

Extreme heat in Australia 1788-2010: who is at risk, how best to respond?

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The project

- Heat-associated deaths in Australia – 1788 to 2010
- Population vulnerability, demographics, occupations, circumstances
- Why this study?
- How: PerilAUS
- Results:
 - deaths & death rates
 - gender & age
 - circumstances & occupation
 - comparisons: case studies; other natural hazards
- Some policy implications



Why it's important

Heatwaves: complex, pervasive and passive in nature...

Silent and invisible killers of silenced and invisible people... (Klinenberg, 2002)

Not newsworthy... but should be!

- **Jan/ Feb 2009.** Heatwave: 432 deaths; bushfires: 173
- **Jan 1939.** Heatwave: 420 deaths; bushfires ~ 76

Definitional confusion & inconsistencies...

- **Eg Adelaide:** 5 consecutive days at or above 35° or 3 days at or over 40°
- **BoM:** period of at least 3 days where combined effect of excess heat & heat stress are unusual wrt local climate
- **Media:** a subjective experience often delineated “officially” by media

Data on total mortality counts and vulnerability trends is poor... yet effective planning includes knowing **who is most at risk.**



Method

PerilAUS – database of natural hazard impacts – 1788-2010

• Australian peril types include:

- bushfires
- earthquakes
- **heatwaves**
- landslides
- floods
- rainstorms
- tropical cyclones
- tsunamis
- hailstorms
- lightning strikes
- tornadoes
- windstorm

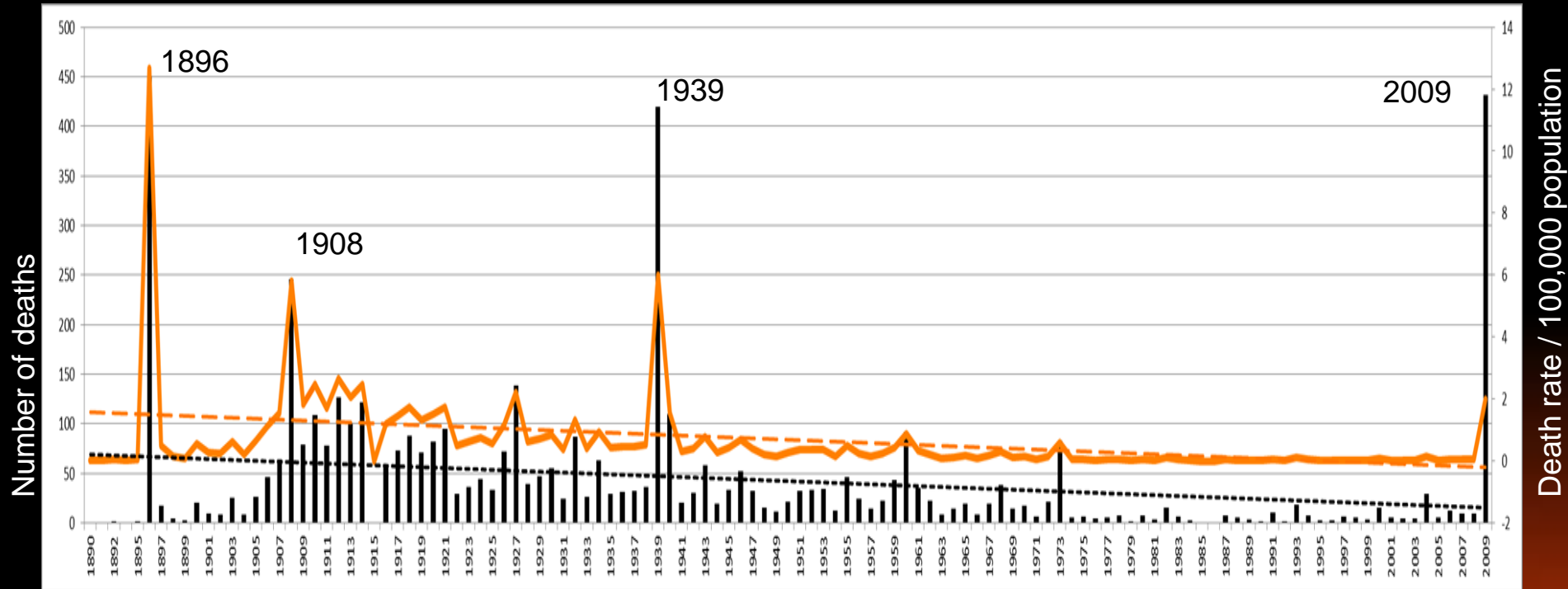
Australian Bureau of Statistics – 1907-2009

