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Supplementary Material

Archetypes and change in wildfire risk perceptions, behaviours and intentions among adults in Tasmania, Australia

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SUPPLEMENTARY MATERIALS

Archetypes and change in wildfire risk perceptions, behaviours and intentions among adults in Tasmania, Australia.

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A. Survey instrument

1. In which town or suburb do you usually live? (Next qn = 2)
    - {Open text box with validated Tasmanian suburb names}
    - I'd prefer not to say

2. Which age group are you in? (Next qn = 3)
    - 18-24
    - 25-34
    - 35-44
    - 45-54
    - 55-64
    - 65+
    - Prefer not to say

3. What is your gender? (Next qn = 4)
    - Man or male
    - Woman or female
    - Non-binary
    - I use a different term (please specify)
    - Prefer not to say

4. Do you rent or own the home where you live most of the time? (Next qn = 5)
    - Open response, interviewer coded for
        - Rent
        - Own with a mortgage
        - Own with no mortgage
        - Other (interviewer instruction - please specify)
        - Unsure
        - Prefer not to say

5. Which of the following best describes how much the people who live in your home received as income over the last 12 months (before tax)? (Next qn = 6)
    - Less than $20,000
    - $20,000 to less than $50,000
    - $50,000 to less than $100,000
    - $100,000 to less than $150,000
    - $150,000 or more
    - Unsure

- Prefer not to say

6. What sources do you use for bushfire information? (Next qn = 7)
    - Open response, interviewer coded for
        - TasALERT website
        - Tasmania Fire Service website
        - Bureau of Meteorology website
        - Local council website
        - Radio or TV
        - Social media
        - Neighbours, family or friends
        - Visual cues
        - Don't use any sources of information
        - Unsure
        - Prefer not to say

7. On a scale of 1 to 5, where 1 is 'very unprepared' and 5 is 'very prepared', how prepared do you think your neighbourhood or local community is for bushfires? For example, is there a list of local people you can call if there is a fire, or a neighbourhood WhatsApp group? Is there an emergency management plan for your area, or are there community clean-up days? (Next qn = 8)
    - 1
    - 2
    - 3
    - 4
    - 5
    - Unsure
    - Prefer not to say

8. Do you have any direct experience with bushfires, either where you live now or somewhere else? For example, there was a bushfire near your home, or you have volunteered or worked in emergency fire response or service. (Next qn = 9)
    - Yes
    - No
    - Unsure
    - Prefer not to say

9. Thinking about the phrase 'Catastrophic Fire Danger', what does this mean to you? Next qn = 10)
    - Open response, interviewer coded for
        - If there is a fire, it will be dangerous and hard to control
        - If there is a fire it is likely that people will die and homes will be destroyed
        - It's the highest fire danger rating
        - I don't know the phrase
        - Unsure

10. On a day when there is a Catastrophic Fire Danger rating, but a fire has not yet started, what would you and other people in your home be most likely to do?
    - Open response, interviewer coded for
        - Stay where you are, but keep track of official advice about what to do (go to 11)
        - Go somewhere safer as soon as practical (go to 10a)
        - Some people would stay and others would leave (go to 10a)
        - Not do anything different to normal (got to 11)
        - Prepare my house or property (go to 11)
        - Or do something else (please specify) (go to 11)
        - Unsure (go to 11)
        - Prefer not to say (go to 11)

10a. Have you already planned where you would go? (Next qn = 11)

- Yes
- No
- Unsure
- Prefer not to say

11. Is your home in an area at risk from bushfire? By that I mean, do you live within 100 metres of bushland larger than about one hectare, which is 100 metres X 100 metres (roughly the size of a football field)?
    - Yes (go to 12)
    - No (go to 16)
    - Unsure (go to 12)
    - Prefer not to say (go to 12)

12. Have you done anything to get your home and everyone in your home better prepared for a bushfire?
    - Yes (go to 12a)
    - No (go to 12b)
    - Unsure (go to 13)
    - Prefer not to say (go to 13)

12a. What have you done? (Next qn = 13)

- Open response, interviewer coded for
    - Packed an emergency kit in case you need to leave your home
    - Planned where you could stay if you need to leave
    - Made a bushfire plan for your home
    - Cleared vegetation and made a space around your home so it is easier to defend
    - Cleaned the gutters on your home and/or your shed
    - Ember-proofed your home
    - Planted bushfire-resistant shrubs around your home
    - Installed a water pump and/or sprinkler system with a water tank or other water supply
    - Conducted burn-offs on the land around your home
    - Talked with people in your household about what you would do in a bushfire
    - Something else (please specify)

12b. What are the main reasons you haven't done anything to prepare for a bushfire? (Next qn = 13)

- Open response, interviewer coded for
    - Don't think you need to
    - It's not a priority
    - There's no point, it won't make any difference
    - Haven't had time
    - Can't make changes to your home (for example, renting)
    - Can't afford it
    - Don't know what to do
    - Another reason (please specify)

13. During a bushfire, people may decide to leave their home at different points in time. If a bushfire was burning near your home, which of the following would best describe your decision to leave?
    - I would leave immediately without any further prompting (go to 14)
    - I would leave immediately if I thought the Fire Danger Rating was too high (go to 14)
    - I would wait and leave after official warnings were issued (for example, by TasALERT, Tasmania Fire Service website, ABC radio or text message) (go to 14)

- I would wait and leave after others (for example, my neighbours, friends or family members) confirmed there was a threat, or I saw cars leaving the area (go to 14)
- I would stay as long as I could and only leave if I believed there was an immediate threat to my life or safety (go to 14)
- I would not leave (go to 13a)
- Other (please specify) (go to 14)
- Unsure (go to 14)
- Prefer not to say (go to 14)

13a. You said that you will not leave. What is the main reason you would stay? (Next qn = 14)

- I think I can protect my home and/or myself
- I have a bushfire shelter built on the property
- This is my home
- The fire service would protect me
- I have nowhere else to go
- I don't know where to go
- Or another reason? (please specify)
- Unsure
- Prefer not to say

14. Still thinking about a fire in your area, what might influence your decision to leave your home? (Next qn = 15)
    - Open response, interviewer coded for
        - Weather conditions (for example a windy, dry and hot day)
        - A visual or environmental cue (for example, if you could see or smell smoke or flames)
        - Receiving a warning or evacuation message on your phone
        - A 'High' Fire Danger Rating for your area
        - An 'Extreme' Fire Danger Rating for your area
        - A 'Catastrophic' Fire Danger Rating for your area
        - An 'Advice' warning is issued for your area
        - A 'Watch and Act' warning is issued for your area
        - An 'Emergency Warning' is issued for your area
        - Or another reason? (please specify)
        - Unsure
        - Prefer not to say

15. If you left your home, where would you most likely go? (Next qn = 16)
    - Open response, interviewer coded for
        - To relatives or friends in an area not affected by the fire
        - To a campground/caravan park not affected by the fire
        - To another house I had access to that was not affected by the fire (for example, a family shack)
        - To a motel/other paid accommodation not affected by the fire
        - To the nearest evacuation centre
        - To a designated nearby safer place (also known as a place of last resort)
        - Other (please specify)
        - Unsure
        - Prefer not to say

