bushfire&natural HAZARDSCRC

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

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An Australian Government Initiative

CRC AUSTRALIA

RISK FRONTIERS

MACQUARIE UNIVERSITY

Objectives

To analyse the impacts of:

floods, cyclones, bushfires, earthquakes, heatwaves and severe storms (wind, hail, lightning, tornados, flash floods)

in terms of:

- demographics, social and environmental circumstances surrounding deaths
- people otherwise affected– injured, near-misses, rescued
- building losses and damage – over the last century

Major outcomes

Evidence-based data to assist with appropriate emergency management and government decision making:

- a longitudinal and geographical examination of trends in the exposure and vulnerability of people and buildings
- an interpretation of these trends in the context of emerging issues (e.g. ageing population, population shifts, climate change), in order to determine potential future trends
- an understanding of the impact of changes to policy and procedures on life and property loss.

Initial objective

To analyse the impacts of **floods** in terms of:

- human fatalities and
- physical characteristics of the flood

Milestones:

- 29 May 2015 – report on flood fatalities alongside a discussion of the results with end-users
- mid-July – submission of journal article

PerilAUS: a means to the end

A database of natural hazard impacts in Australia

- **Data held** from 1788; best data is from 1900.
- **14,760** event reports from 1900 to the present (and counting…)

Coronial inquests:– crucial to augmenting the detail surrounding fatalities.

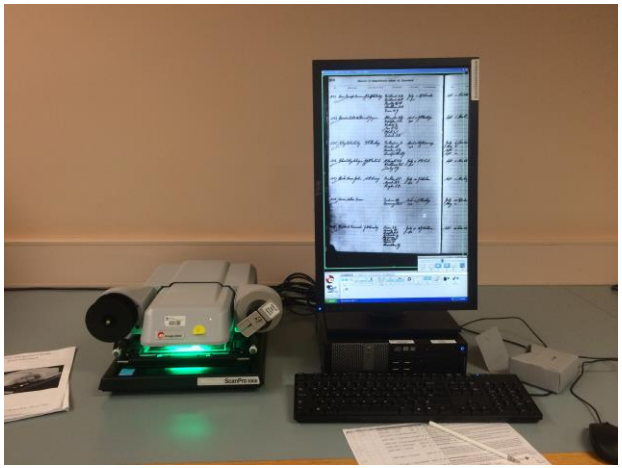
[garnered for bushfire fatalities (as at 2008) for a previous project for the Bushfire CRC]

First we needed to add as many names as possible…

What we've done

Enriching the database (from March 2014 to now):

- Fatal flood events: 548 → 1076 (96%)
- Number of flood deaths 1207 → 1799
- Named flood deaths 606 → 1559 (from 50% → 87%)
- References 16,598 → 19,924



Qld Archives – office Step 2. Having found the most likely page no. on the appropriate microfilm from the inquest register, ensure it's the right event/ person and get the inquest number. Next: order via the online form; wait for the staff to find it; unwrap carefully and photograph. Return to Sydney office and very nicely ask De to input it.

What we've done

Coronial inquest reports: types of data

- name, age, occupation, where found, date of death
- actions of deceased; reasoning behind decisions
- knowledge/ forewarning of flood dangers; ability to swim; blood alcohol level
- details of weather; state of river; type of flood

QLD 1920/16555: Inquest gave the reason behind the attempt to cross the river, time, details on the incident and information on where the body was found.

PerilAUS: *[deceased] drowned whilst crossing Russell River at the old Chuchabber crossing during the flood.*

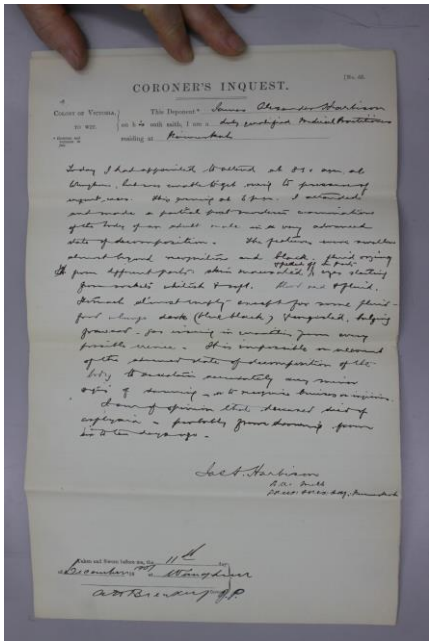
[deceased] was a labourer and contractor, ~50, unmarried, originally from Inverell. His employer, who was going to Cairns, instructed [him] to remove horses from the opposite side of the river if there was any sign of flood. A witness accompanied [him] at about 5.30am to bring horses from across the river as the river was rising and there was a danger of flood. [He]crossed the river on his horse which appeared to get into difficulties about halfway across. Both disappeared: the horse reappeared downstream but [deceased] did not. The river was running very quickly and the water was muddy. His body was found the following day, caught in the roots of a big tree, about half a mile from where he entered the river.