National Coronial Information Service – 2001-2010



Results: deaths & death rates 1890-2010

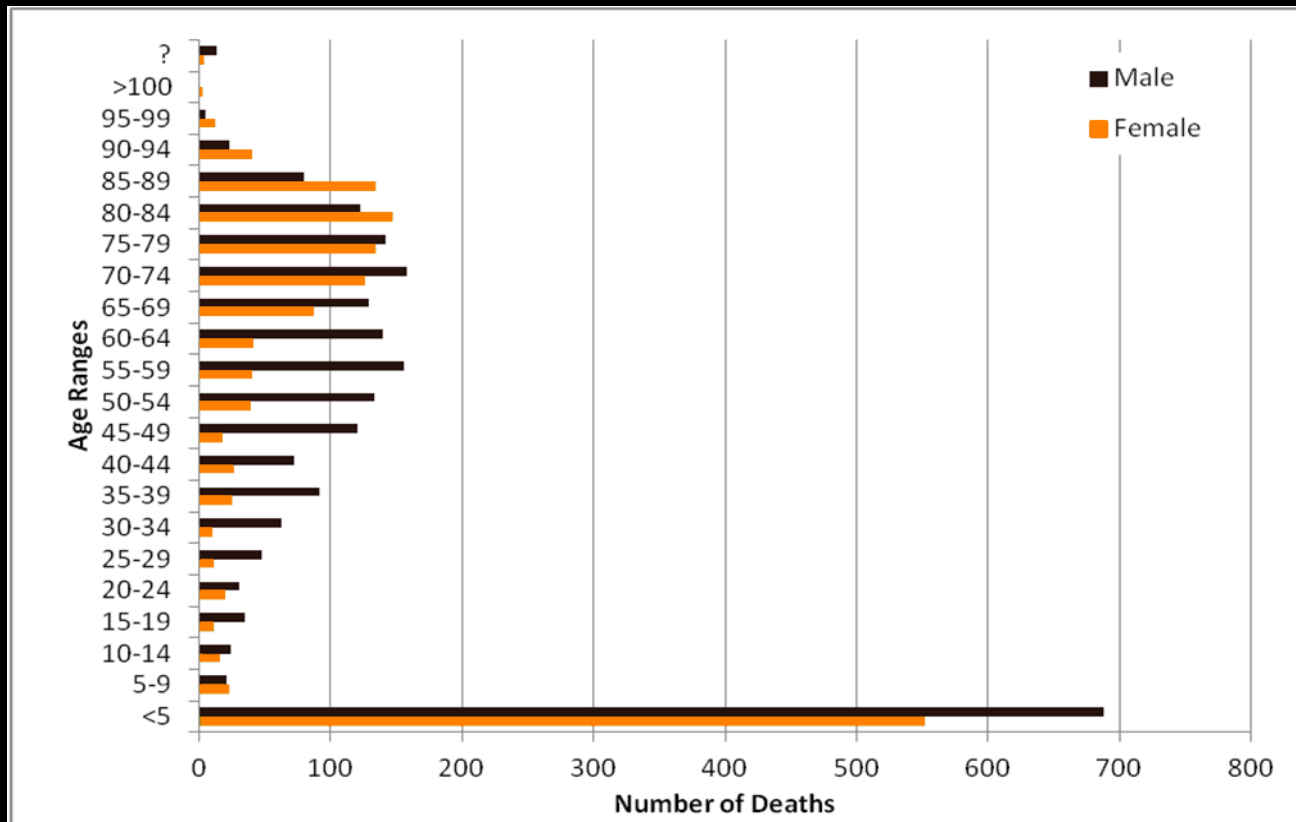
- at least 363 heat events since 1788 and 5,332 fatalities since 1844