16. If there was a lot of bushfire smoke in or around your home, but there wasn't a bushfire nearby, what would you do to limit your exposure to the smoke?
    - Open response, interviewer coded for
        - Find and seal up any gaps in your home so air from outside couldn't get in (for example, close windows and doors)
        - Turn on my air-conditioner
        - Use a portable air cleaner or air purifier
        - Wear a P2 or N95 mask as much as possible
        - Not go outside until the smoke cleared
        - Use an air quality smartphone app or website
        - Talk to your doctor about your health
        - Move to somewhere away from the smoke
        - Nothing
        - Unsure
        - Prefer not to say

B. Cluster analysis

A dendrogram was constructed using the *cluster* package (Maechler et al. 2022). Survey variables including those related to information source, meaning of catastrophic fire days, preparedness actions, influences on decision to leave, and self-evacuation intention were included in the clustering, which was performed using the *agnes* (agglomerative nesting) algorithm. The average, single, complete and Ward's method were trialled, and Ward's method was found to produce the highest agglomerative coefficient of 0.92. The hierarchical tree was pruned to four clusters, which were used to assign groups for the remaining analyses.

For each survey response variable, a chi-squared test was performed for each cluster, showing the most significant variable that had the strongest influence in discriminating between each cluster. For each individual cluster and variable combination, a binomial linear regression calculation was performed and ranked by z-score, resulting in identification of the top five variables that had a strong positive or negative influence with cluster membership (see Table S1 below).

For analysis of archetypes, the *multipatt* function from the *indicspecies* package v1.7.14 (De Cáceres M & Legendre P 2009) was used to perform multi-level pattern analysis. This shows the association between patterns of binary survey answers (standing in for species presence/absence) and clusters, selecting the combination of answers with the highest association value with each cluster. The *r.g* association value function was selected as appropriate for the binary survey data, and 10,000 permutations were performed. Multi-level pattern analysis output showed a range of significant associations of survey question answers with the four groups, which allowed for a description of each archetype.

Table S1: Top five variables with positive or negative influence for each cluster.

Group number and variable	Corresponding survey question	Direction of association
Group 1		
Seek information from visual cues	Q6	Negative
Influenced to leave 'Extreme' Fire Danger Rating	Q14	Negative
Intend to leave in fire threat	Q13	Positive

Seek information from Bureau of Meteorology	Q6	Negative
Influenced to leave by phone message	Q14	Negative
Group 2		
Intend to stay in fire threat	Q13	Positive
Intend to leave in fire threat	Q13	Negative
Influenced to leave by emergency warnings	Q14	Negative
Influenced to leave by phone message	Q14	Negative
Influenced to leave by visual or environmental cue	Q14	Negative
Group 3		
Property not prepared due to no need	12b	Positive
Property not prepared due to no point	12b	Positive
Property not prepared due to no priority	12b	Positive
Property not prepared	12	Positive
Property not prepared due to no time	12b	Positive
Group 4		
Influenced to leave 'Extreme' Fire Danger Rating	Q14	Positive
Influenced to leave by advice warnings	Q14	Positive
Influenced to leave 'Catastrophic' Fire Danger Rating	Q14	Positive
Influenced to leave by emergency warnings	Q14	Positive
Influenced to leave 'High' Fire Danger Rating	Q14	Positive

C. Correlation tables

Correlation table outputs demonstrated a strong correlation between anticipated sociodemographic variables (for example, age and home ownership) and a present but weaker correlation between leave intention and gender; wildfire risk and wildfire experience; and income and home ownership (see Figure S1 and Figure S2).

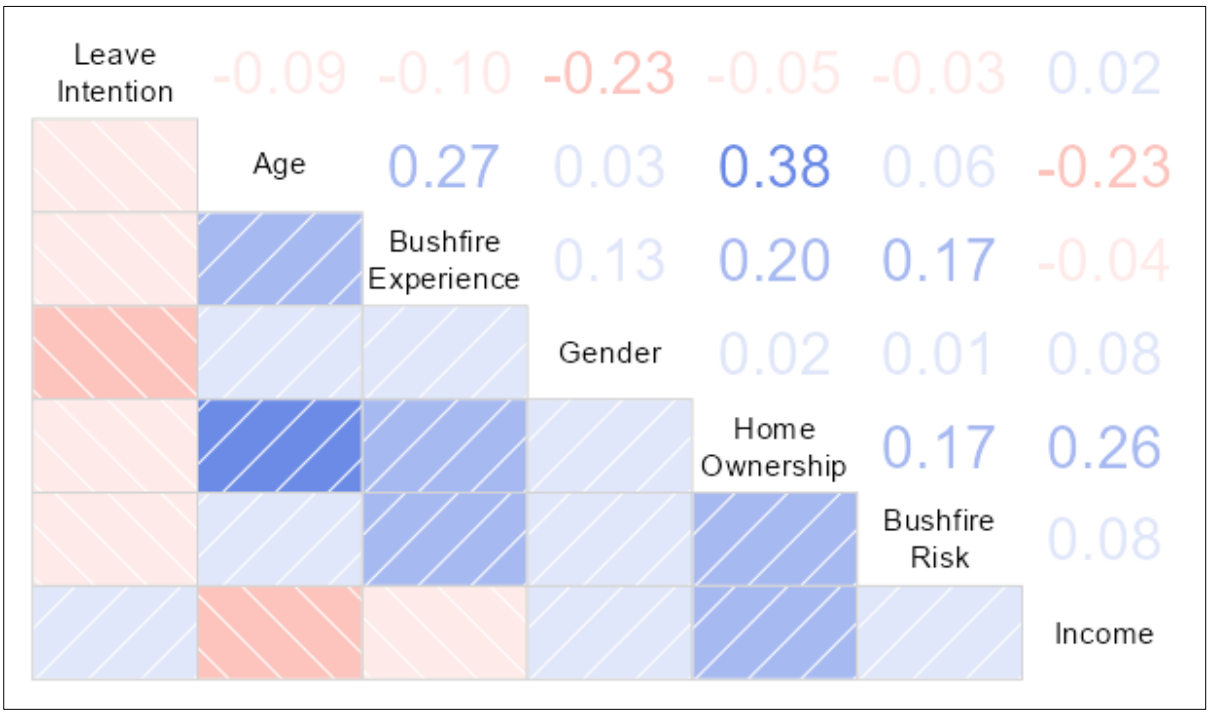

Figure S1: Correlation table showing the relationship between various sociodemographic variables including bushfire risk at home, where dark blue demonstrates a stronger positive correlation, and darker red demonstrates a stronger negative correlation.

