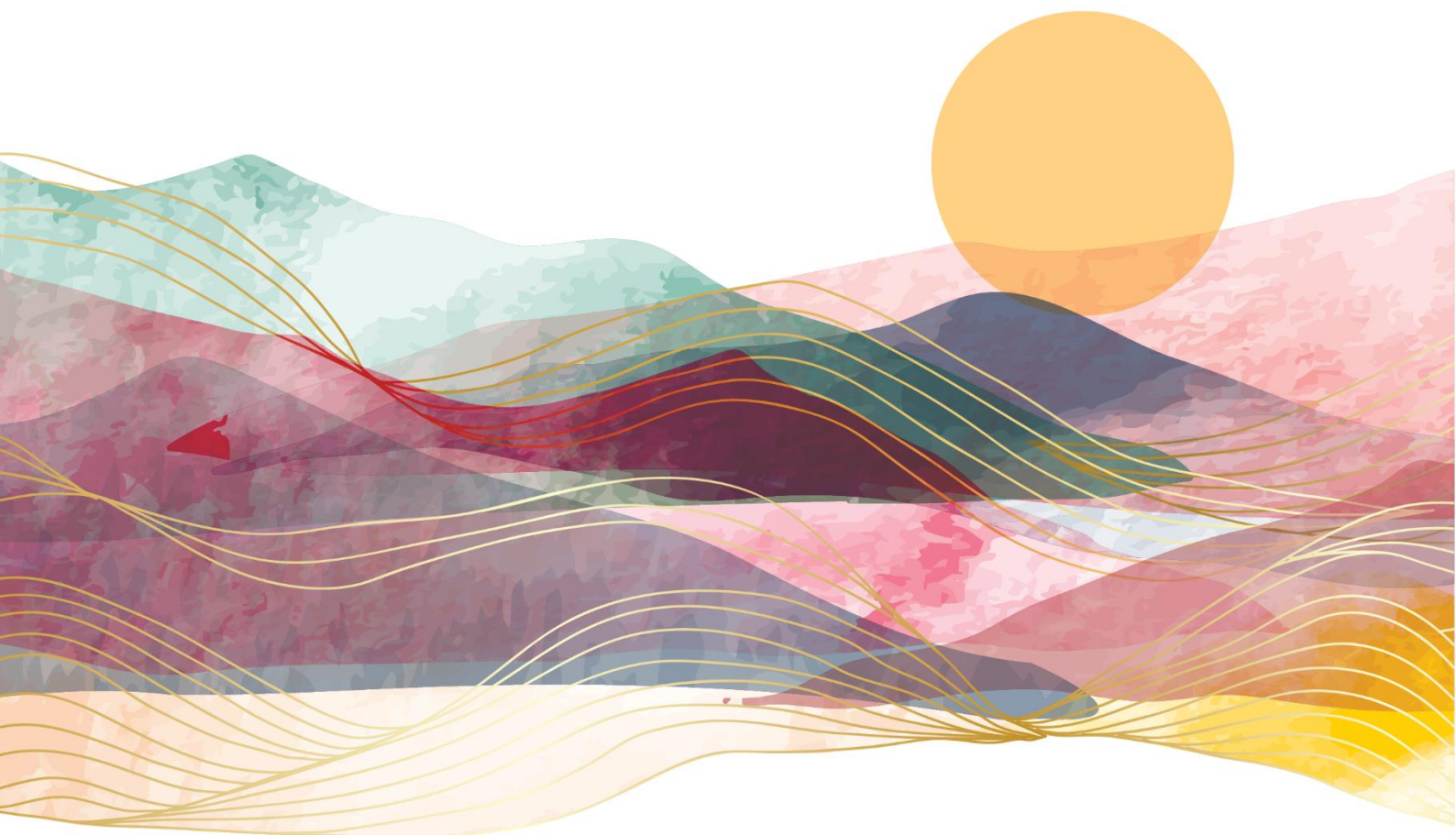ACT Government | ACT Health

The PATH Through Life Project:
Impact of the 2019/2020 Bushfires on a Cohort of Older Adults

Report prepared for
ACT Health by UNSW Psychology and
UNSW Ageing Futures Institute

February 2023

Acknowledgements

This report was commissioned by the ACT Health Directorate and provides statistics and findings from the PATH Through Life Project (PATH) related to the health of PATH participants during the 2019/2020 Australian bushfire season. It was prepared by the University of New South Wales (UNSW) on behalf of the ACT Health Directorate's Epidemiology Section and was written by Mr James Lian of UNSW. Prof Kaarin J. Anstey, Dr Ranmalee Eramudugolla, Dr Sarang Kim of UNSW, and Mr Glenn Draper of ACT Health's Epidemiology Section provided extensive input into this project. Dr Craig Sinclair, Dr Kim Kiely, Dr Brooke Brady, Dr Scherazad Kootar of UNSW, and Dr Richard Burns of Australian National University provided reviews.

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ACT Health acknowledges the Traditional Custodians of the land, the Ngunnawal people. ACT Health respects their continuing culture and connections to the land and the unique contributions they make to the life of this area. ACT Health also acknowledges and welcomes Aboriginal and Torres Strait Islander peoples who are part of the community we serve.

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Executive summary

The PATH Through Life project is a large, population-based, longitudinal cohort study. Participants were randomly sampled from the electoral roll of the ACT and neighbouring town of Queanbeyan, NSW in 1999/2000 and have since been followed up approximately every 4 years. The time interval between the 4th and 5th wave was 5–7 years. At baseline, the study included 7,485 adults in three narrow age cohorts: 20–24 years (birth years 1975–1979; 20s cohort), 40–44 years (birth years 1956–1960; 40s cohort) and 60–64 years (birth years 1937–1941; 60s cohort). The PATH survey includes demographic questions as well as multiple measures of mental and physical health.

In late 2019 and mid-2020, 1,069 participants aged 59–65 years (40s cohort) completed an online PATH survey as part of the fifth wave of data collection. The data collection commenced prior to the 2019/2020 bushfires. Consequently, it was possible to examine the impact of the bushfires on our study cohort. An additional ad hoc questionnaire was developed to capture each participant's experiences with the bushfires. Participants who had completed their planned assessment were re-contacted and offered an online bushfire questionnaire, while those who had not yet been contacted, received the additional items as part of their planned assessment. The bushfire questionnaire forms the basis of this report.

The key findings of this report are:

1. On average, mental health worsened during the bushfire period but returned to pre-bushfire levels following the bushfires.

2. People directly exposed to the bushfires experienced significantly worse mental and physical health outcomes compared to people not exposed or indirectly exposed to the bushfires.

3. Feeling prepared for natural disasters was associated with better mental and social health outcomes following the bushfires.

In summary, respondents in this cohort were resilient to the bushfires. There was no significant difference between average scores on mental and physical health measures before, during, and after the bushfires. However, mental health outcomes such as depression and anxiety followed a consistent pattern, which was to slightly worsen during the bushfire period and return to pre-disaster levels following the bushfires.

Direct exposure to the 2019/2020 bushfires led to significantly worse outcomes for anxiety, depression, general mental health, general physical health, and psychological trauma measures. Women experienced more negative effects on mental health than men as a result of direct fire exposure. However, no exposure group differences were observed for suicidality, alcohol use, and sleep quality.

Finally, disaster preparedness was a protective factor against the negative health impacts of the bushfires. Feeling better prepared for bushfires was associated with more positive scores on measures associated with anxiety, depression, suicidality, psychological trauma, and sleep quality.

1. Introduction

The 2019/2020 bushfire season in Australia was one of the most severe in recorded history. Over 24 million hectares were burnt, and many Australians were impacted, directly or indirectly, by the fires. In total, 33 people died and many more experienced smoke-related health problems. Over 3,000 homes were destroyed, while threats to lives and property resulted in large scale evacuations. The national financial cost of the fires was estimated to be over $10 billion. Bushfire severity and duration are expected to increase due to climate change.

Natural disasters such as bushfires have an impact on both the physical and mental health of people. Following a bushfire event, such as that experienced in 2019/2020, people are at higher risk of depression, anxiety, trauma, drug abuse, and reduced lung function (Bryant et al., 2018). These effects can result from direct bushfire exposure, such as firefighting, or indirect exposure, such as family or friends being impacted by fires.

The aim of this study was to examine the impact of the 2019/2020 bushfires on the health of older adults. Furthermore, the study examined whether disaster preparedness affected health outcomes following the bushfires.

1.1. PATH Through Life Project

The Personality & Total Health (PATH) Through Life project is a large, population-based, longitudinal cohort study. Participants were randomly sampled from the electoral roll of the ACT and nearby city of Queanbeyan in 1999/2000 and have since been followed up every 4 years for waves 2–4. The time interval between the 4th and 5th wave was 5–7 years. A description of the first four waves of the study has been published in the International Journal of Epidemiology (Anstey et al., 2020; Anstey et al., 2012).

1.2. Methodology

In late 2019 and mid-2020, 1,069 participants aged 59–65 years (birth years 1956-60; referred to as the '40s cohort') completed an online PATH survey as part of the fifth wave of data collection. Three comparison groups were formed based on when they were assessed, to evaluate the impact of the bushfire. The sample was split into three groups: those who completed the PATH survey before the bushfires started (12th of November 2019), those who completed the survey during the bushfires, and those who completed the survey after the bushfires concluded (27th of February 2020); see Figure 1. Scores for health outcomes were then averaged and compared between the three groups.

Health outcomes were also assessed based on a participant's level of bushfire exposure. The sample was split into three groups: "pre-exposed", "directly exposed" and "indirectly exposed". Those who completed the PATH survey before the bushfires were allocated to the "pre-exposed" group. Meanwhile, those who completed the PATH survey during or after the fires and responded "Yes" to any of the following questions were allocated to the "directly exposed" group:

- Involved in fighting the fires

- Worked directly in fighting the fires

- Own home, possessions or workplace was damaged by the fires

- Experienced health issues as a result of the fires

Participants who completed the PATH survey during or after the fires but did not respond "Yes" to the above questions were allocated to the "indirectly exposed" group. Scores for health outcomes were then averaged and compared between the three groups.