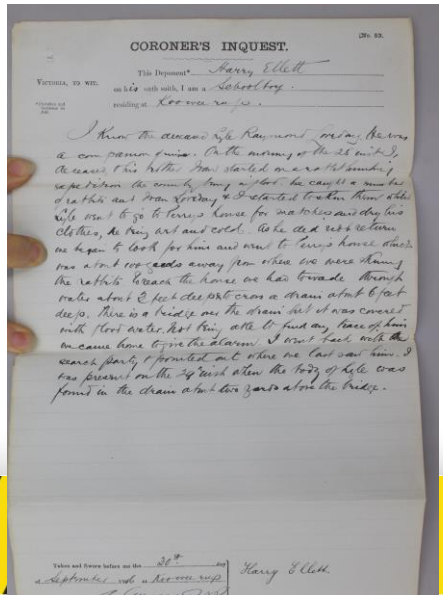
What we've done

Coronial inquest reports

Challenges encountered:

- Accessing some Records offices (WA, NT)
- Inquests aren't always kept (NSW, WA)
- Variable names in PerilAUS
- Reports difficult to read!


CORONER'S INQUEST.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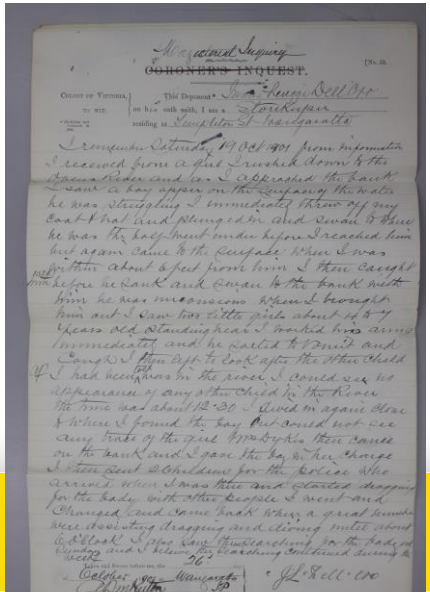

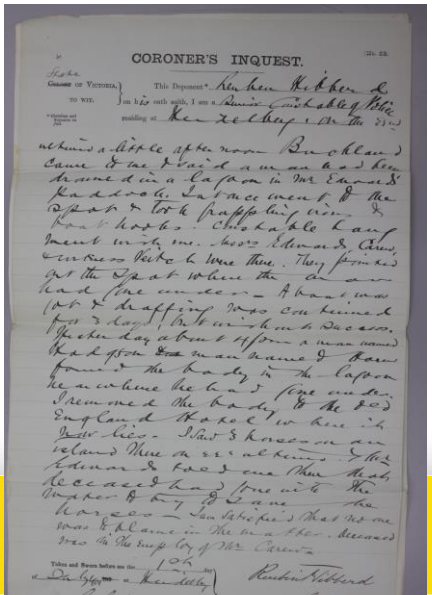
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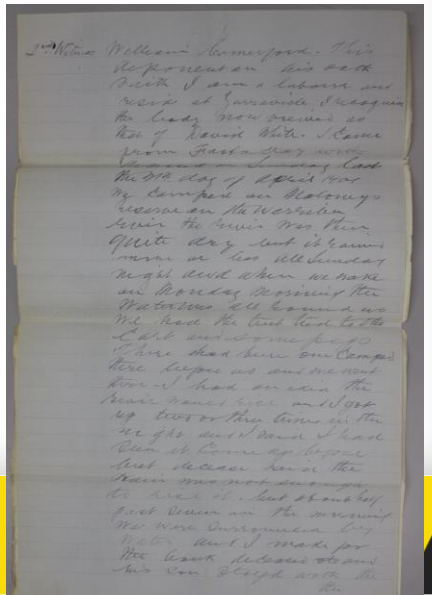

What we've done

Current state of play

Inquest reports held at State Archives offices:

- accessed available reports: SA, Vic, Qld, NSW
- end of April will complete Tas, ACT
- unable to access records for NT
- hope springs eternal – WA

May be able to access more recent inquest reports direct from the Coroner for some states

Still closing gaps for physical characteristics of fatal flood events – about four decades' worth.