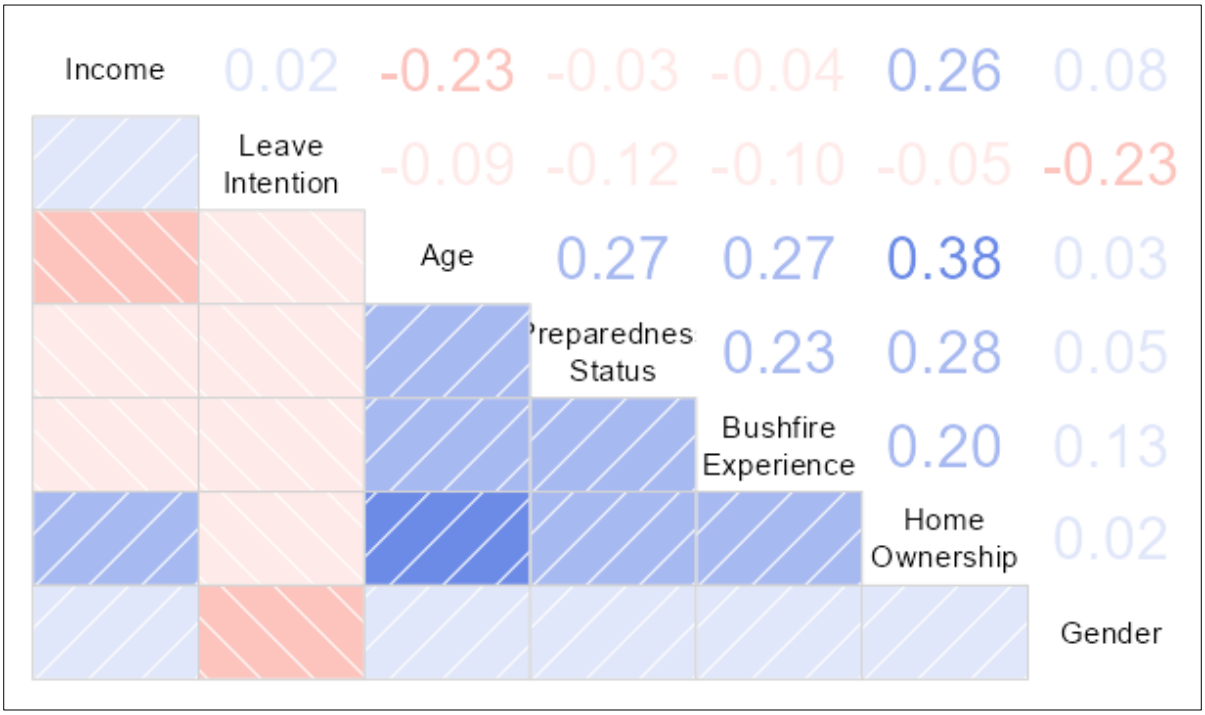

Figure S2: Correlation table showing the relationship between various sociodemographic variables including preparedness status, where dark blue demonstrates a stronger positive correlation, and darker red demonstrates a stronger negative correlation.

D. Influences on self-evacuation decision

Participants were asked what factors might influence their decision to leave home when threatened with a fire in the area, and were able to make more than one response choice. Almost 80% of participants responded that receiving a warning or evacuation phone message would influence their decision, and almost 70% of respondents reported visual or environmental cues (such as seeing or smelling smoke). A similar proportion of respondents reported receiving an 'Emergency' level warning for the area, or a 'Catastrophic' Fire Danger Rating would also influence the decision to leave (56.6% and 53.9% respectively). Adverse weather conditions, such as a dry, windy and hot day would also prompt almost half of participants (49%) (see Figure S3, where responses are categorised by gender, and divided to extrinsic factors above the horizontal line, or intrinsic factors below the horizontal line). Influential factors not captured in these categories include the ability to leave safely via an available route, the actions of neighbours and others close by, and safety concern for partners, children and pets.

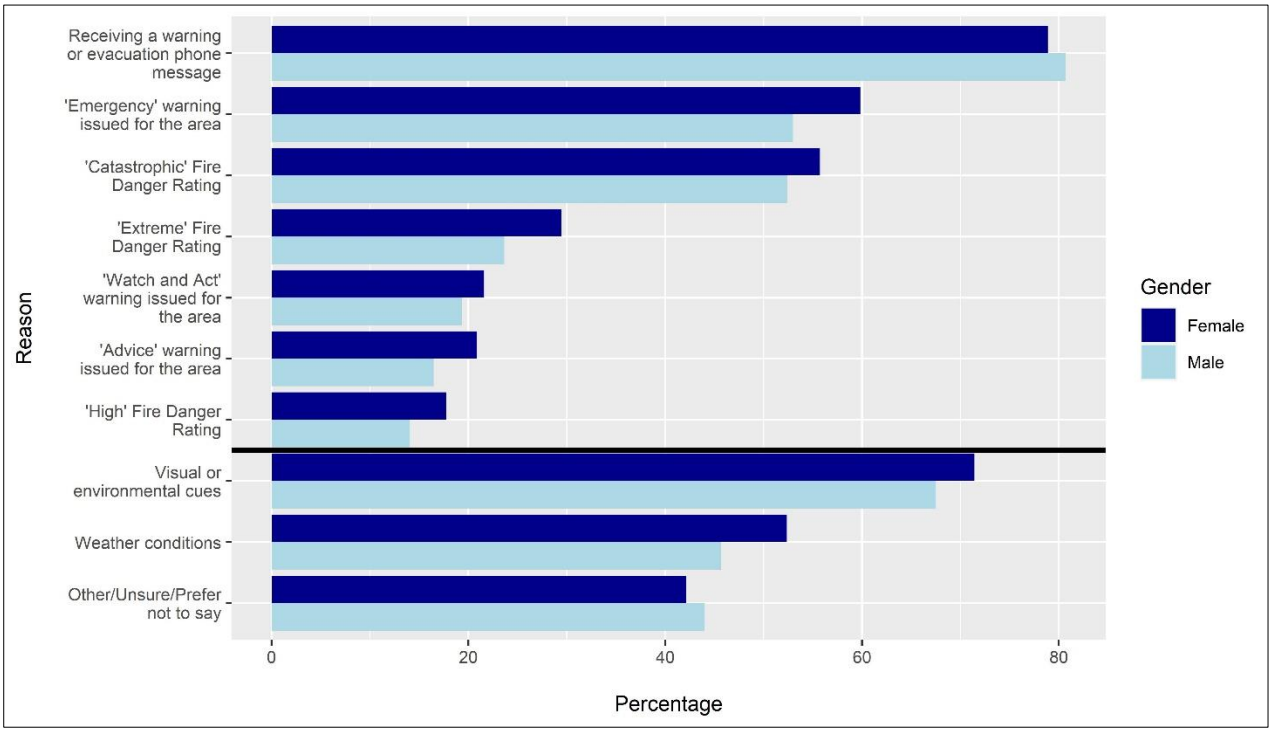

Figure S3: Influences on decisions to leave home during a wildfire event by gender, showing extrinsic factors above the horizontal line, and intrinsic factors below the horizontal line, Tasmania, Australia (2023).

