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**HAZARDS**CRC



# An analysis of human fatalities from flood hazards in Australia, 1900-2015

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An Australian Government Initiative



# Objectives



To analyse the impacts of:

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

in terms of:

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

# Major outcomes



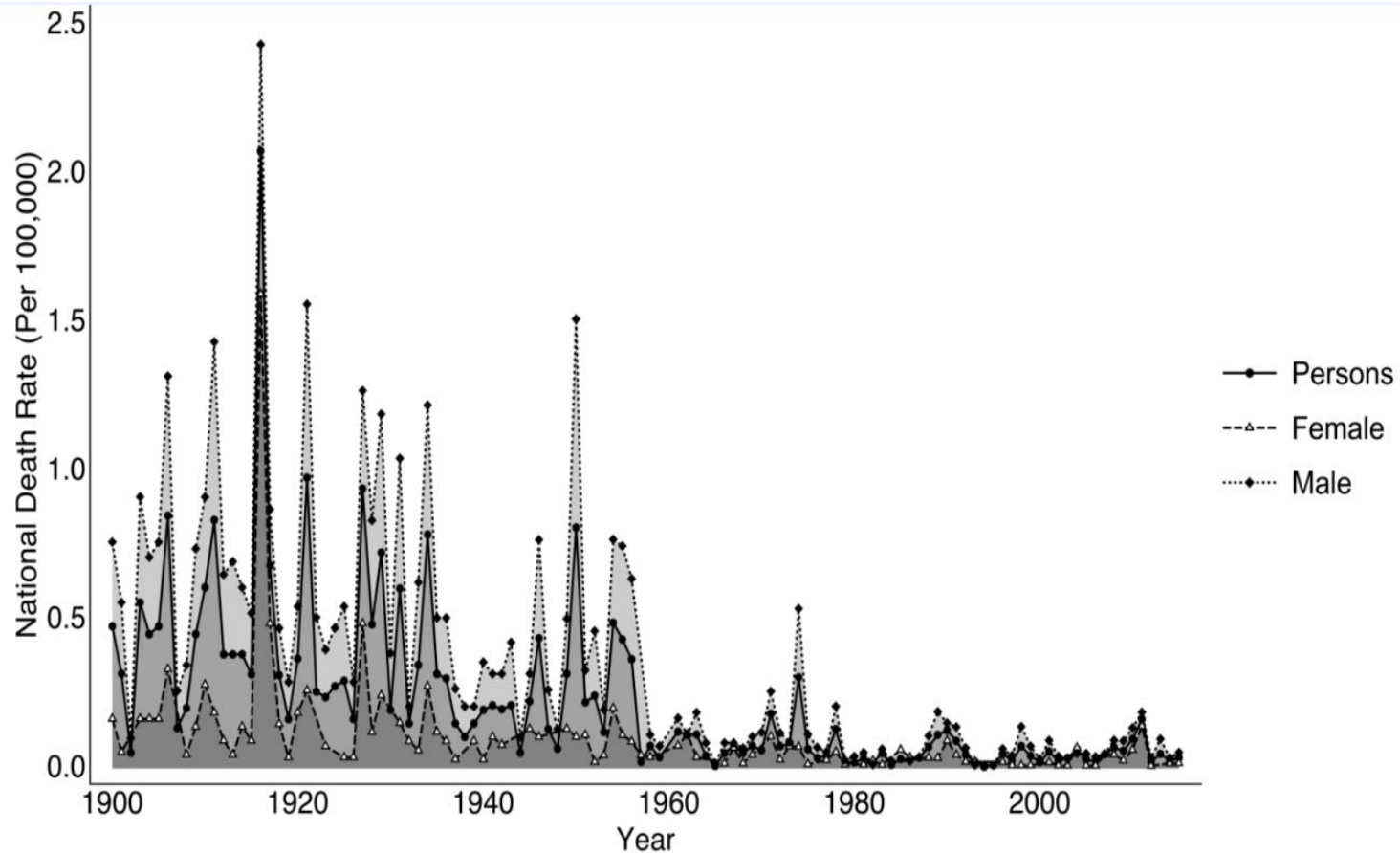
Evidence-based data to assist with appropriate emergency management and government decision making:

- 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.