Figure 1. Flowchart of the distribution of PATH participants
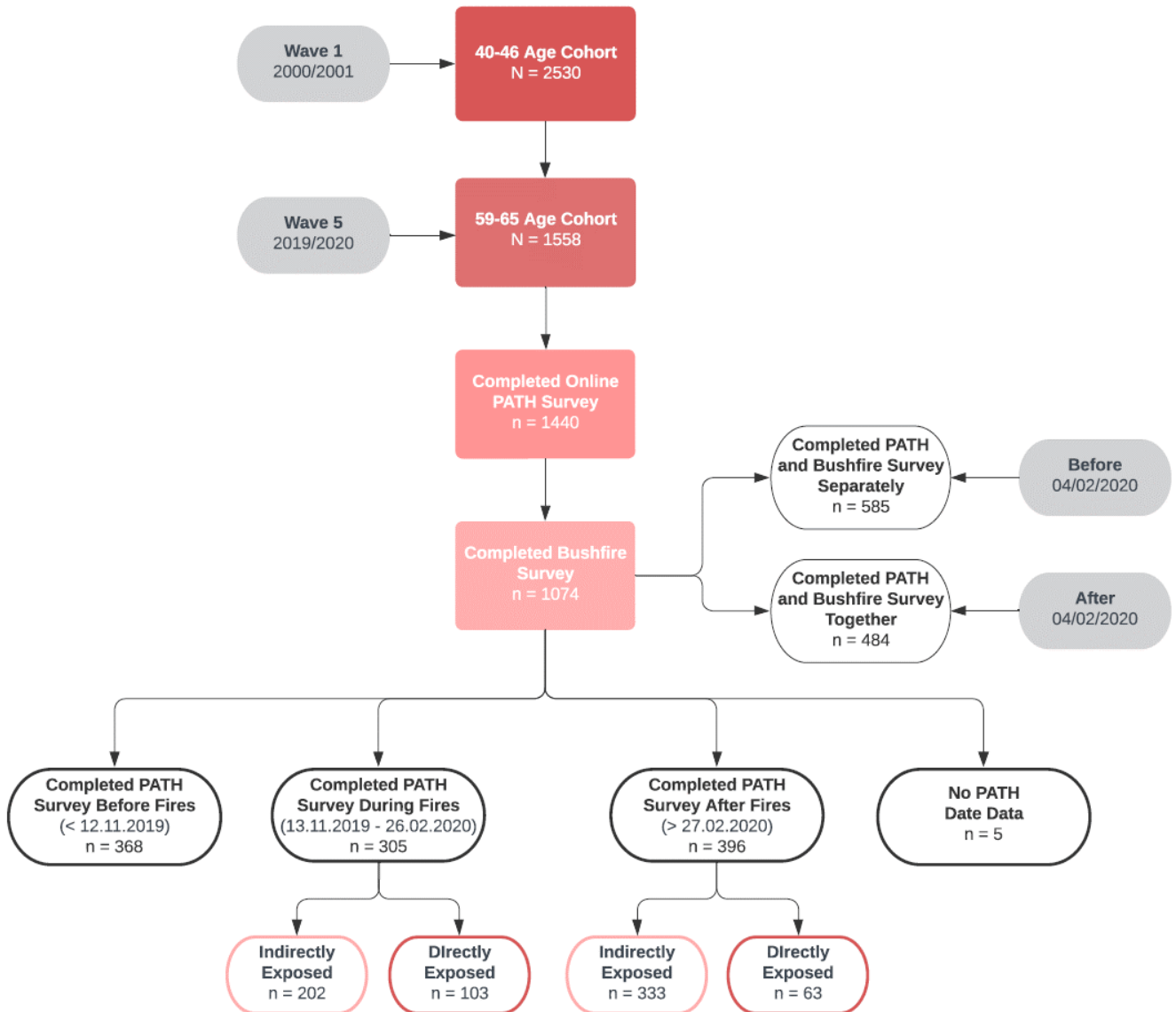
1.3. Measures of mental and physical health

Mental and physical health was measured using numerous validated questionnaires. Details about each questionnaire and their clinical cut-offs are summarised in Appendix 7.1. Unless otherwise specified, higher scores indicate poorer outcomes.

1.4. Demographic profile

The demographic profile of PATH participants was comparable with that of the Australian population (ABS, 2022), where the PATH sample had a similar distribution for gender and income. However, the PATH sample had a higher proportion of Caucasian respondents than the Australian population.

The three bushfire timing sample groups were comparable across gender, age, income, and education.

Table 1. Demographics by assessment timepoint (before, during, or after the bushfires)

	Before (n = 368)	During (n = 305)	After (n = 396)
Gender (%female)	53.00	51.80	51.77
Age	61.73	62.01	62.18
Household Income	4.52	4.54	4.40
Education (years)	14.94	15.21	14.92

Note: Household income was measured in a categorical variable. 1 refers to 'no more than $300 per week'; 2 refers to 'more than $300 per week but no more than $649 per week'; 3 refers to 'more than $650 per week but no more than $999 per week'; 4 refers to 'more than $1,000 but no more than $1,749 per week'; 5 refers to 'more than $1,750 but no more than $2,999 per week'; and 6 refers to 'more than $3000 per week'.

The three bushfire exposure groups were also comparable, scoring similarly across age, income, and education. However, the directly exposed group had a higher proportion of female respondents.

Table 2. Demographics by exposure.

	Pre-bushfire (n = 368)	Indirectly exposed (n = 539)	Directly exposed (n = 167)
Gender (%female)	52.60	50.01	57.23
Age	61.73	62.15	62.00
Household Income	4.69	4.64	4.73
Education (years)	14.94	14.99	15.22

Note: Household income was measured in a categorical variable. 1 refers to 'no more than $300 per week'; 2 refers to 'more than $300 per week but no more than $649 per week'; 3 refers to 'more than $650 per week but no more than $999 per week'; 4 refers to 'more than $1,000 but no more than $1,749 per week'; 5 refers to 'more than $1,750 but no more than $2,999 per week'; and 6 refers to 'more than $3000 per week'.

2. Health outcomes before, during, and after the bushfires

In this section, outcomes of mental, physical, and social health measures were compared between the three bushfire timing groups. 95% confidence intervals were used in all bar charts. Although trends were observed, no statistically significant differences were observed at the α = .05 level for any of the outcome variables examined for this cohort aged 59-65 years (see Appendix 7.2 for further information).

2.1. Anxiety and depression

Anxiety and depression remained relatively low during and after the 2019/2020 bushfires. However, while not statistically significant, a small increase in both anxiety and depression scores were recorded during the fires.

Figure 2. Anxiety and depression scores before, during, and after the 2019/2020 bushfires.
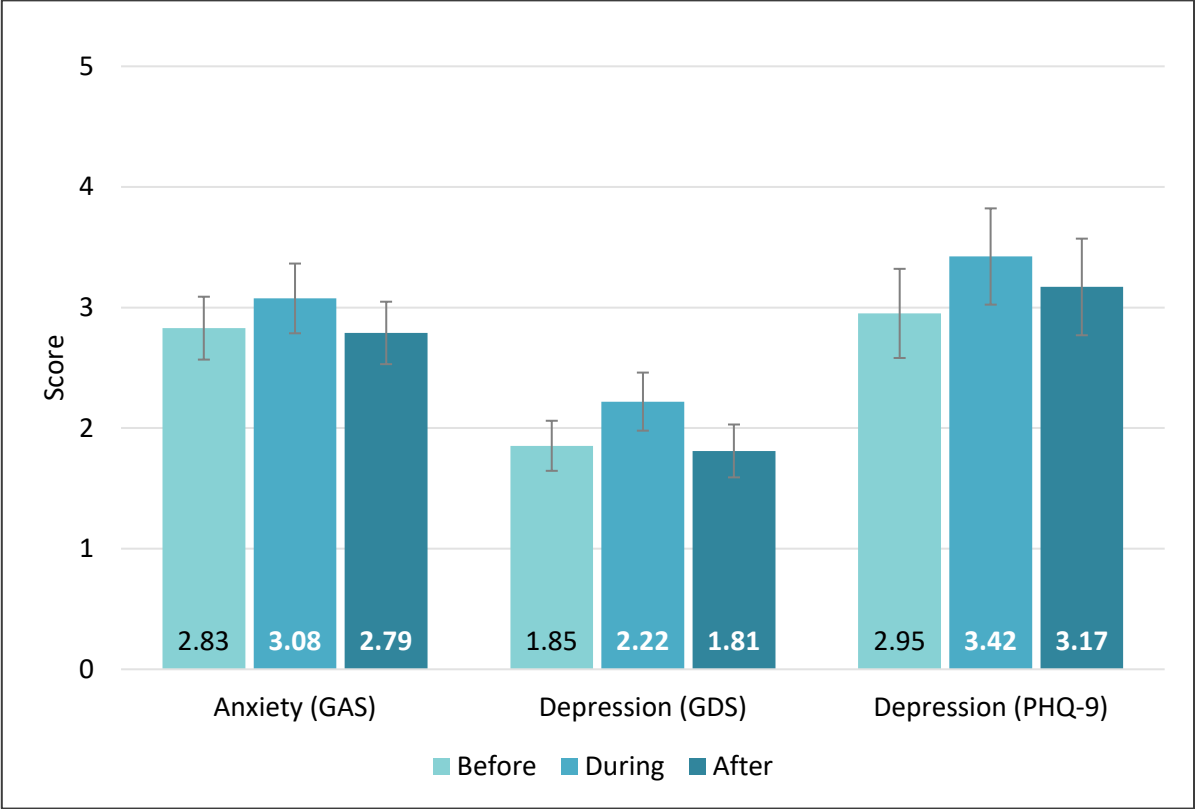
Note. Anxiety and depression measured by the Goldberg Anxiety Scale (GAS; range from 0-9), Goldberg Depression Scale (GDS; range from 0-9), and Patient Health Questionnaire (PHQ-9; range from 0-27). Higher scores indicate worse outcomes.

2.2. General mental health

General mental health showed a similar pattern to anxiety and depression whereby mental health scores were slightly worse during the bushfires and returned to baseline after the fires.