E. Choosing where to evacuate

When asked the question "If you left your home, where would you most likely go?", over 70% of survey participants stated they would go to family or friends in an area not affected by the fire, which was slightly more prevalent for women. Just over 60% stated they would go to an evacuation centre, and just under 50% said they would go to a 'nearby safer place' (also known as a 'place of last resort') (see Figure S4, where responses are categorised by gender, and divided to formal structures above the horizontal line, or informal structures below the horizontal line). Other locations not captured in these categories include the beach, the river, in a boat, or the nearest waterfront area, and to the centre of the closest city, a shopping mall, oval, school or community centre. Multiple survey participants reported their final location would be dependent on the direction of the fire, with their intention to move away from the fire front.

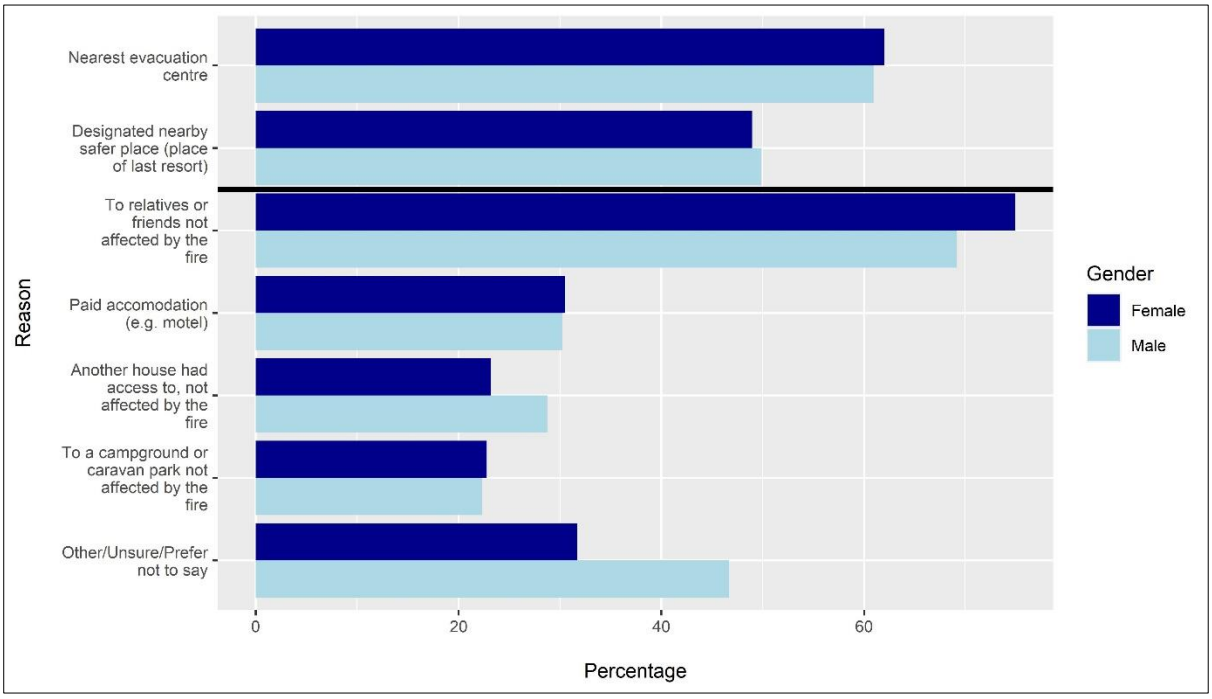

Figure S4: Preferred self-evacuation destinations during a wildfire threat, Tasmania, Australia.

F. Wildfire preparedness level and actions

Participants were asked to rate the preparedness level of their neighbourhood or local community, on a scale of 1-5, where 1 was 'very unprepared' and 5 was 'very prepared'. Responses were analysed by wildfire risk at home (see Figure S5). Only 6.6% of participants considered their community 'very prepared'.

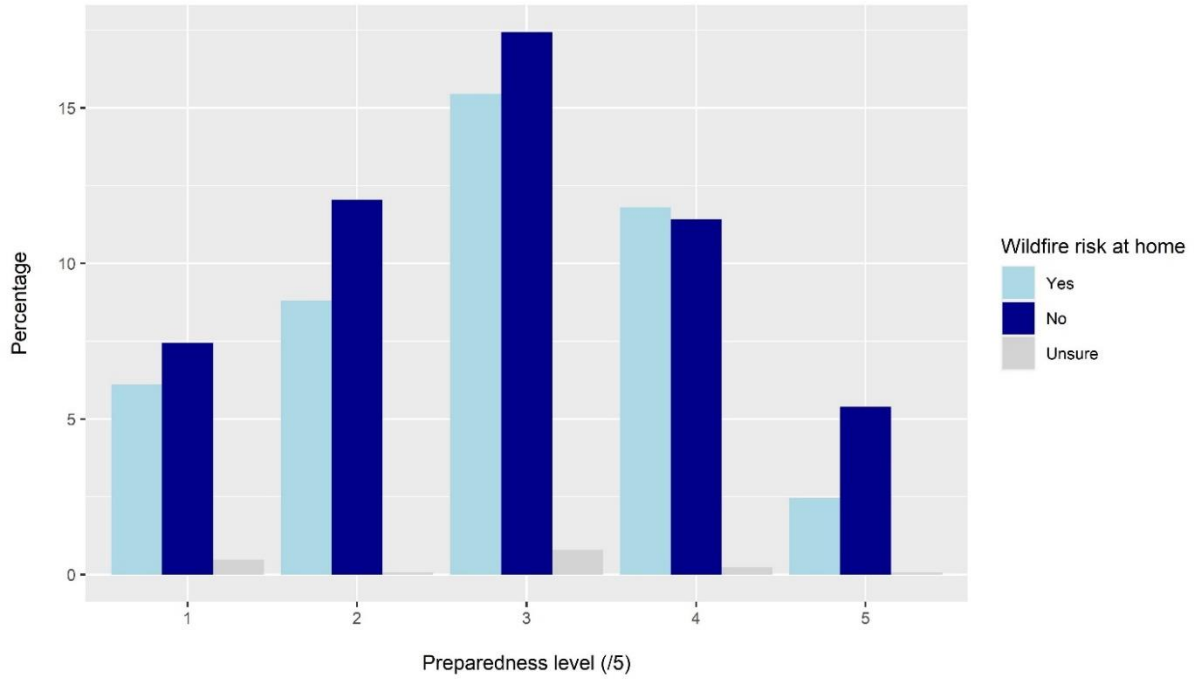

Figure S5: Community wildfire preparedness level (where 1 = very unprepared to 5 = very prepared) by wildfire risk at home (Tasmania, Australia).

If participants self-reported that their home was in an area at risk of wildfire, they were asked if they had undertaken activities to get their home and everyone in their home better prepared.

Of the 626 participants who reported living in an area at risk of wildfire, over three-quarters (77.8%) of participants reported they had undertaken actions around their home to be better prepared. These included clearing vegetation and gutters around the house, installing a water pump, making a survival plan, talking with people in the household about what to do in the event of a wildfire, and packing an emergency kit (see Figure S6). Other actions not captured in these categories include having the house built to a suitable fire hazard rating, having multiple hoses located around the property, and extensive land preparation such as building fire breaks and mowing paddocks.