What you can expect

Fatalities from natural perils: raw data

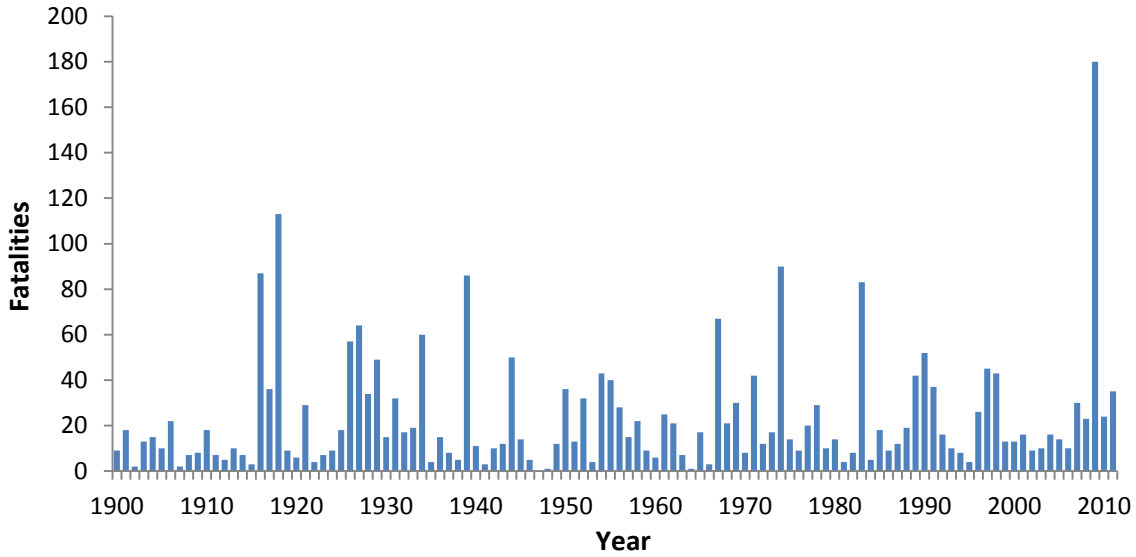

Figure 1: Australian natural disaster fatalities, 1900-2010 - raw data
(Data source: PerilAUS database, Risk Frontiers)

Perils include:
bushfire, earthquake, flood, grassfire, wind gust, hail, landslide, lightning, rain, tornado and tropical cyclone