Figure 3. Mental health scores before, during, and after the 2019/2020 bushfires.
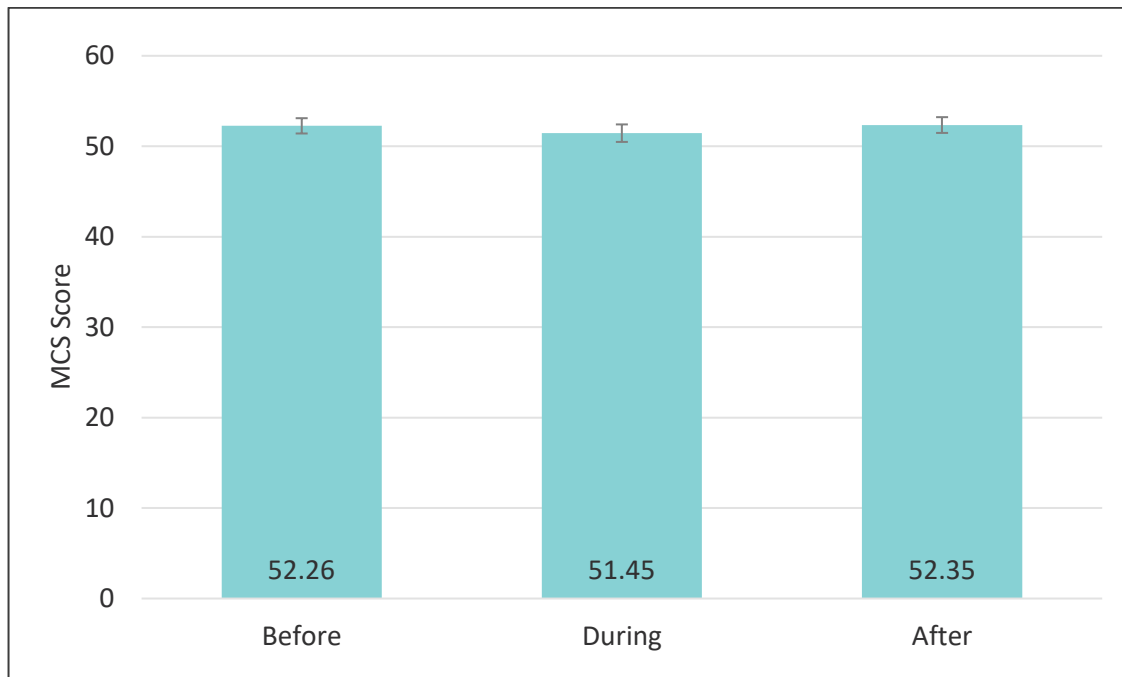
Note. General mental health was measured by the Short Form Survey (SF-12) mental component (MCS; range from 0-100). Lower scores indicate a higher probability of a mental condition.

2.3. Suicidality

Suicidality scores were slightly lower during the bushfires and remained low after the fires.

Figure 4. Suicidality before, during, and after the 2019/2020 bushfires.
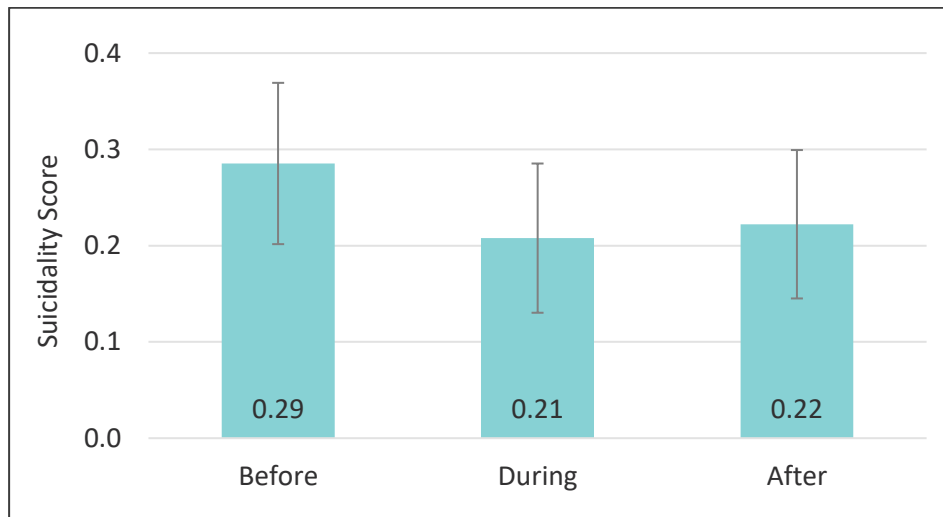
Note. Suicidality scores range from 0-6 and higher scores indicate greater suicidal ideation.

2.4. Alcohol use

Participants who completed the survey before and during the bushfires consumed alcohol at similar levels. However, a slight but not statistically significant increase in alcohol use was observed among those who completed the PATH survey following the bushfires.

Figure 5. Alcohol use before, during, and after the 2019/2020 bushfires.
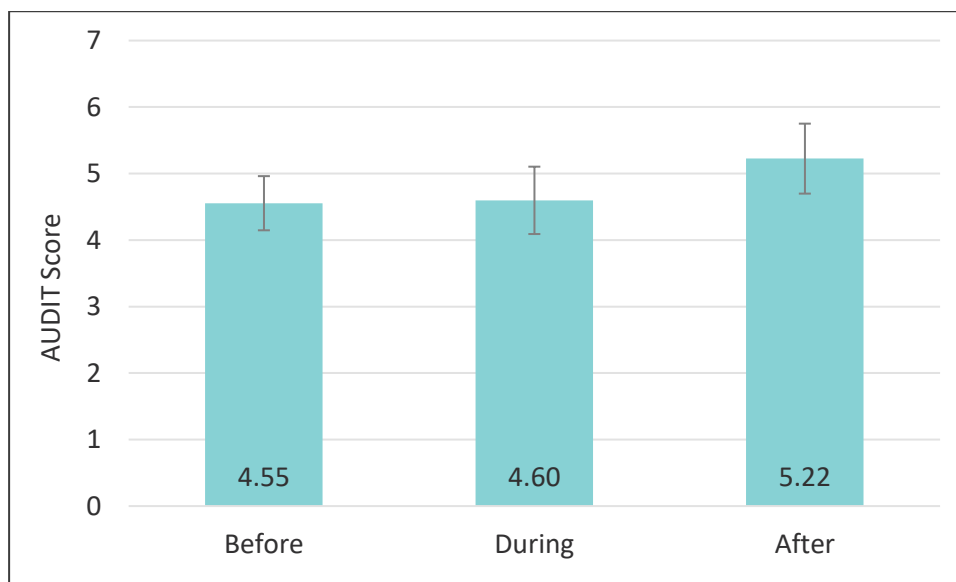
Note. Alcohol use was measured by the Alcohol Use Disorders Identification Test (AUDIT; range 0-40). Higher scores indicate higher risk of having an alcohol abuse problem.

2.5. General physical health

Very little difference in general physical health was reported among respondents regardless of when they completed the survey.

Figure 6. Physical health before, during, and after the 2019/2020 bushfires.
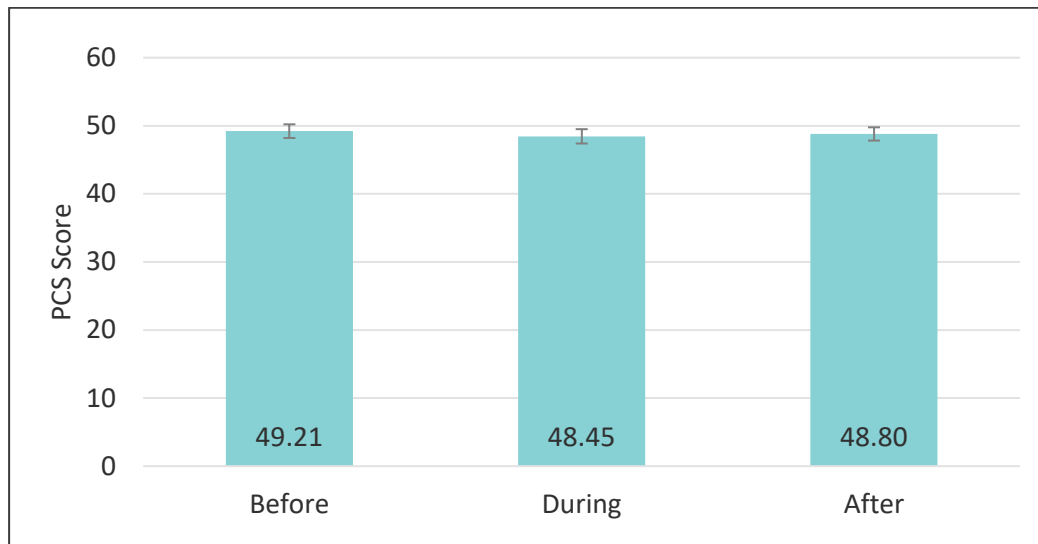
Note. Physical health was measured by the Short Form Survey (SF-12) physical health component (PCS; range 0-100). Lower scores indicate higher probability of a physical condition.

2.6. Sleep quality

The Insomnia Severity Index scores the quality of sleep on a scale of 0–28, with higher scores indicating a high risk of insomnia. Sleep quality remained similar across all three bushfire timing groups.

Figure 7. Sleep quality before, during, and after the 2019/2020 bushfires.
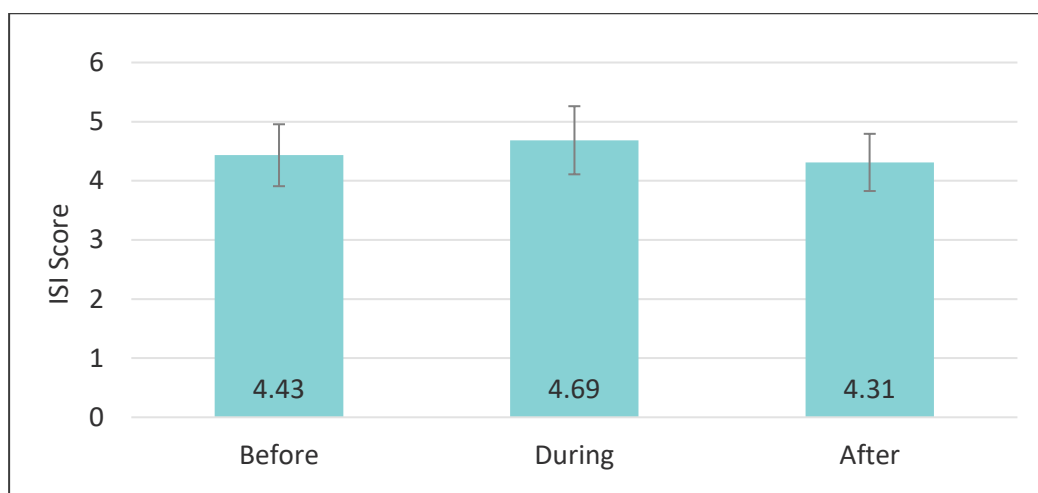
Note: Sleep quality was measured by the Insomnia Severity Index (ISI; range 0-28). Higher scores indicate greater risk of insomnia.

2.7. Physical activity

Time spent doing physical activity did not change significantly during and after the bushfires.