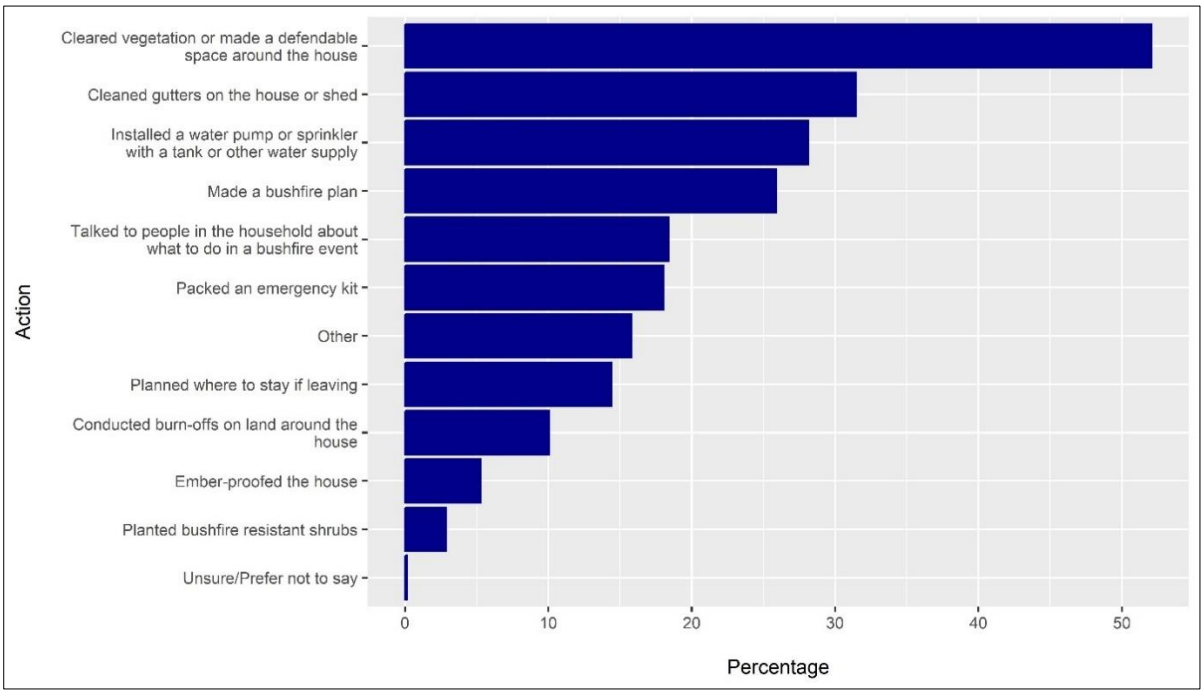

Figure S6: Preparedness actions reported by survey participants living in areas of high wildfire risk, Tasmania, Australia.

Those reporting being in an at-risk area and not undertaking preparedness actions (20.2%) were asked about the main reasons they had not prepared. Just over 40% (n=51) stated they did not need to undertake any preparation actions, while almost a third (32.3%) stated there was no point/it won't make a difference, and another third (32.2%) stated it wasn't a priority (see Figure S7). Other reasons for not undertaking preparedness actions included the perception of living in a low risk area, being 'slack' or 'lazy', and planning to leave in the threat of a fire, so preparedness actions were not necessary.

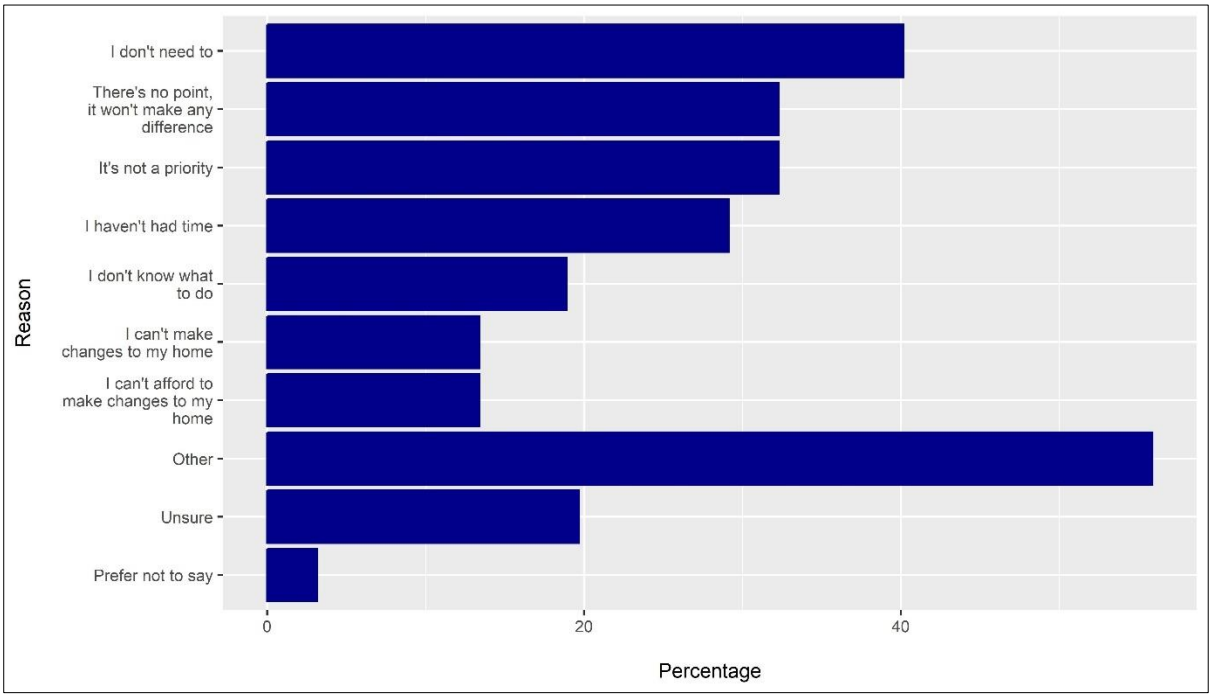

Figure S7: Reasons for lack of preparedness actions reported by survey participants living in areas of high wildfire risk, Tasmania, Australia.

G. Information sources

When asked "What sources do you use for bushfire information?", participants reported using visual and environmental cues, Tasmania Fire Service information, social media and word of mouth (for example, neighbours, family and friends). Local council and newspapers were the lowest ranked sources of information (see Figure S8).