What you can expect

Fatalities from natural perils normalised by population

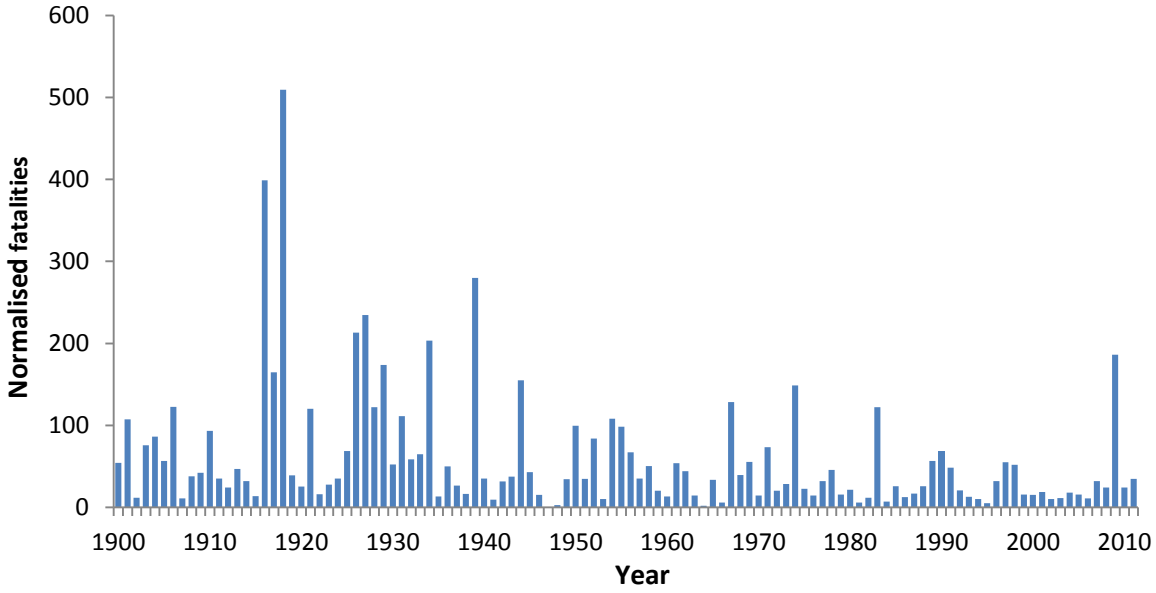

Figure 2: Australian natural disaster fatalities, 1900-2010 – population normalised to year 2010 numbers (Data source: PerilAUS database, Risk Frontiers)

Perils include:
bushfire, earthquake, flood, grassfire, wind gust, hail, landslide, lightning, rain, tornado and tropical cyclone

Natural hazard fatalities

Environmental Science & Policy
Volume 42, October 2014, Pages 33–44

Exploring 167 years of vulnerability: An examination of extreme heat events in Australia 1844–2010

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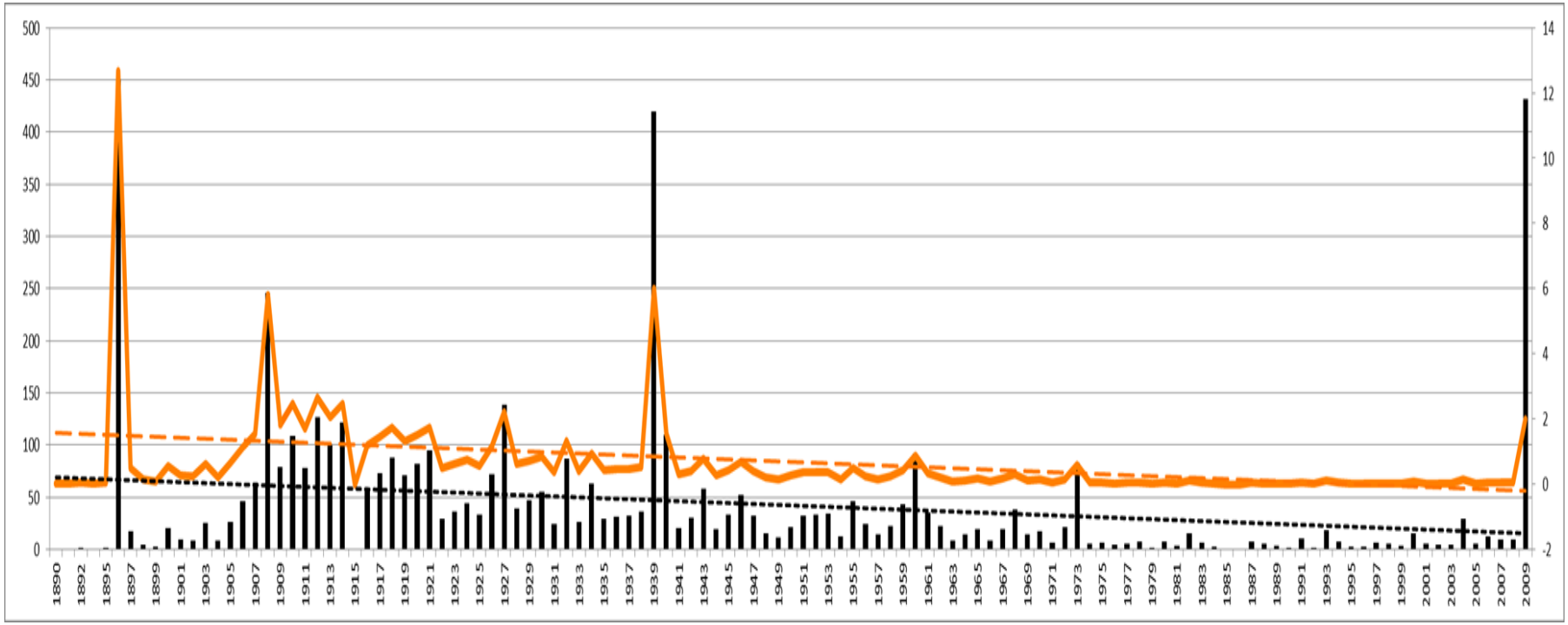
Natural hazard	Deaths 1900–2011	% total natural hazard deaths 1900–2011
Extreme heat	4,555	55.2
Flood	1,221	14.8
Tropical cyclone	1,285	15.6
Bush/grassfire	866	10.5
Lightning	85	1
Landslide	88	1.1
Wind storm	68	0.8
Tornado	42	0.5
Hail storm	16	0.2
Earthquake	16	0.2
Rain storm	14	0.2