Figure 8. Physical activity before, during, and after the 2019/2020 bushfires.
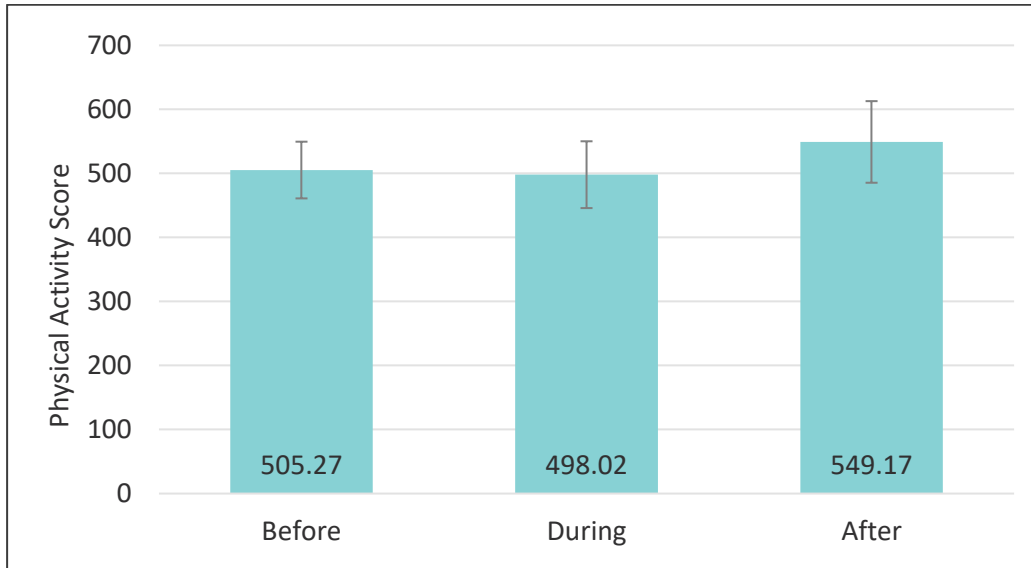
Note: Physical activity was measured using a sub-section of the Active Australia Survey. Physical Activity score was calculated by summing minutes of walk per week, minutes of moderate activity per week, and 2 x minutes of vigorous activity per week. Higher scores represent more time spent doing physical activities.

2.8. Volunteering

Time spent volunteering was slightly greater during and after the bushfires when compared to baseline levels.

Figure 9. Hours spent volunteering per week before, during, and after the 2019/2020 bushfires.
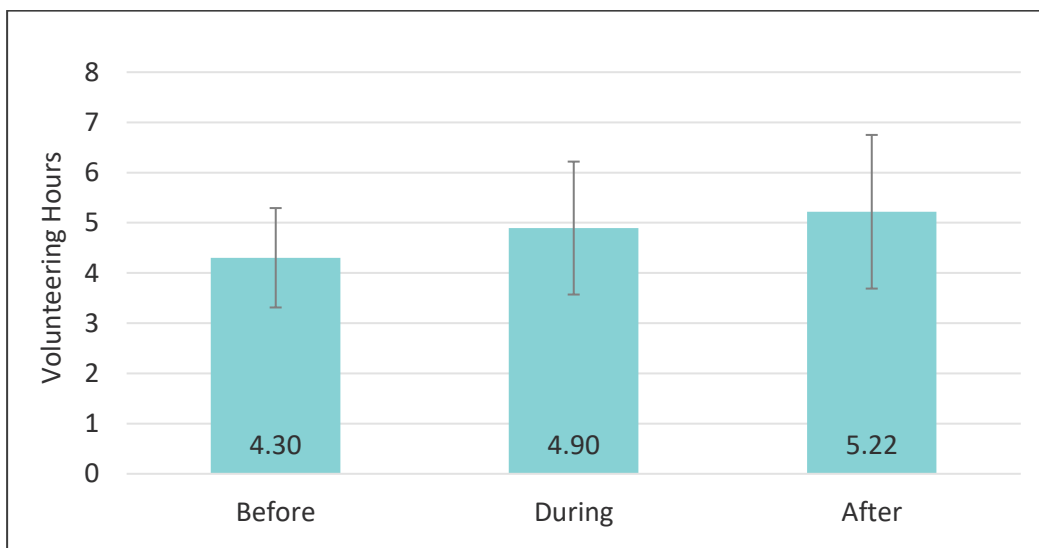
2.9. Resilience

Psychological resilience slightly increased during and after the bushfires when compared to baseline levels.

Figure 10. Psychological resilience before, during, and after the 2019/2020 bushfires.
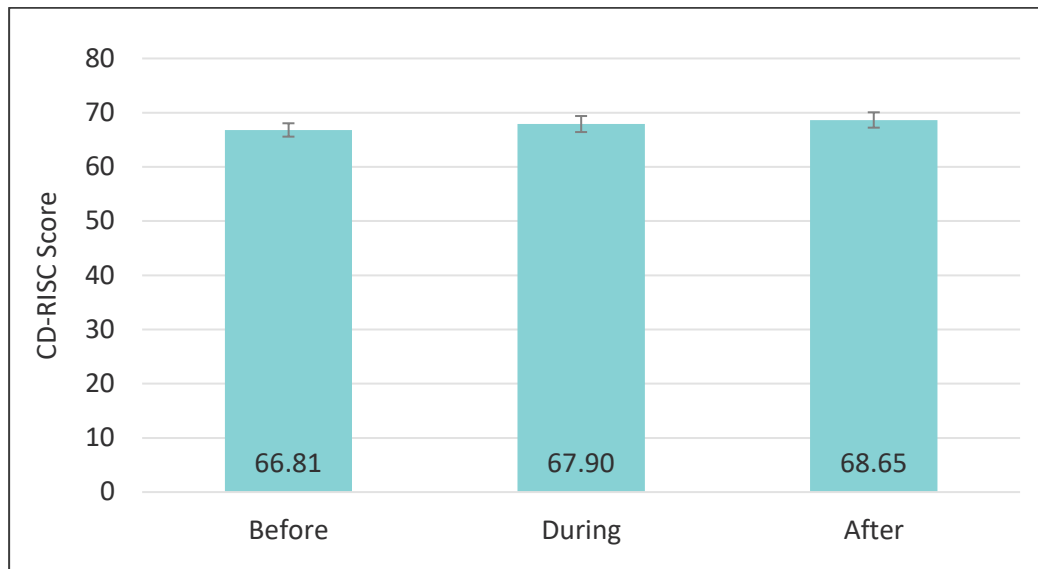
Note: Resilience was measured by the Connor-Davidson Resilience Scale (CD—RISC; range 0-100). Higher scores indicate greater psychological resilience.

2.10. Clinical health

The proportion of participants meeting clinical health cut-offs (see Appendix 7.1 for definitions) was significantly greater during the bushfires for depression (GDS), general physical health, and lung function. A smaller proportion met clinical cut-offs for high blood pressure during the fires. All other differences were not statistically significant.

Figure 11. Percentage of people who met clinical cut-offs for adverse health outcomes before, during, and after the bushfires.

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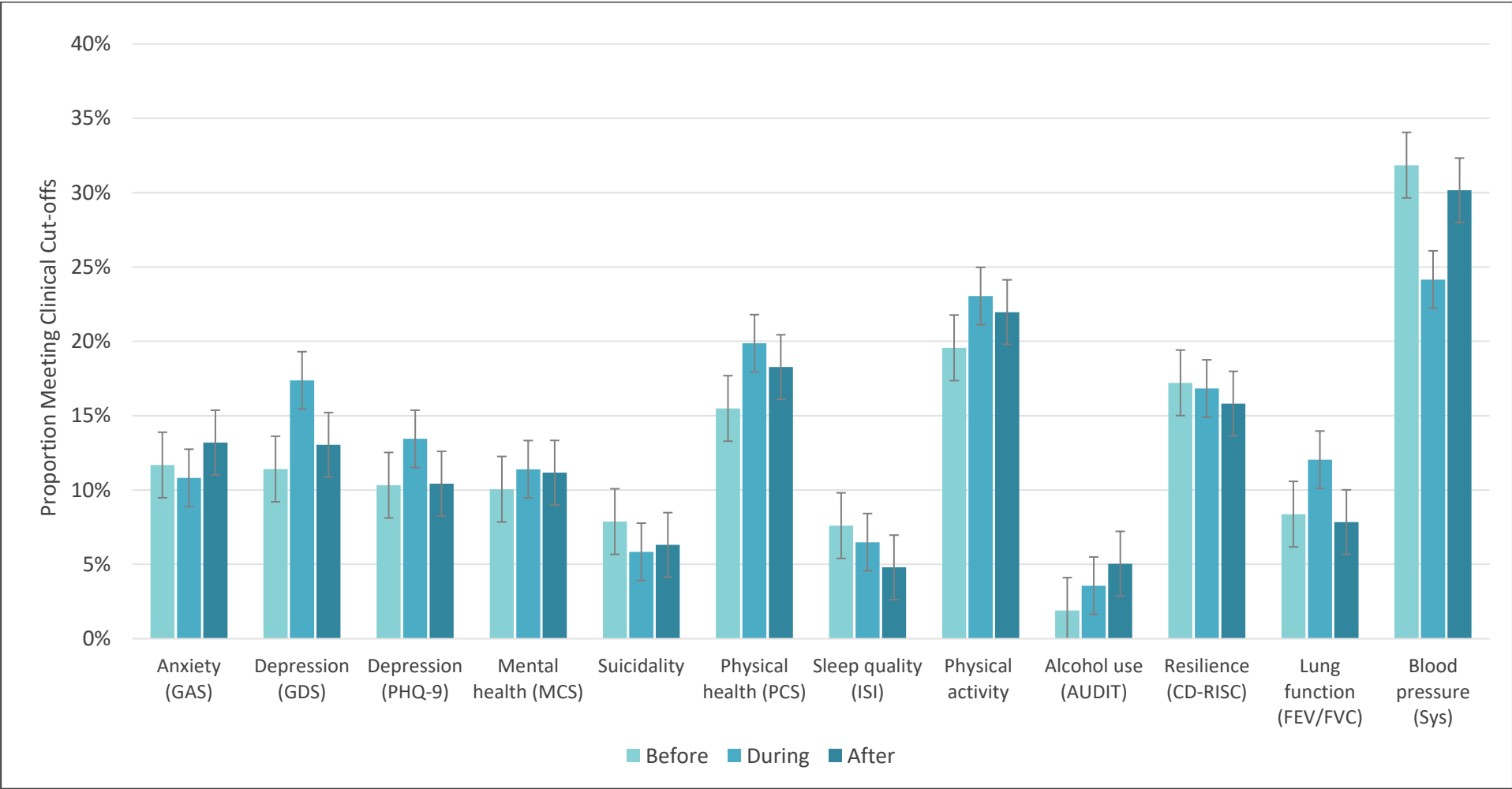
2.11. Summary

In summary, Figures 2-10 show small but important differences in mean health scores before, during, and after the bushfire for this cohort aged 59 to 65 years. Notably, mental health as measured by four separate measures (GAS, GAD, PHQ-9, MCS), was poorer in those assessed during the bushfire compared to those assessed at pre-disaster and post-disaster time points. These findings suggest that people experienced a worsening of their mental health during the bushfire period. However, on average, people were resilient and mental health tended to improve to baseline levels following the bushfire event. A follow-up of this cohort is necessary to confirm this.