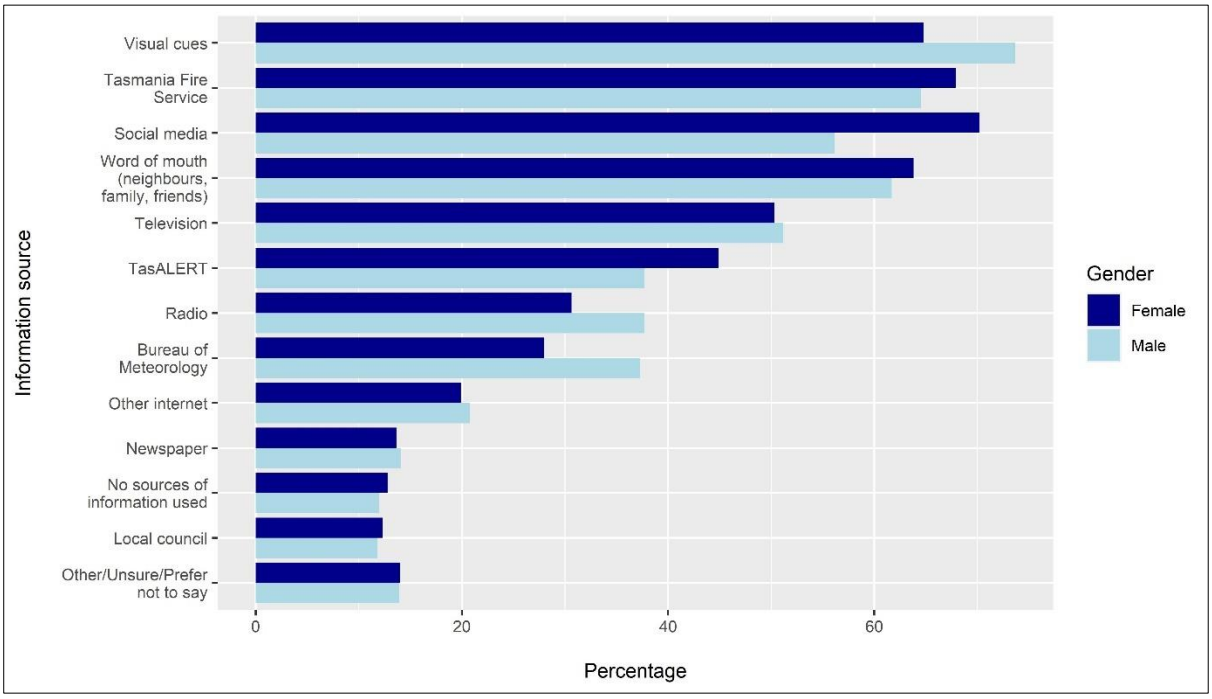

Figure S8: Sources used for wildfire information, by gender, Tasmania, Australia.

Using multiple sources of information was common, with an average of 4.3 sources used by each participant (range 0-10, SD=2.1) (see Figure S9).

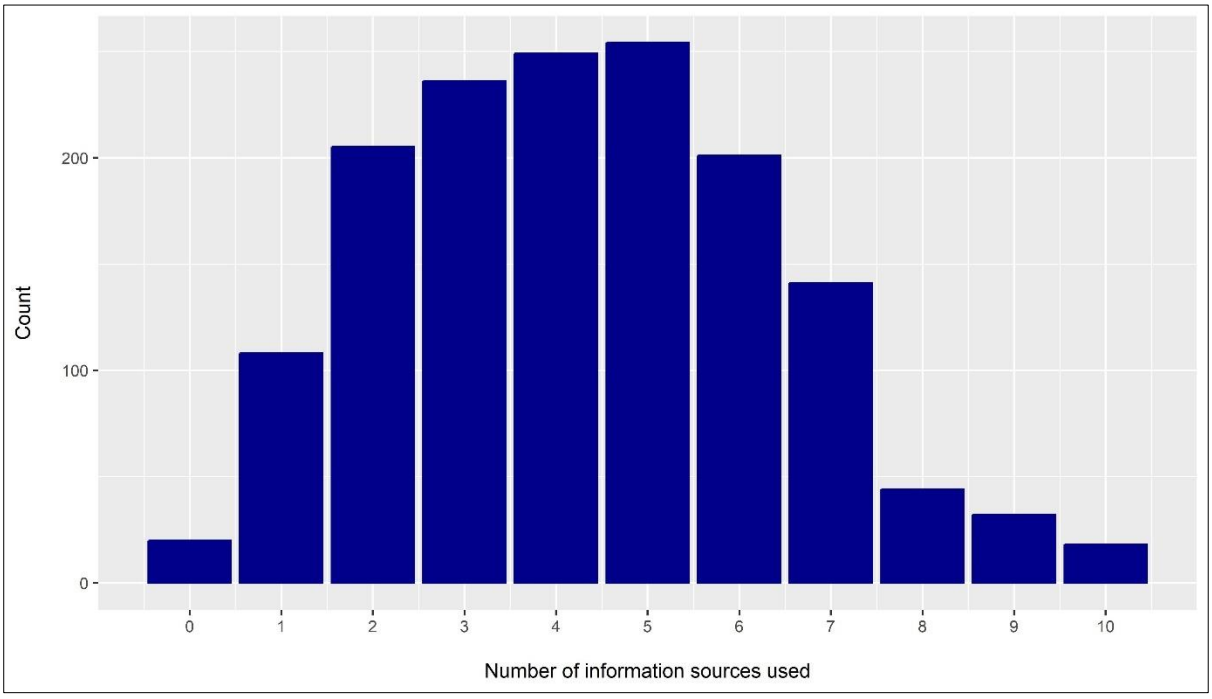

Figure S9: Number of sources used for wildfire information, Tasmania, Australia.

H. Catastrophic Fire Danger: meaning and action

When asked the phrase "Thinking about the phrase 'Catastrophic Fire Danger', what does this mean to you?", a large proportion (84%) understood the phrase as being the highest fire danger rating. Participants appeared to comprehend the severity of the rating, with 77% of participants understanding the phrase to mean "If there is a fire it is likely that people will die and homes will be destroyed", and 75.1% of participants understanding the phrase to mean "If there is a fire, it will be dangerous and hard to control". Less than 10% of participants either didn't know the phrase, or were unsure about its meaning (see Figure S10). Other responses reflected the severity of the situation, including "a terrifying experience", "absolutely evacuate…worst case scenario" and "life threatening". Many understood the phrase to mean a call to action, such as an immediate evacuation. A small number of participants responded that the phrase was meaningless or intended as a baseless threat, for example, "It's a scam to put fear into people's minds", "It is nonsense. Unnecessary. Extreme rating is enough.", and "A scary line to make people panic".

