaware of flood waters. Activity in or near the water was 2nd-highest for men and 3rd-highest for women.

Reasons behind actions taken: Most en route to a destination; mostly on their way home. Recreating is the 2nd highest cause of death, but highest in 0-19 age groups. For men, the 3rd-highest reason behind action is working, attending to livestock or livelihoods; for women it's evacuating

Transport: Fatalities associated with 4WD vehicles have increased over the last 15 years.

Time of day: 65% of those in a motorised vehicle perished at night or during twilight.

UTILISATION

The results of this research have contributed to both policy and practice.

Policy: Results have significantly contributed to the Prevention of Flood Related Fatalities Working Group of the Community Engagement Sub-committee of ANZEMC.

Practice: Results have been used to inform and support community outreach video campaigns produced by the NSWSES.

Hazard	Coverage	Deaths	% deaths ³	Fatal States
Extreme heat ¹	1900-2011	4555	46.3	Vic, NSW, SA
Flood ²	1900-2015	1911	19.4	Qld, NSW
Cyclone ²	1900-2015	1216	12.4	WA, NT, Qld
Bushfire ²	1900-2015	974	9.9	Vic, NSW
Wind gusts ²	1900-2015	525	5.3	NSW, Vic, Qld
Lightning ²	1900-2015	486	4.9	NSW, Qld

¹ Coates et al 2014

² Recent PerilAUS updates (May 2017)

³ of all hazards covered by PerilAUS (including landslide, tornado, rain, earthquake, hail)

EXTREME HEAT

- 1844-2010: at least 5332 deaths
- 1900-2010: 4555: as many as the combined total of deaths from all other natural hazards
- Deaths and death rates show an overall decrease with time
- Male to female death-rate ratio approaches but does not reach equality
- Seniors most vulnerable group; infants also over-represented

TROPICAL CYCLONES

The **severity** of a tropical cyclone doesn't necessarily have a bearing on likelihood of fatalities: 1/4 of deaths occurred in minor-moderate events.

Record dominated by Cyclone **Tracy**, where most deaths occurred via wind on land.

Middle period of record: high seas the main cause of death. During the **last decade**, deaths have fallen markedly.

Building codes, changed around 1980, have worked: few deaths are now caused by wind on land.

Gender - 84% males.

EARTHQUAKES

The Newcastle earthquake is an example of the vulnerability of Australian cities and towns to earthquakes. 14 died, most from the collapse of buildings and structures not built to withstand earthquake... But **don't let the numbers fool you:** the event occurred 28 Dec: if on a normal working day Newcastle, a working city, may have had some 300-500 fatalities.

WIND GUSTS

- Gender - 75% males
- Most (30%) drowned - mainly from boats capsized in high seas; 25% from injuries received in a vehicle accident; 25% from a tree or tree-limb fall.
- Highest proportion (40%) in NSW, then Vic 22% and Qld 20%.
- Transport: most (30%) on foot; 25% in boat on water, 17% in an aircraft, 13% in a vehicle and 8% in a house.
- Action prior to onset of hazard: most males (34%) and females (36%) were recreating, followed by being *en route* to a destination (29% and 30%). 15% of males were working.

SEVERE STORMS

People may be overtaken by another peril type whilst sheltering from rain: lightning, for example, whilst sheltering from rain under a tree.

LIGHTNING

- Gender - 79% males
- ~20% fatalities occurred amongst outdoor workers (training camp, farmyard, near parked vehicle, at building site or race course).
- ~15% whilst recreating at beach (near the water's edge; in water; in act of leaving beach).
- 13% took refuge under a tree.
- ~10% whilst recreating at a sportsfield or golf course.
- ~10% in a small fishing vessel.

RECOMMENDATIONS (Flood):

- Evaluate current education and warning strategies
- Target information to specific high risk groups
- Utilize and evaluate gender and age-specific messaging
- Investigate other risk factors, e.g. road characteristics
- Use a holistic behavioural change focus including education, incentives/ regulation and structural changes to roads etc.
- Ensure all future strategies are evidence based.

RECOMMENDATIONS (Extreme heat):

- Focus more resources at all levels of government on risk reduction
- Target those working in hot environments: outdoor workers, e.g. labourers, tradespersons, miners; indoor workers, e.g. chefs
- Target those undertaking recreation
- Target, most particularly, the elderly
- Rethink how we design: address urban planning, building design, community development and social equity

RECOMMENDATIONS (Cyclone, Storm):

- Future work: investigate effectiveness of existing EM recommendations and how they are communicated to the public.
- Community engagement campaigns for high-fatality hazards of cyclone, gust, lightning should target males especially.
- Community engagement campaigns should discourage people from sheltering/camping under large trees during severe weather conditions. Rather, people should be encouraged to shelter in sturdy buildings and, esp. in case of lightning, at earliest opportunity
- ESOs should work collaboratively with marine risk groups, e.g. recreational boaters, and marine safety and rescue authorities to communicate key safety messages across inland & coastal waters

RECOMMENDATIONS (Earthquake):

- ESOs should encourage members of the public and employers to find out if they live or work in a building prone to earthquake damage.
- Future research should examine buildings/areas which may pose a greater risk of dying in an earthquake: e.g. places of mass gathering or essential infrastructure facilities which don't meet current earthquake building regs, e.g. older hospitals, clubs, malls.

END-USER STATEMENT

Outputs have provided significant input to the national Attorney-General's Department-funded project within the Australia and New Zealand Emergency Management Committee, looking at the way forward within government policy and practice to reduce the number of flood fatalities. The project has also assisted the understanding within emergency services of the causal factors of flood fatalities, along with internal awareness within NSW SES.

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PUBLICATIONS:

- Coates L, Haynes, K, O'Brien, J, McAnaney, J and Dimer de Oliveira, F, 2014, Exploring 167 years of vulnerability: An examination of extreme heat events in Australia 1844-2010, Environmental Science & Policy, 42:33-44.
- Haynes, K, Coates, L, Dimer de Oliveira, F, Gissing, A, Bird, D, Radford, D, D'Arcy, R, Smith, C, 2016, An analysis of human fatalities from floods in Australia 1900-2015. Report for the Bushfire and Natural Hazards Cooperative Research Centre.
- Coates, L, Haynes, K, Radford, D, D'Arcy, R, Smith, C, van den Honert, R, Gissing, A, 2016, An analysis of human fatalities from cyclones, earthquakes and severe storms in Australia. Report for the Bushfire & Natural Hazards Cooperative Research Centre.