In line with these findings, resilience scores were higher in those assessed during and after the bushfires. Interestingly, suicidality scores were lower during this period, which contrasts with results from other disaster studies. There was no statistically significant difference in alcohol consumption between the before and during groups. However, consumption was greater in those assessed after the bushfires, which aligns with prior studies where drinking is used as a coping mechanism following disasters (Bryant et al., 2018; Bryant et al., 2014).

Physical health and sleep quality showed similar patterns to mental health, with poorer scores in participants assessed during the bushfires compared to pre-disaster and post-disaster groups. Physical activity was greater in the post-disaster group. Meanwhile, hours spent volunteering were higher in the during and after groups. Again, it is positive to observe a "bouncing back" effect, as well as post-disaster increases in time spent exercising and volunteering.

Lastly, we examined the proportion of participants who met clinical cut-offs for a range of health outcomes in Figure 11. Clinical cut-offs are used to identify people who are at risk of a disorder and likely require further assessment. Cut-offs for each outcome measurement can be found in Appendix 7.1. During the bushfires, significantly higher proportions of participants met clinical cut-offs for depression (GDS), physical health, and lung function.

3. Health outcomes by bushfire exposure

In this section, health measures were analysed by bushfire exposure. Participants, aged 59 to 65 years, were either not exposed ('pre-exposed'), indirectly exposed, or directly exposed to the bushfires. 95% confidence intervals were used in all bar charts.

3.1. Anxiety and depression

Anxiety and depression scores were similar between those who were not exposed and indirectly exposed to the 2019/2020 bushfires. However, significantly poorer outcomes for all three measures were observed with those who were directly exposed to the fires.

Figure 12. Anxiety and depression scores by exposure level to the 2019/2020 bushfires
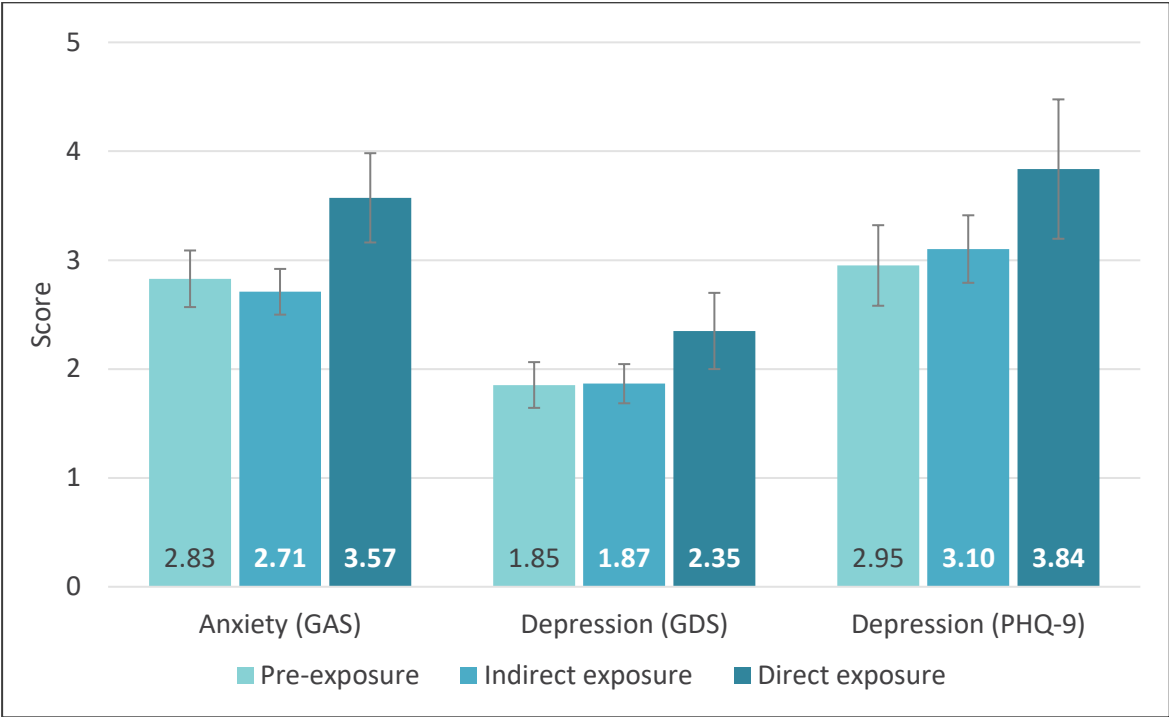
Note. Anxiety and depression measured by the Goldberg Anxiety Scale (GAS; range 0-9), Goldberg Depression Scale (GDS; range 0-9), and Patient Health Questionnaire (PHQ-9; range 0-27). Higher scores indicate worse outcomes.

No sex differences in anxiety and depression outcomes were observed in those who were indirectly/not exposed to the bushfires. However, among those who were directly exposed to the fires, women scored significantly poorer outcomes than men in all three anxiety and depression measures.

Figure 13. Anxiety and depression outcomes by gender and fire exposure.
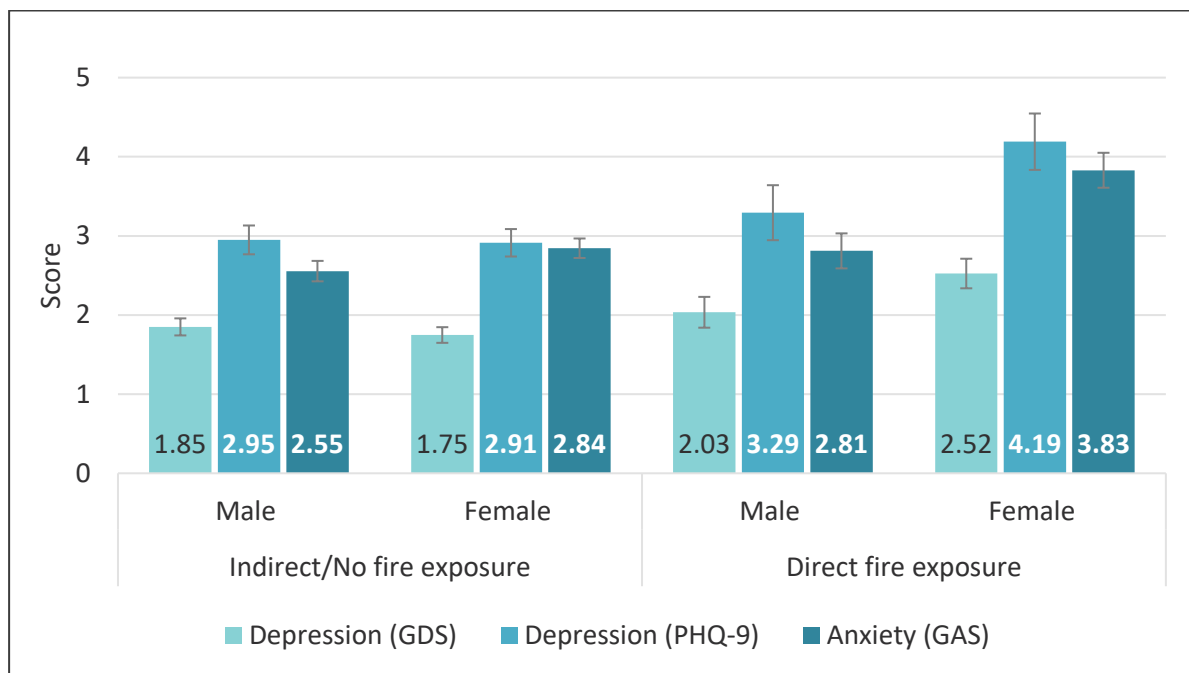
Note: Higher scores indicated worse outcomes. Differences between men and women within the direct fire exposure group were statistically significant for all three measures.

3.2. General mental health

General mental health scores were slightly poorer for those who were directly exposed to the bushfires. However, this difference was not statistically significant.

Figure 14. General mental health by exposure to the 2019/2020 bushfires.
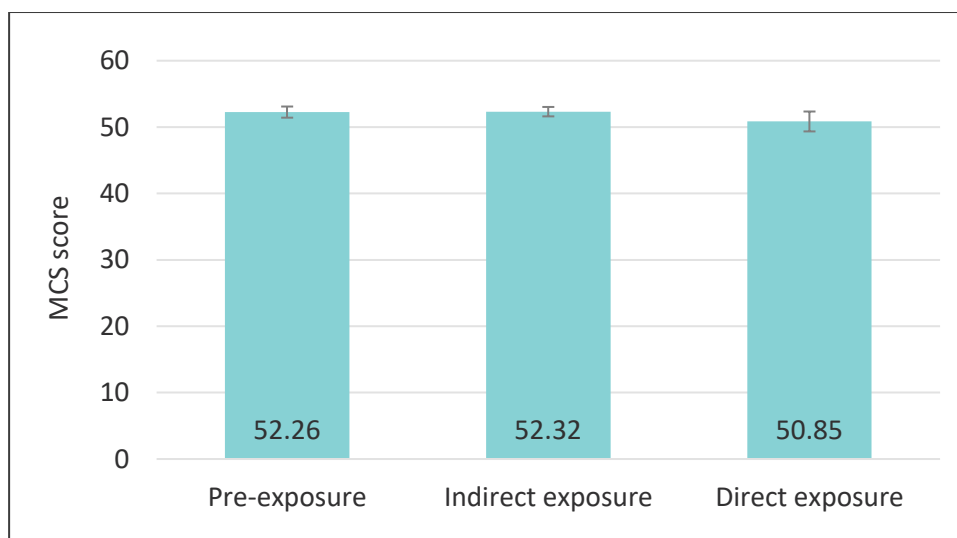
Note: General mental health was measured by the Short Form Survey (SF-12) mental component (MCS; range 0-100). Lower scores indicated poorer mental health.