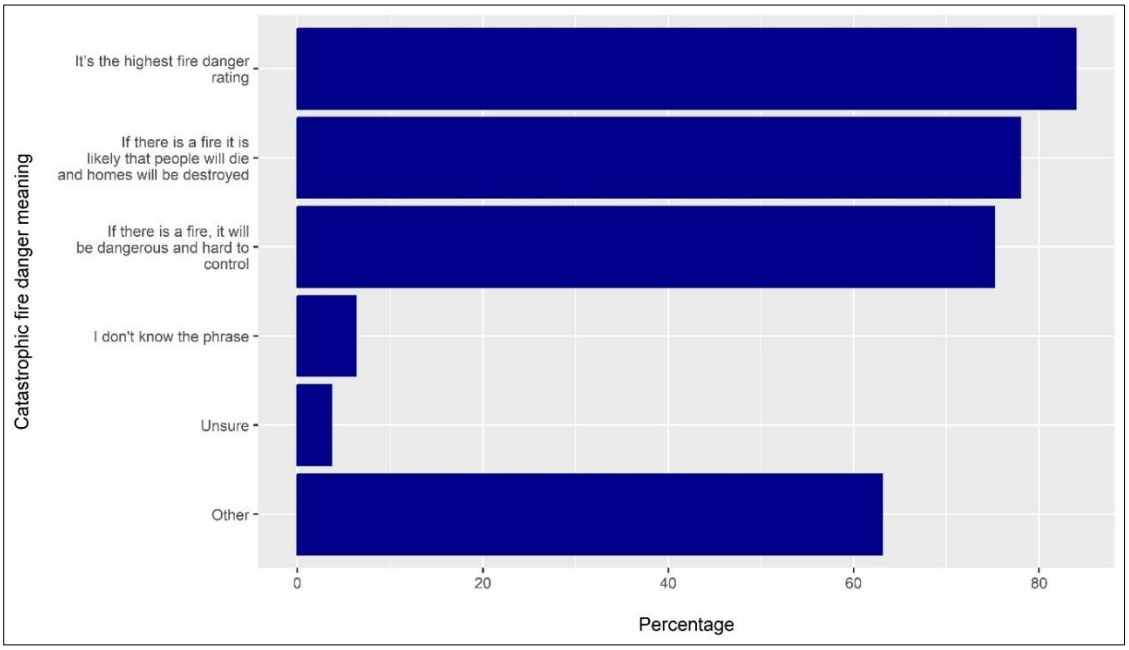

Figure S10: Understanding of the 'Catastrophic Fire Danger' rating , Tasmania, Australia.

When asked the question "On a day when there is a Catastrophic Fire Danger rating, but a fire has not yet started, what would you and other people in your home be most likely to do?", 41.1% of participants said they would stay in their current location, but keep track of official advice about what to do, while 23.6% said they would prepared their house or property, and 13.1% said they would do nothing different to normal. Only 11.8% of participants said they would leave as soon as practical. Of those that responded they would leave, or some people in their household would leave, 57% had planned where to go, 31% had not planned where to go, and the remaining 12% were unsure. Other responses included keeping in contact with family, friends and neighbours, and being prepared to evacuate (see Figure S11).

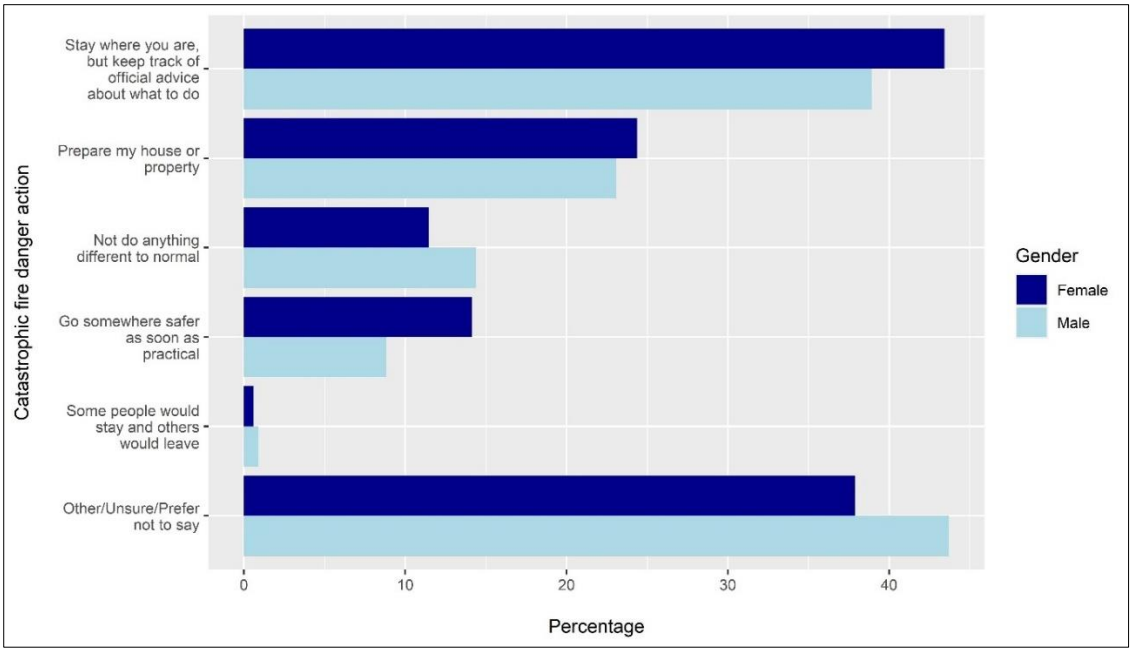

Figure S11: Actions associated with a 'Catastrophic Fire Danger' rating day, Tasmania, Australia.

I. Smoke exposure reduction actions

When asked the question "If there was a lot of bushfire smoke in or around your home, but there wasn't a bushfire nearby, what would you do to limit your exposure to the smoke?", 93.2% of respondents said they would seal gaps around the home to prevent outside air getting into the house, and 84.1% said they would not go outside until the smoke had cleared. Almost two-thirds (63.2%) pf participants said they would move to somewhere away from the smoke, and almost half (48%) would turn on their air-conditioner. Almost one in five participants (18.2%) stated they would do nothing (see Figure S12). Other responses included turning the air-conditioner off, and wrapping something around the face, such as a wet towel or cloth. Many responses indicated a response action directed at fire control and awareness rather than limiting smoke exposure, such as wetting down areas around the house or similar preparation.