What you can expect

Heatwaves: deaths & death rates 1890-2010

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



What you can expect

Heatwaves: summary & policy implications

- **Concentrate more resources at all levels of government on risk reduction**
  - 5,332 deaths since 1844 and 4,555 deaths since 1900
  - 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…

What you can expect

Bushfires: gender

ENVIRONMENTAL SCIENCE & POLICY 13 (2010) 185–194

available at www.sciencedirect.com

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journal homepage: www.elsevier.com/locate/envsci

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Australian bushfire fatalities 1900–2008: exploring trends in relation to the 'Prepare, stay and defend or leave early' policy

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Table 2a – Gender and age of bushfire fatalities over three different time periods.

	Time period			Comparison of the two periods	
	1900–2008	1900–1954	1955–2008	z-Score	*p*-Value
Total number killed	552	292	260		
Gender					
Male	373 (67%)	224 (77%)	149 (57%)	5.011	<0.00001
Female	147 (27%)	48 (16%)	99 (38%)	−5.856	<0.00001
Unknown	32 (6%)	20 (7%)	12 (5%)		

Table 2a# from: Haynes et al, 2010, Australian bushfire fatalities 1900-2008: exploring trends in relationship to the 'Prepare, stay & defend or leave early' policy [p.189]. *Env Sci & Pol* 13: 185-194

What you can expect

Bushfires: capacity to respond

Table 8 – Awareness/capacity to respond.

	1900–2008		1900–1954		1955–2008		Comparison of the two periods	
	Number	%	Number	%	Number	%	z-Score	*p*-Value
Physically and/or mentally incapable	24	4.3	8	2.7	16	6.2	−2.013	<0.05
Aware of the fire and carrying out a premeditated action	152	27.5	72	24.7	80	30.8	−1.601	>0.1
Aware of the fire but had no plans or did not follow them	110	19.9	54	18.5	56	21.5	−0.881	>0.2
Unaware of the fire and realised too late	59	10.7	28	9.6	31	11.9	−0.873	>0.2
Extenuating circumstances, e.g. heart attack	25	4.5	10	3.4	15	5.8	−1.353	>0.1
Children who followed adults' decisions	60	10.9	39	13.4	21	8.1	1.994	<0.05
Unknown	122	22.1	81	27.7	41	15.8	3.364	<0.001
Total	552	100	292	100	260	100		

Table 8 from: Haynes et al, 2010, Australian bushfire fatalities 1900-2008: exploring trends in relationship to the 'Prepare, stay & defend or leave early' policy [p.192]. *Env Sci & Pol* 13: 185-194

What you can expect

Floods: location

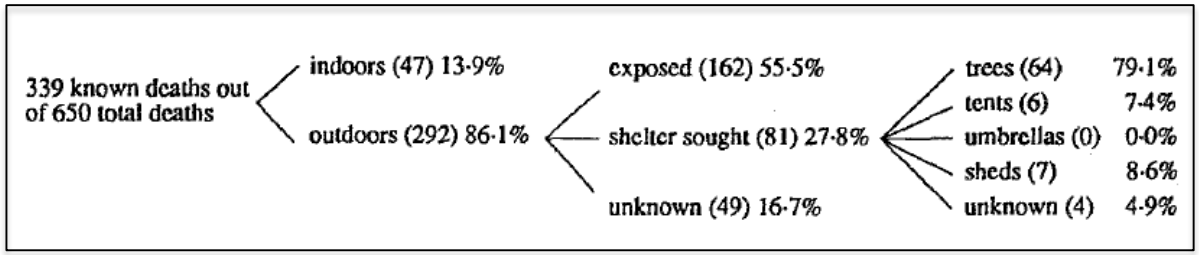
Total flood deaths (and %) by state/ territory, 1788-1996, and in 50-year intervals