3.3. Psychological trauma

Psychological trauma scores were significantly worse among those who were directly exposed to the bushfires compared to those indirectly exposed.

Figure 15. Psychological trauma by exposure to the 2019/2020 bushfires.
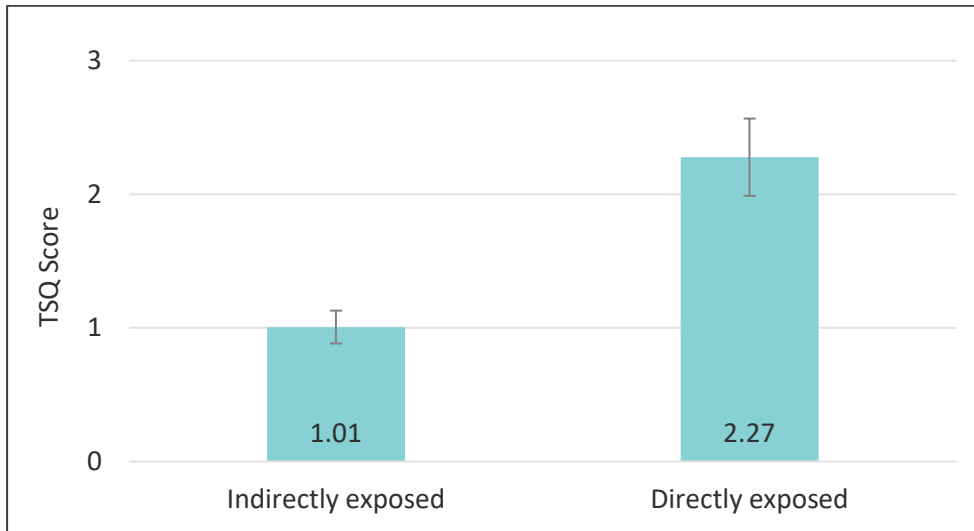
Note: Psychological trauma as measured by the Trauma Screening Questionnaire (TSQ; range 0-10), where higher scores indicated greater traumatic stress. Difference was statistically significant.

3.4. Suicidality

Suicidality scores were slightly lower in those exposed to the fires, however the differences were not statistically significant.

Figure 16. Suicidality by exposure to the 2019/2020 bushfires.
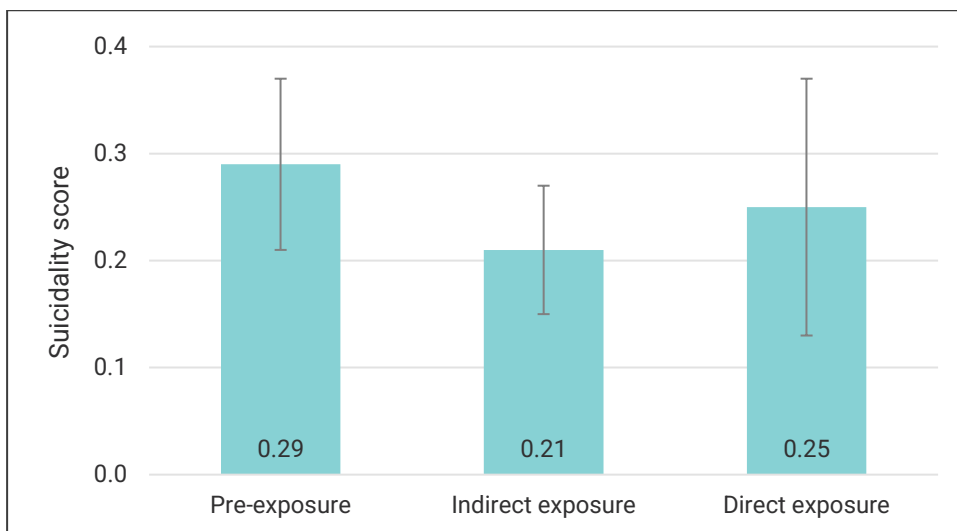
Note: Suicidality score range from 0 to 6 and higher scores indicate greater suicidal ideation.

3.5. Resilience

Psychological resilience was rated higher in both fire-exposure groups compared to non-exposure. However, these differences were not statistically significant.

Figure 17. Psychological resilience by exposure to the 2019/2020 bushfires.
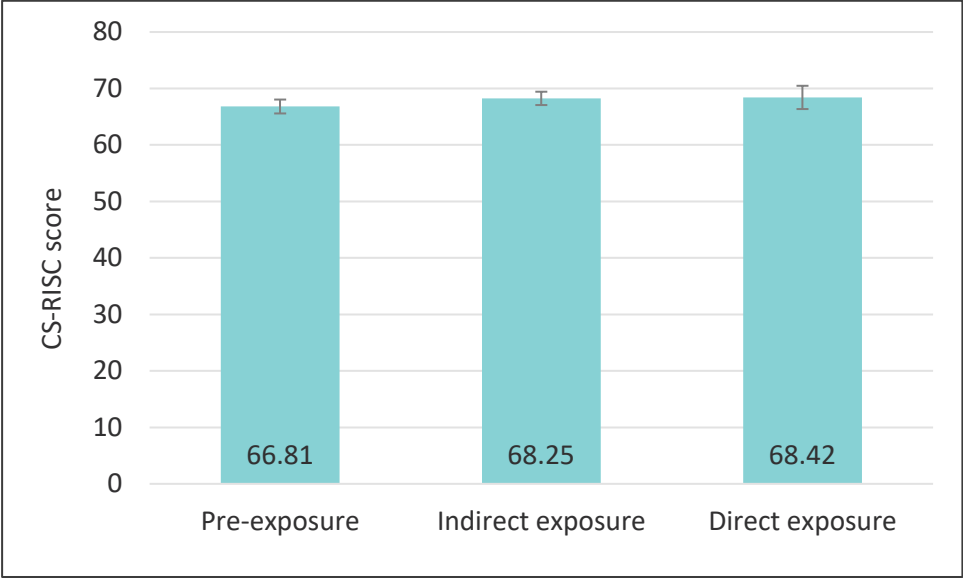
Note: Psychological resilience as measured by the Connor Davidson Resilience Scale (CD-RISC; range 0-100). Higher scores indicate greater resilience.

3.6. Alcohol use

Alcohol use did not differ between the three bushfire exposure groups.

Figure 18. Alcohol use by exposure to the 2019/2020 bushfires.
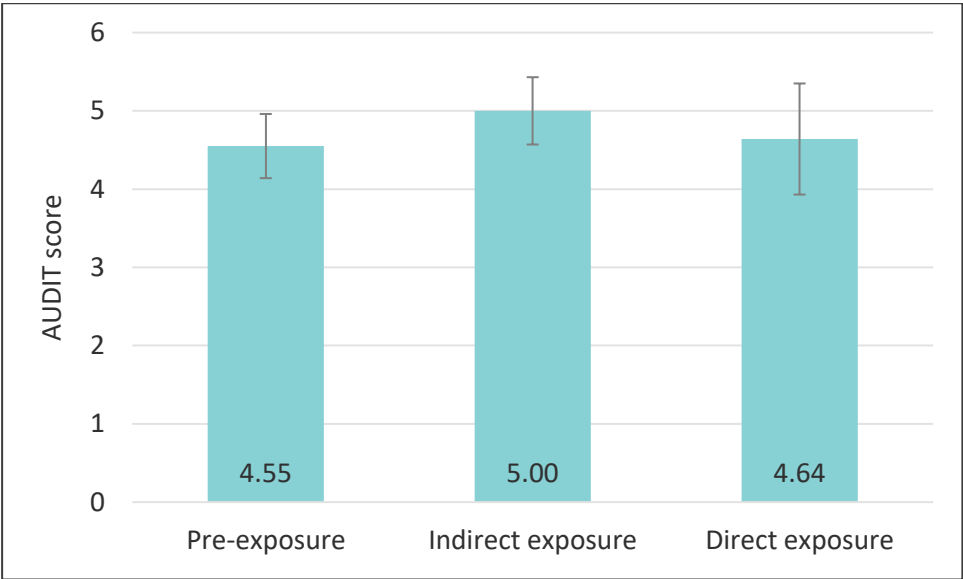
Note: Alcohol use as measured by the Alcohol Use Disorders Identification Test (AUDIT; range 0-40). Higher scores indicate higher risk of having an alcohol abuse problem.

3.7. General physical health

General physical health was significantly poorer in those directly exposed to the bushfires compared to those not exposed and indirectly exposed.

Figure 19. Physical health by exposure to the 2019/2020 bushfires.
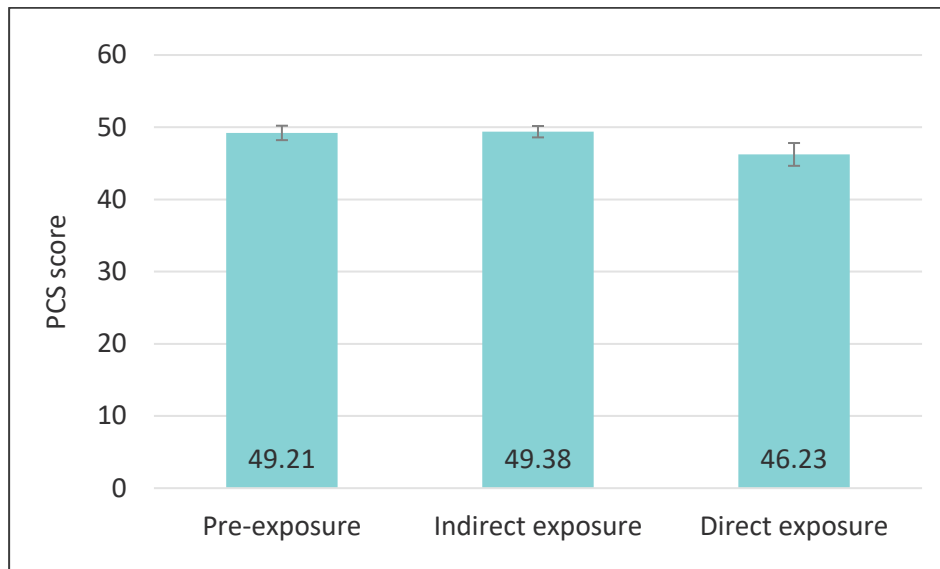
Note. Physical health was measured by the Short Form Survey (SF-12) physical health component (PCS; range 0-100). Lower scores indicate higher probability of a physical condition.

3.8. Sleep quality

Sleep quality was similar across all three exposure groups.