Death rate / 100,000 population

RISK FRONTIERS

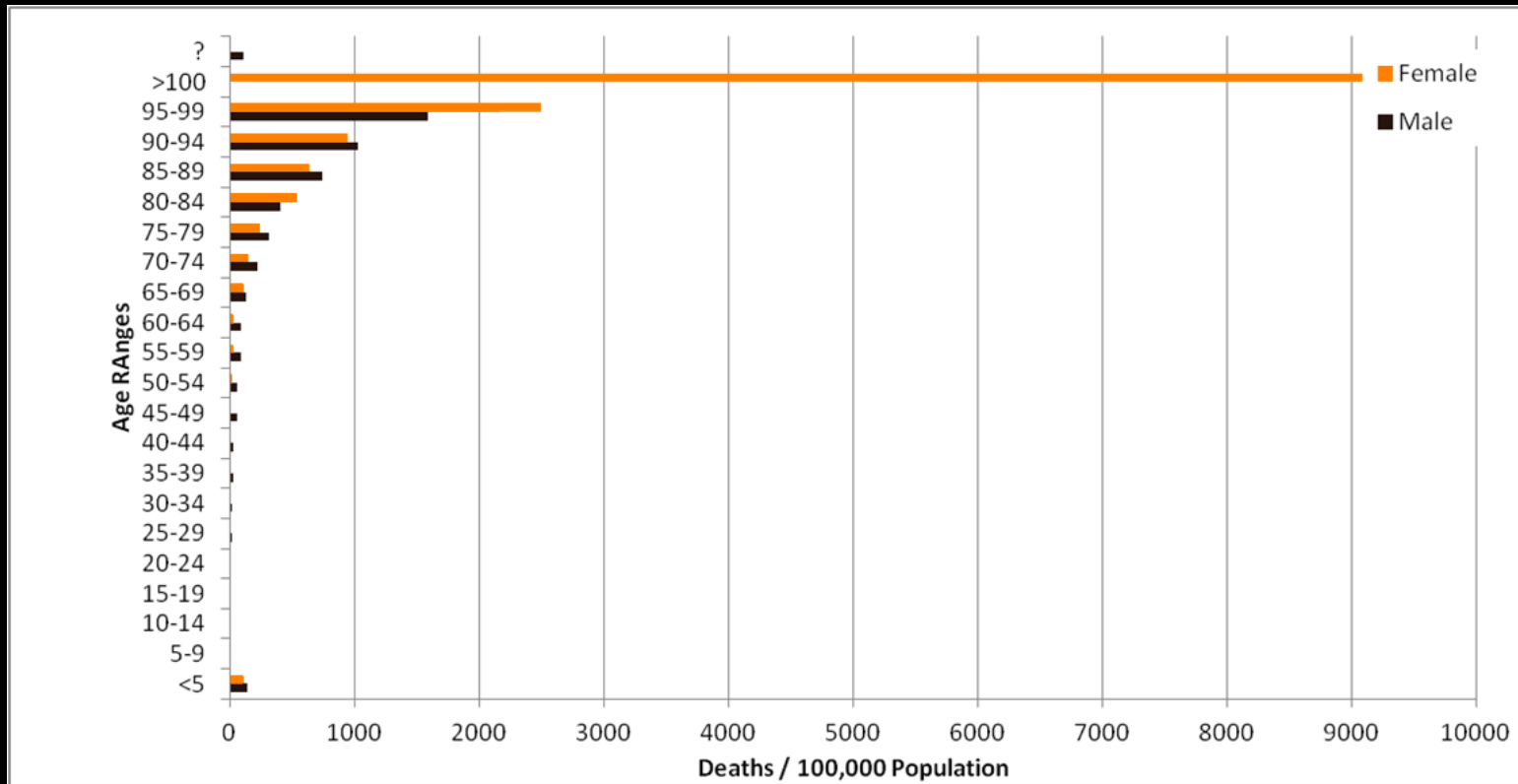
Results: gender & age – deaths 1907-92



- more males than females have died of extreme heat
- infants overrepresented
- “bulge” of deaths at 50-89 years



Results: gender & age – death rates 1907-92



- slight overrepresentation of infants
- overrepresentation of seniors with age
- infants & males 50-79 becoming less at risk

Death rates have decreased: the general distribution of vulnerability has not.



Results: circumstances

| Circumstances | % of known casualties | | |
|--|-----------------------|--------------|--------------|
| | 1844-1899 | 1900-1955 | 1956-2010 |
| Total heat-associated deaths for that interval: | 789 | 3,345 | 1,198 |
| Activity prior: no. known deaths | 117 | 63 | 65 |
| • working | 49.6 % | 44.4 % | 20.0 % |
| • travelling | 16.2 % | 17.5 % | 20.0 % |
| • recreation | 5.1 % | 14.3 % | 30.8 % |
| • walking | 6.0 % | 14.3 % | 18.5 % |
| • other | 23.1 % | 5.1 % | 10.7 % |
| Other vulnerabilities: no. known deaths | 208 | 182 | 380 |
| • alcohol or mental health issues | 1.4 % | - | 5.2 % |
| • disabled / medical condition / in care | 3.8 % | 0.1 % | 10.8 % |
| • in the city | 5.2 % | 0.2 % | - |
| • in rural location | 14.9 % | 10.4 % | 0.3 % |
| • newly arrived | 7.2 % | 0.2 % | 0.3 % |
| • senior | 28.8 % | 64.8 % | 87.3 % |
| • very young | 42.3 % | 21.4 % | 6.3 % |
| • other | 3.4 % | 0.3 % | 5.0 % |