State or territory	Total 1788–1996	% of total	1790–1846	1847–1896	1897–1946	1947–1996
New South Wales	**1090**	**49.3**	**76**	**562**	196	**256**
Queensland	741	33.5	2	336	**301**	102
Victoria	178	8.0	3	81	82	12
South Australia	78	3.5	5	50	20	3
Tasmania	60	2.7	0	21	33	6
Western Australia	28	1.3	0	24	3	1
Northern Territory	26	1.2	0	10	0	16
Australian Capital Territory	12	0.5	0	0	1	11
AUSTRALIA	2213	100.0	86	1084	636	407

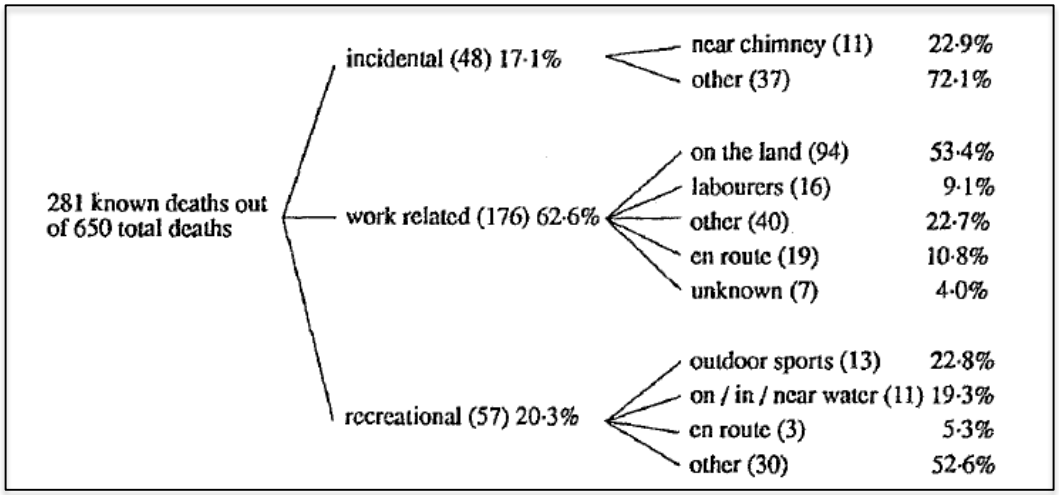
Table 4 from: Coates, 1999, Flood fatalities in Australia, 1788-1996 [p.398]. *Aust Geog* 30(3): 391-408

What you can expect

Lightning: circumstances



Whereabouts of casualty at time of strike



Activity of casualty at time of strike

[Figures 7 & 8 from: Coates, 1993, Lightning fatalities in Australia, 1824-1991 [p.229]. *Nat Haz* 8: 217-233]

Milestones

- *30 Mar 2014* – Submit journal article on heatwave deaths based on current knowledge
- *28 Nov 2014* – Report on data quality and completeness of historical natural hazard building losses
- *31 Dec 2014* – Report on data quality for fatalities from flood and the social and environmental circumstances surrounding each fatality
- **CM 1.03.2** – *29 May 2015* – report on flood fatalities alongside discussion of results with end-users
- *mid-July* – submission of journal article on flood fatalities
- **CM 1.03.3** – *31 Dec 2015* – Report on data quality for fatalities from tropical cyclone, earthquake, heatwaves and severe storm and environmental and social circumstances surrounding each fatality
- *31 May 2016* – Workshop with end-users and stakeholders to discuss fatality and building loss data
- **CM 1.03.4** – *31 July 2016* – Report and journal article on fatalities from tropical cyclone, earthquake, heatwaves, bushfire, and severe storm
- **CM 1.03.5** – *31 Dec 2016* – Report and journal article of detailed analysis of all historical natural hazard building losses (by state and time period), alongside presentation to relevant end-users
- *30 Mar 2017* – Report on the analysis of injury, near-miss and rescue data
- *15 Jun 2017* – A report on the impact of changes to policy and procedures related to natural hazard risk

THANK YOU!

http://www.riskfrontiers.com/

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