Figure 20. Sleep quality by exposure to the 2019/2020 bushfires.
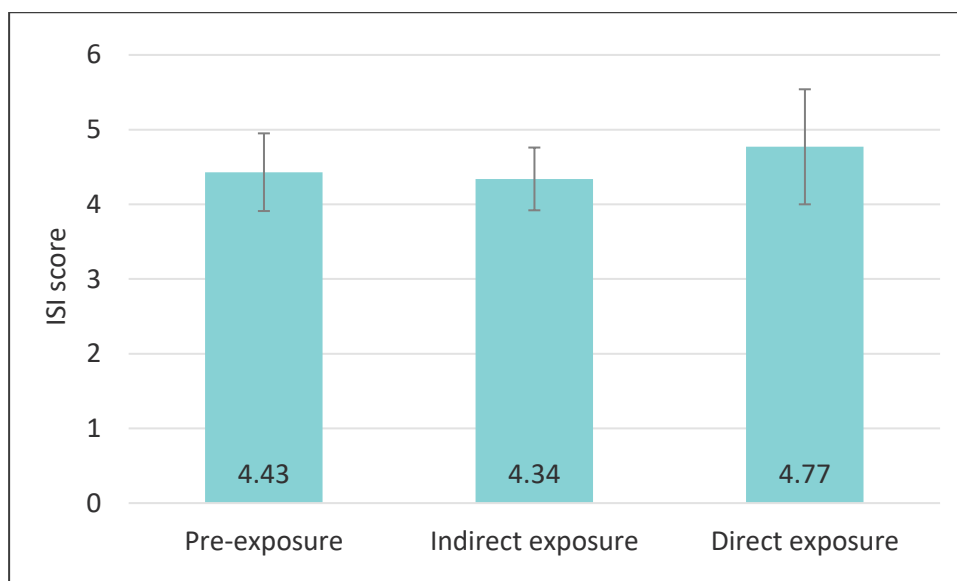
Note: Sleep quality was measured by the Insomnia Severity Index (ISI; range 0-28). Higher scores indicate greater risk of insomnia.

3.9. Physical activity

Time spent doing physical activity was similar across all three exposure groups.

Figure 21. Physical activity by exposure to the 2019/2020 bushfires.
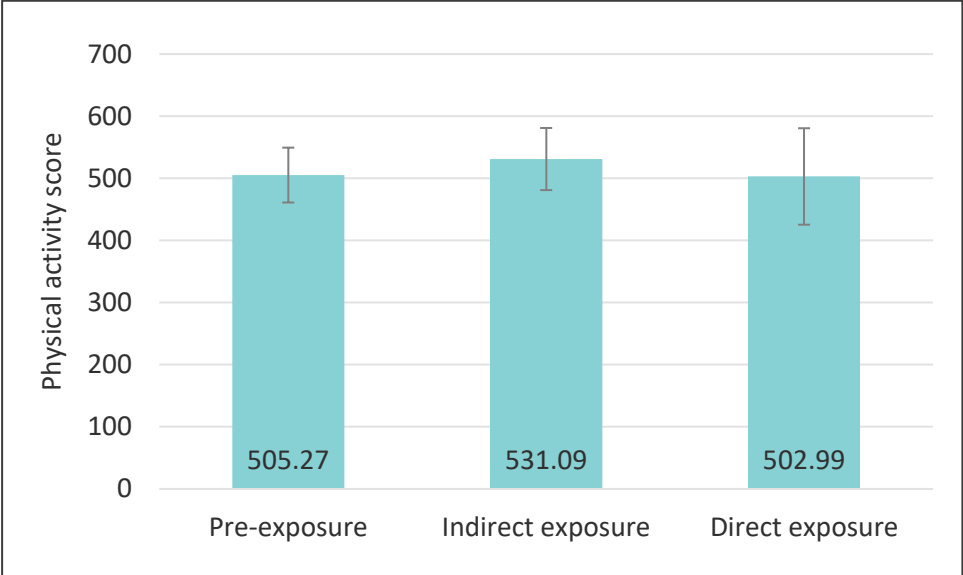
Note: Physical activity was measured using a sub-section of the Active Australia Survey. Physical Activity score was calculated by summing minutes of walk per week, minutes of moderate activity per week, and 2 x minutes of vigorous activity per week. Higher scores represent more time spent doing physical activities.

3.10. Volunteering

Time spent volunteering was slightly greater in the two fire-exposure groups compared to the non-exposure group. These differences were not significant.

Figure 22. Hours spent volunteering by exposure to the 2019/2020 bushfires.
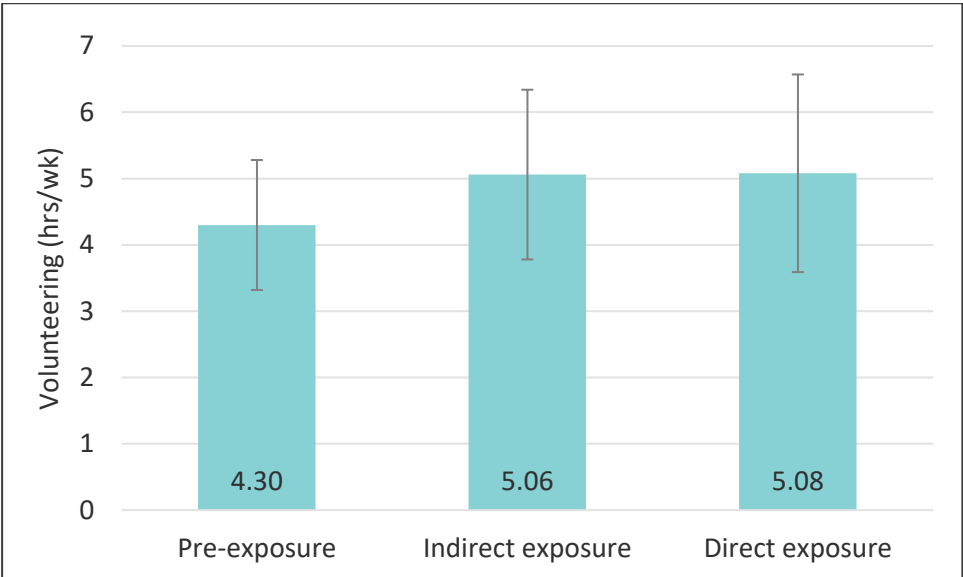
3.11. Adverse health outcomes

A higher proportion of individuals who were directly exposed to the fires met clinical cut-offs (see Appendix 7.1 for definitions) for adverse health outcomes including anxiety, depression, general mental health, physical health, and psychological trauma. All other differences were not significant.

Figure 23. Percentage of people who met clinical cut-offs for health outcomes: not exposed vs indirectly exposed vs directly exposed.
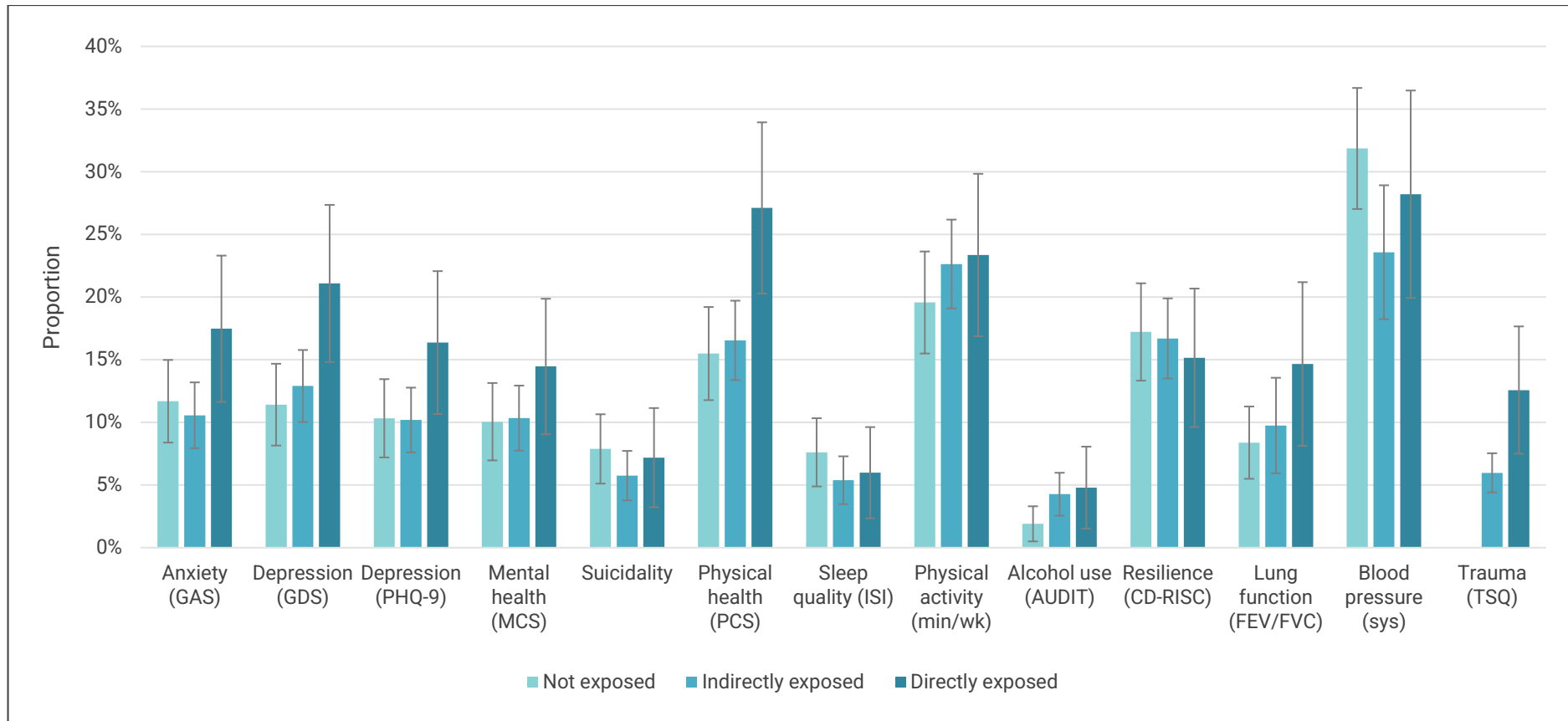
3.12. Summary

The results above show differences in mean mental health scores for people not/indirectly exposed to the bushfires compared to those directly exposed to the fires. Participants who were directly exposed to the bushfires scored significantly worse on anxiety, depression, general mental health, and psychological trauma compared to those who were not/indirectly exposed to the bushfires. When examining anxiety and depression outcomes by sex, women were more susceptible to adverse mental health effects of direct fire exposure compared with men in this cohort. There was no significant difference between the three exposure groups for suicidality, alcohol use, and resilience.