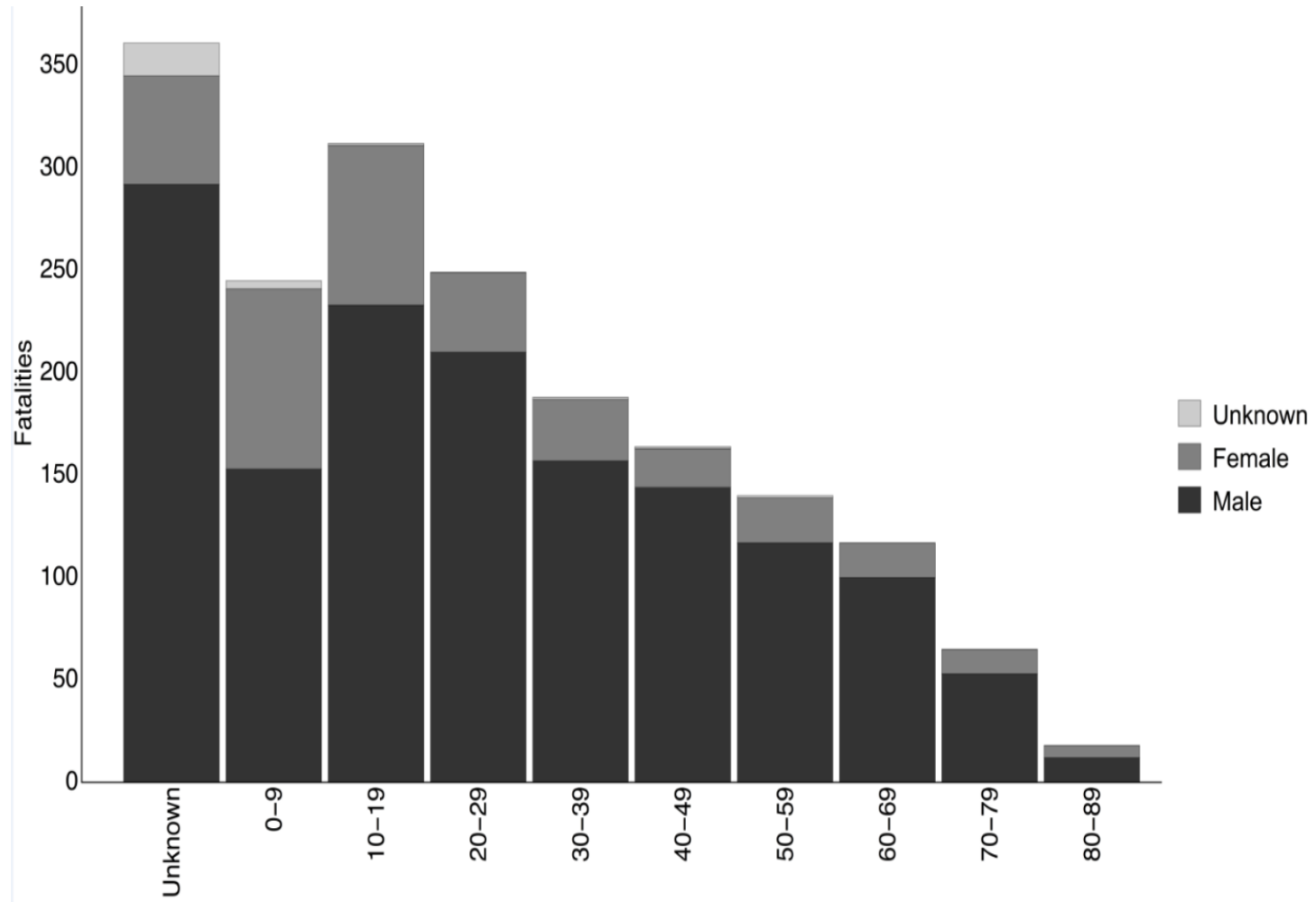
# Methods

- Update the number of named flood fatalities within PerilAUS – via Factiva and Trove
  - Number of flood deaths 1207 → 1859
- Retrieve coronial inquests, crucial to augmenting the detail surrounding fatalities.
  - name, age, occupation, where found, date of death
  - actions of deceased; reasoning behind decisions
  - knowledge/ forewarning of flood dangers; preparedness; ability to swim; blood alcohol level
  - details of weather; state of river; type of flood.