Results: occupation

Consistently high risk professions and some trends

| Profession | % known casualties by profession | | | % known casualties working at the time | | |
|----------------|----------------------------------|-----------|-----------|--|-----------|------------------------|
| Interval | 1844-1899 | 1900-1955 | 1956-2010 | 1844-1899 | 1900-1955 | 1956-2010 ¹ |
| Labourer | 12.6 | 12.7 | 7.3 | 10.3 | 9.1 | 2.6 |
| On the land | 10.7 | 8.2 | 6.6 | 5.6 | 3.6 | 0 |
| Tradesmen | 3.7 | 2.7 | 5.9 | 0.9 | 0.9 | 0.4 |
| Miner | 3.7 | 1.8 | 2.2 | - | 1.8 | - |
| Food prep | 3.3 | 6.4 | 0.4 | - | 3.6 | - |
| Admin/clerical | 1.9 | 0.9 | 3.7 | - | - | - |

¹ percentage value may be much higher due to differences in data sets over time

- Decrease in percentage working at time of death
- **Most at risk:** labourers &/or working outdoors; mining & food prep
- **Increasing:** tradesmen, administration/ clerical
- **Decreasing:** labourers, on the land, food preparation



Comparisons: case studies >100 deaths

| Date & Duration | Area affected | Deaths | Temperature (°C) |
|-------------------------------|--|------------|--|
| Oct 1895-Jan 1896 | NSW (89%), SA, WA, Vic, Qld | 435 | "Never in the history of [NSW] has such a continuance of fierce heat been known." |
| 12-26 Jan 1908 | SA (49%), Vic (48%), NSW | 213 | Records set SA & Vic: 6 consecutive days >40 * Melbourne: Tmin >20, Tmax 44.2 * Adelaide: Tmin > 25, Tmax 44.2 |
| 6~22 Jan 1939 | NSW (77%), Vic, SA | 420 | Records set in many locations: * Adelaide 46.1 * Melbourne 45.6 * Bourke: 37 consecutive days > 38 |
| 9-25 Jan & 6-8 Feb 1959 | Melbourne & rural Vic | 145 | Melbourne: * 3 consecutive days > 42 * Tmin 24 - 32.2 |
| 25-30 Jan & 31 Jan-2 Feb 2009 | Vic (87%), SA | 432 | Very hot Tmin - Adelaide 30, Melb. 20-25 New records: * 3 consecutive days > 43 in Melbourne * 8 consecutive days > 40 Adelaide |



Comparisons: other Australian perils

| Natural Hazard | Deaths 1900-2011 |
|---------------------|------------------|
| Extreme heat | 4,555 |
| Flood | 1,221 |
| Tropical cyclone | 1,285 |
| Bush/ grassfire | 866 |
| Lightning | 85 |
| Landslide | 88 |
| Wind storm | 68 |
| Tornado | 42 |
| Hail storm | 16 |
| Earthquake | 16 |
| Rain storm | 14 |

- Extreme heat has killed more Australians than the combined total of deaths from all other natural hazards!
- ~31% have occurred in just nine events
- It is quite likely that extreme heat has killed many more people



Summary & policy implications

- **Concentrate more resources at all levels of government on risk reduction**
 - 5,332 deaths since 1844
 - decrease in death rate BUT future risk: climate change + social vulnerability
 - **Who to target? WHS:**
 - Those working in hot environments
 - **Recreation-related:**
 - > 25% fatalities prior to 1956 working at death; < 10% from 1956
 - 1956-2010 – recreation riskiest activity, then working
 - **The very old**
- **Long term risk reduction focus:**
 - planning policies currently are response-focused... and...
 - many of the most vulnerable groups are difficult to reach
 - We suggest: urban planning, building design, social equity, community development

Another heat disaster is inevitable – not enough has changed since 2009...



Questions?

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