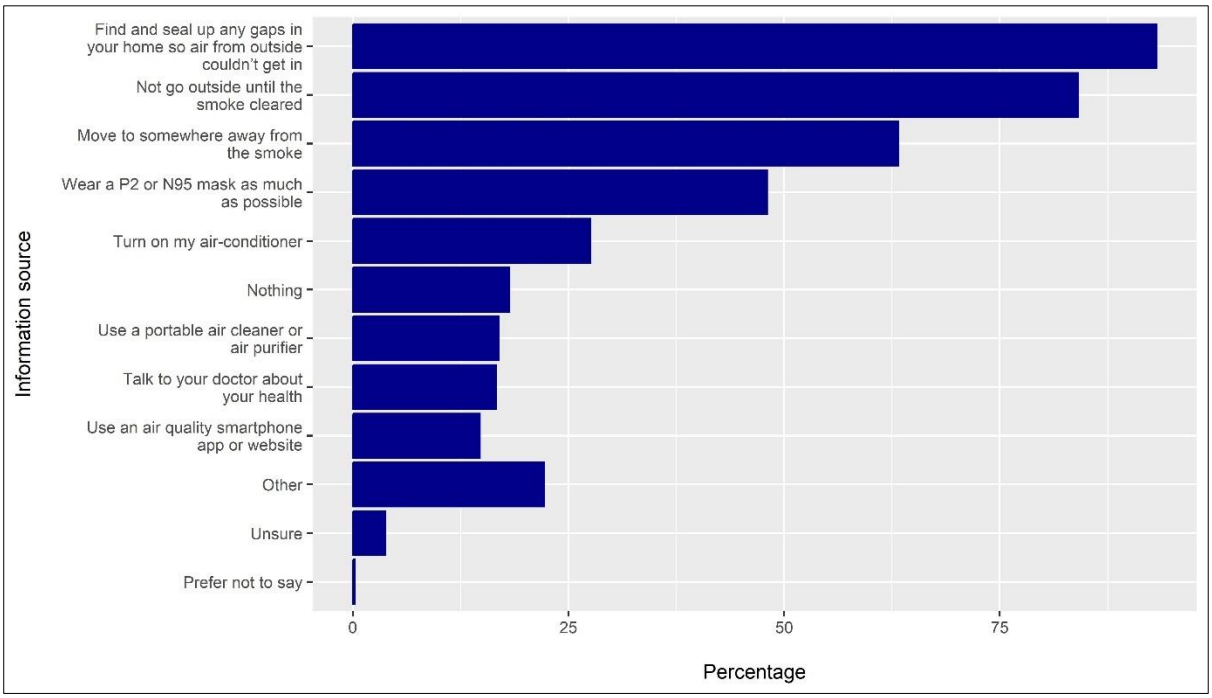

Figure S12: Actions associated reducing smoke exposure, Tasmania, Australia.

J. Regression analysis for intention to leave and sociodemographic outcomes

Table S2: Risk ratios, 95% confidence intervals and significance levels for the association between leave intention and sociodemographic outcomes, in a representative sample of 1270 people in Tasmania, Australia (2023).

	Leave intention		
Predictors	Risk Ratio	95% CI	*p*
Gender (Female)	1.25	1.17 – 1.33	**<0.001***
Age (>65)	0.95	0.88 – 1.01	0.130
Income (over $50,000)	1.06	1.00 – 1.13	0.061
Wildfire risk at home (yes)	1.00	0.95 – 1.05	0.948
Previous direct wildfire experience (yes)	0.99	0.94 – 1.04	0.636
Home owner	1.01	0.96 – 1.07	0.792
Urban	1.09	1.03 – 1.15	**0.003***

Bold and * indicates $p<0.05$

K. Regression analysis for preparedness actions and sociodemographic outcomes

Table S3: Risk ratios, 95% confidence intervals and significance levels for the association between undertaking preparedness actions and sociodemographic outcomes, in a representative sample of 557 people in Tasmania, Australia (2023).

	Undertaking preparedness action		
Predictors	Risk Ratio	95% CI	*p*
Gender (Female)	0.99	0.93 – 1.06	0.844
Age (>65)	1.05	0.97 – 1.13	0.230
Income (over $50,000)	1.00	0.92 – 1.09	0.948
Previous direct wildfire experience (yes)	1.18	1.08 – 1.28	**<0.001**
Home owner	1.49	1.22 – 1.84	**<0.001**
Urban	0.92	0.86 – 0.98	**0.015**

Bold and * indicates $p<0.05$

L. 2016 TPHS/2023 survey results

Table S4: Home wildfire risk and self-evacuation intention, Tasmania, Australia (2016 and 2023).

	Bushfire risk at home		Self-evacuation intention	
	Yes	No	Leave	Stay
2016	1666	4067	1064	568
2023	626	860	477	123

Table S5: Wildfire leave intention proportion by gender and location, Tasmania, Australia (2016 and 2023).

Location	**Gender**	**Year**	**Mean**	**95% CI**
Rural	Female	2016	0.73	0.69-0.77
Rural	Female	2023	0.84	0.78-0.90
Rural	Male	2016	0.51	0.47-0.55
Rural	Male	2023	0.58	0.54-0.64
Urban	Female	2016	0.77	0.73-0.80
Urban	Female	2023	0.93	0.90-0.97
Urban	Male	2016	0.53	0.50-0.57
Urban	Male	2023	0.65	0.61-0.69

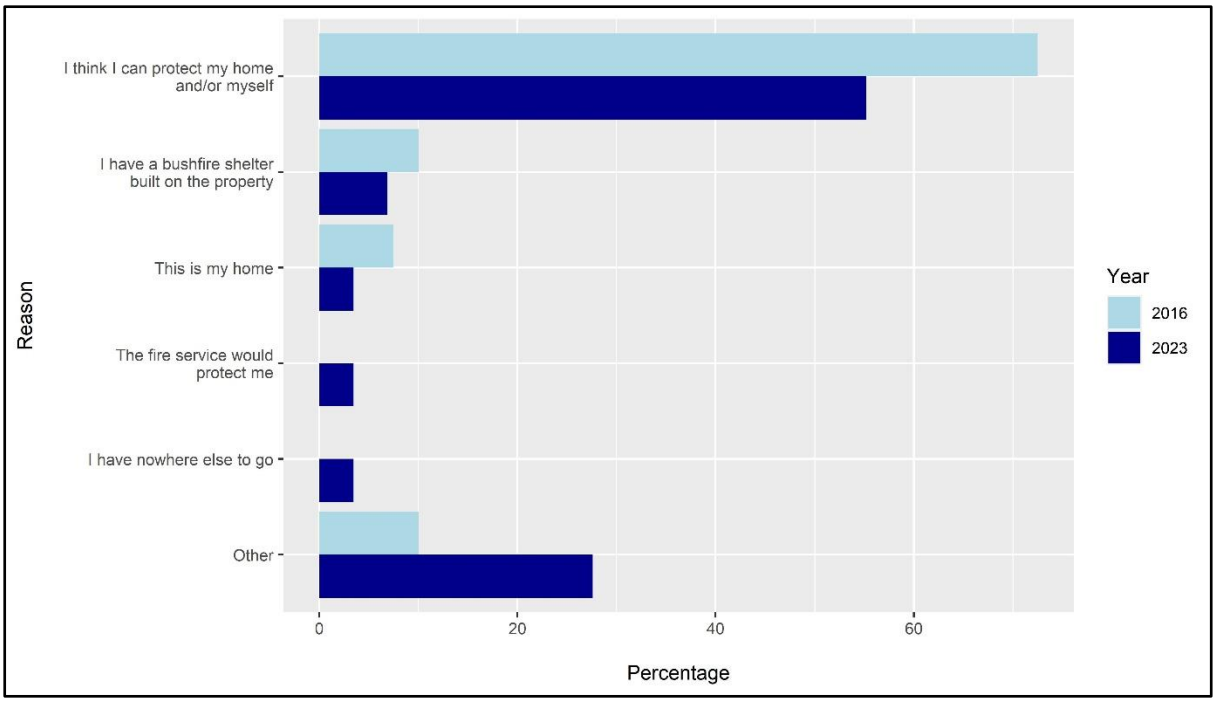

Figure S13: Comparison of reasons for staying at home during a wildfire threat, Tasmania, Australia (2016 and 2023).

Note: Additional response choices were added in 2023 (“The fire service would protect me” and “I have nowhere else to go”), with a very small number of participants choosing these response options (n=1 for each).

References

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