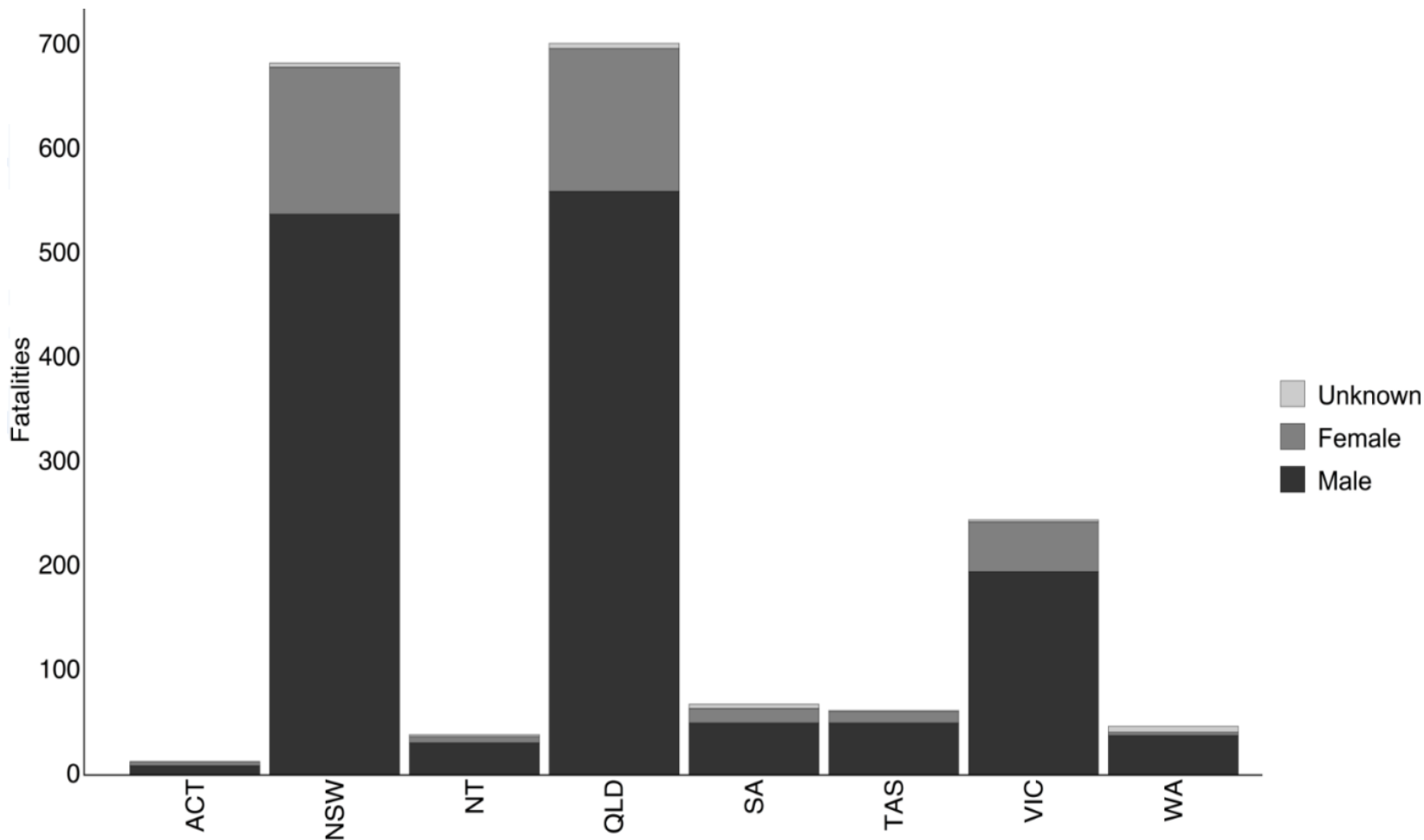
# Gender and death rates



# Age and gender



# By State & Territory



# Activity prior to death

- Highest proportions of men and women died attempting to cross a bridge, flooded road, etc. (men: 43%, n=639; women: 38%, n=139)
- Second highest cause of death for women involved activity not near a usual watercourse (23%, n=82). Third highest cause of death for men (10%, n=141).
- Activity in or near the water was the second highest cause of death for men (12%, n=173) and the third highest for women (11%, n=41).



# Reason behind actions taken...

- Highest number of fatalities for both genders occurred en route to a destination (30%, n=564).
- Recreating is the second highest cause of death for both genders (15%, n=280).
- For men, the third highest reason leading to flood deaths is working, attending to livestock or livelihoods (12%, n=181). The third highest reason for women is evacuating (15%, n=56).
- Majority of those in the 0-19 year age groups were recreating at time of death (33%, n=181).

# Capacity and awareness

	Aware but did not expect to encounter the flood	Aware but not depth and or speed took them by surprise	Unaware and taken by surprise	N/A – child < 11	N/A – other	Unknown	Total
Capable of independent action	158 (66.4%)	593 (73.2%)	148 (60.4%)	2 (0.7%)	10 (58.8%)	86 (33.0%)	997 (53.6%)
Physically and or mentally disabled or incapable	3 (1.3%)	13 (1.6%)	4 (1.6%)	1 (0.3%)	3 (17.6%)	4 (1.5%)	28 (1.5%)
Cannot swim	14 (5.9%)	27 (3.3%)	7 (2.9%)	1 (0.3%)	2 (11.8%)	2 (0.8%)	53 (2.9%)
Influenced by drugs or alcohol	9 (3.8%)	49 (6.0%)	20 (8.2%)	0 (0.0%)	0 (0.0%)	7 (2.7%)	85 (4.6%)
Following the decision making of others	39 (16.4%)	81 (10.0%)	39 (15.9%)	126 (43.8%)	2 (11.8%)	5 (1.9%)	292 (15.7%)
A child or group of children on their own < 11 years old	6 (2.5%)	6 (0.7%)	1 (0.4%)	156 (54.2%)	0 (0.0%)	4 (1.5%)	173 (9.3%)
Unfamiliar with the area	1 (0.4%)	13 (1.6%)	11 (4.5%)	0 (0.0%)	0 (0.0%)	1 (0.4%)	26 (1.4%)
Encumbered with clothing, possessions or equipment	2 (0.8%)	11 (1.4%)	2 (0.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	15 (0.8%)
Looking after dependents	0 (0.0%)	5 (0.6%)	3 (1.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (0.4%)
N/A	0 (0.0%)	0 (0.0%)	3 (1.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (0.2%)
Unknown	6 (2.5%)	12 (1.5%)	7 (2.9%)	2 (0.7%)	0 (0.0%)	152 (58.2%)	179 (9.6%)
<b>Total</b>	<b>238 (100%)</b>	<b>810 (100%)</b>	<b>245 (100%)</b>	<b>288 (100%)</b>	<b>17 (100%)</b>	<b>261 (100%)</b>	<b>1859 (100%)</b>

# Transport



- On foot (25.9%, n=482)
- In a vehicle (24.4%, n=462)

The detailed breakdown by vehicle type has:

- 219 in or exiting a sedan car
- 107 in or exiting a horse drawn vehicle
- 45 in or exiting a 4WD
- 26 in or exiting a truck
- 8 in or exiting a ute

# Transport

Car/4WD/truck/ute etc = 336 people killed.

- In total 71% were men and 29% were females
- Of those who were driving, 85% were men and 15% were females
- Of those who were passengers, 53% were males and 46% were females
- 25% of these fatalities were in the 0-19 age range, the majority of whom were passengers.

In terms of the time of day (where known):

- The highest proportions of those on foot perished during daylight hours (daylight = 47%, n=228; darkness = 22%, n=104).
- The highest proportion of those in a vehicle (with horse drawn vehicles removed) perished at night or during twilight (daylight = 24%, n=82; darkness = 45%, n=150).

VEHICLE JOB 978

3. Indentation where deceased [redacted] was wedged



**'IT'S JUST ONE OF THOSE THINGS THAT YOU READ IN THE PAPER, YOU DON'T EXPECT IT TO HAPPEN'**

# 2000-2015

- 178 fatalities
- 67% male, 30% female
- Age - highest proportion 10-19
- QLD 52%; NSW 26%; VIC 9%; NT 8%; WA 3%; TAS 2%
- Majority (54%) died attempting to cross a watercourse
- Almost 50% of fatalities were in a vehicle, 25% on foot and 12% swimming
- High proportion of those <29 were recreating at the time of death, particularly the 10-19 age group. Older age groups dominantly en route in vehicles.

# In summary

- Death rates have declined due to emergency management and response, prediction and warnings, education, structural mitigation and land-use planning.
- The female:male fatality ratio has increased.
- The data highlights the distinct high-risk groups of children and young adults (< 29 years of age).
- Increase in fatalities associated with motorised vehicles is seen in recent decades, particularly 4WDs.

# Targeting messages

- Recreation: children, teens, young adults and their parents
- Driving and entering floodwaters: all people
- 4WD drivers,



# Further Research

- Develop and evaluate messaging and methods with different socio-demographic groups
- Evaluate signage options and smart technology for warning people about flood waters and dangers ahead
- Evaluate strategies for regulation and enforcement
- Compare the efficacy and cost effectiveness of education, regulation and enforcement

# Next steps

- Finalise the research and report on fatalities from cyclones, earthquakes and severe storms (gusts, hail, lightning, tornados).
- Take a case study approach to examine injuries and rescues for different hazards.
- Analyse building damage and losses.



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### **Report available from the BNHCRC website**

Haynes, K., Coates, L., Dimer de Oliveira, F., Gissing, A., Bird, D., van den Honert, R., 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 Hazard Cooperative Research Centre.