Direct exposure to bushfires significantly impaired general physical health. However, sleep quality was not affected. Furthermore, time spent volunteering and doing physical activity per week was not affected by exposure to the bushfires.

Finally, clinical cut-offs for health outcomes were examined. A higher proportion of participants in the direct exposure group met clinical cut-offs for multiple health outcomes. Differences were significant for anxiety (GAS), depression (GDS, PHQ-9), general mental health (MCS), psychological trauma (TSQ), general physical health (PCS), and lung function. No significant differences between groups were found for suicidality, sleep quality, physical activity, alcohol use, resilience, lung function, and blood pressure.

4. Disaster preparedness and health outcomes following the bushfires

Following the bushfires, an additional survey was posted to participants that assessed disaster preparedness. Disaster preparedness refers to measures taken to prepare for and reduce the negative effects of disasters. Questions in the survey assessed the respondent's ability to stay calm, manage, and respond effectively to disaster events.

Prior research has shown that disaster preparedness is associated with a reduced risk of health disorders and increased resilience for individuals, families, and communities (Malkina-Pykh & Pykh, 2013). The current study used linear regression to examine associations between disaster preparedness scores and multiple health outcomes.

The results from the analysis below (see Table 3) show that disaster preparedness is associated with positive mental health outcomes. Specifically, higher scores on the disaster preparedness questionnaire are significantly correlated with better outcomes on measures for anxiety, depression, suicidality, psychological trauma, and general mental health. Disaster preparedness is also linked with having a larger social network, a sense of mastery, and psychological resilience.

A positive physical health outcome as a result of greater disaster preparedness is better sleep quality. Unexpectedly, higher preparedness is also associated with higher blood pressure. Outcomes that were not affected by disaster preparedness include general physical health, physical activity, drug use, volunteering, and lung function.

Table 3. Linear regression output of disaster preparedness and health outcomes.

Outcome	R2	Estimate	SD	t-statistic
Anxiety (GAS)	0.05	-0.12	0.03	-4.09**
Depression (GDS)	0.06	-0.10	0.02	-4.44**
Depression (PHQ-9)	0.04	-0.15	0.04	-3.75**
Mental health (MCS)	0.06	0.40	0.09	4.28**
Suicidality	0.01	-0.02	0.01	-1.99*
Psychological trauma (TSQ)	0.06	-0.11	0.03	-4.35**
Physical health (PCS)	0.00	0.11	0.11	1.05
Sleep quality (ISI)	0.03	-0.17	0.06	-2.85**
Physical activity	0.01	10.46	6.58	1.59
Alcohol use (AUDIT)	0.00	0.05	0.05	1.06
Smoking status	0.00	0.00	0.00	-0.30
Marijuana	0.00	0.00	0.00	0.04
Social network (LSNS)	0.03	0.19	0.06	3.19**
Volunteering (hrs/wk)	0.01	0.16	0.10	1.58
Resilience (CD-RISC)	0.24	1.20	0.13	9.61**
Mastery (PM)	0.17	0.28	0.04	7.70**
Lung function (FEV/FVC)	0.00	0.00	0.00	0.56
Blood pressure (systolic)	0.03	0.67	0.20	3.29**
Blood pressure (diastolic)	0.03	0.34	0.11	3.04**

Note: Estimate shows whether the association is positive or negative.

*P<0.05, **P<0.01

5. Conclusion

This report examined the impact of the 2019/2020 bushfires on the health of PATH participants aged 59-65 years and whether disaster preparedness affected health outcomes following the bushfires. On average, PATH participants were relatively resilient to bushfires. A small trend where mental and some physical health declined was shown but people seemed to bound back to baseline levels after the bushfires ended. People with direct fire exposure had poorer mental health outcomes, especially women. However, it should be noted that the results from this study were for older adults aged 59-65 years and therefore may not be generalisable to other groups in the population.

Feeling better prepared for bushfires was associated with more positive scores on measures associated with anxiety, depression, suicidality, psychological trauma, and sleep quality. This suggests better bushfire preparation would be advantageous, and when a hot and dry summer is expected, more resources should be targeted towards preparing for potential bushfires. Disaster education in the community can be useful, including educating people about bushfires, how to prepare for them, and what to expect. This could then help improve mental and physical health outcomes when these events occur. In addition to preparation, post-fire recovery is also important. Mental health services such as free counselling for those who are directly impacted by the fires may be beneficial.

6. References

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7. Appendix

7.1. Health outcomes

Supplementary Table 1. *Descriptions of all health outcomes analysed in the study.*

	Value range	Time period	Clinical cut-off	Cut-off definition	Scale and notes
MENTAL					
Anxiety (GAS)	0-9	Last 4 weeks	≥ 7	High probability of anxiety disorder	Goldberg Anxiety Scale
Depression (GDS)	0-9	Last 4 weeks	≥ 5	High probability of any depressive disorder	Goldberg Depression Scale
Depression (PHQ-9)	0-27	Last 2 weeks	≥ 8	Moderate depressive symptoms	Patient Health Questionnaire
Mental health (MCS)	0-100	Last 4 weeks	≤ 42	Indicative of clinical depression	Mental Health Component of the Short Form Survey (SF-12). Lower score is poorer mental health
Suicidality	0-6	Last year	n/a	N/A	Suicidal ideation section of the Columbia Suicide Severity Rating Scale
Trauma (TSQ)	0-10	Last week	≥ 6	Higher probability of trauma	Trauma Screening Questionnaire

	Value range	Time period	Clinical cut-off	Cut-off definition	Scale and notes
PHYSICAL					
Physical health (PCS)	0-100	Last 4 weeks	≤ 50	Indicative of a physical condition	Physical Health Component of the Short Form Survey (SF-12). Lower score is poorer physical health
Sleep quality (ISI)	0-28	Last 2 weeks	≥ 15	Clinical insomnia (moderate severity)	Insomnia Severity Index
Physical activity	mins/wk	Last 1 week	<150	0 = sedentary, <150mins = insufficient	Active Australia survey Q1-8. Score = walktime + modtime + (2 x vigtime)
Lung function	0-1	Current	≤ 0.7	Moderate severity of lung condition	FEV1/FVC ratio. Normal ratio is >0.8
Blood pressure	mmHg	Current	> 130/80 mmHg	High blood pressure	Systolic/diastolic blood pressure ratio. Normal pressure is 120/80 mmHg
SUBSTANCE USE					
Marijuana use	yes/no	Varies (year)	n/a	N/A	
Tobacco use	yes/no	Last 4 weeks	n/a	N/A	
Alcohol use (AUDIT)	0-40	Varies	≥ 16	High risk of alcohol problem	Alcohol Use Disorders Identification Test
SOCIAL HEALTH					
Social network size (LSNS)	0-30	Current	≤ 12	At risk for social isolation	Lubben Social Network Scale
Volunteering	n/a	Last 12 months	n/a	N/A	Hours spent volunteering per week
PSYCHOLOGICAL CORRELATES					
Resilience (CD-RISC)	0-100	Last 4 weeks	≤ 55	Bottom quartile in resilience	Connor-Davidson Resilience Scale
Mastery (PM)	7-28	Current	n/a	N/A	Pearlin Mastery Scale.

7.2. Bushfire timing on health outcomes analysis

Supplementary Table 2. Health outcomes by bushfire exposure

Outcome variables	Before (N=368) M (SD)	During (N=308) M (SD)	After (N=396) Mean
Anxiety (GAS)	2.83 (2.54)	3.08 (2.57)	2.79 (2.61)
Depression (GDS)	1.85 (2.03)	2.22 (2.14)	1.81 (2.20)
Depression (PHQ-9)	2.95 (3.61)	3.42 (3.54)	3.17 (4.04)
Mental health (MCS)	52.26 (8.25)	51.45 (8.62)	52.35 (8.79)
Suicidality	0.29 (0.82)	0.21 (0.69)	0.22 (0.78)
Physical health (PCS)	49.21 (9.79)	48.45 (9.37)	48.80 (9.82)
Sleep quality (ISI)	4.43 (5.11)	4.69 (5.14)	4.31 (4.90)
Physical activity	505.27 (432.19)	498.02 (465.08)	549.17 (645.05)
Alcohol use (AUDIT)	4.55 (3.97)	4.60 (4.52)	5.22 (5.33)
Smoking status	1.96 (0.20)	1.94 (0.23)	1.93 (0.26)
Marijuana	0.07 (0.26)	0.04 (0.19)	0.06 (0.23)
Social network (LSNS)	17.20 (5.27)	17.21 (5.41)	17.14 (5.44)
Volunteering (hrs/wk)	4.30 (6.46)	4.90 (7.66)	5.22 (9.42)
Resilience (CD-RISC)	66.81 (11.99)	67.90 (13.08)	68.65 (14.23)
Mastery	22.13 (3.42)	22.19 (3.48)	22.29 (3.46)
Blood pressure (sys)	0.79 (0.06)	0.78 (0.07)	0.80 (0.06)
Blood pressure (dias)	130.35 (16.94)	128.64 (16.27)	130.75 (18.85)
Lung function (FEV/FVC)	82.99 (9.25)	82.20 (10.09)	83.32 (9.66)

7.3. Bushfire exposure on health outcomes analysis

Supplementary Table 3. Bushfire exposure on health outcomes

	Pre-exposure		Indirectly exposed		Directly exposed		Significance
	M	SD	M	SD	M	SD	
Anxiety (GAS)	2.83	2.72	2.71	2.52	3.57	2.54	*
Depression (GDS)	1.85	2.33	1.87	2.12	2.35	2.03	*
Depression (PHQ-9)	2.95	4.19	3.10	3.70	3.84	3.61	*
Mental health (MCS)	52.26	9.85	52.32	8.33	50.85	8.25	
Suicidality	0.29	0.80	0.21	0.72	0.25	0.82	
Physical health (PCS)	49.21	10.38	49.38	9.28	46.23	9.79	*
Sleep quality (ISI)	4.43	5.11	4.34	4.97	4.77	5.11	
Physical activity	505.27	511.96	531.09	591.99	502.99	432.19	
Alcohol use (AUDIT)	4.55	4.71	5.00	5.09	4.64	3.97	
Smoking status	1.96	0.23	1.93	0.25	1.95	0.20	
Marijuana	0.07	0.20	0.05	0.22	0.04	0.26	
Social network (LSNS)	17.20	5.48	17.04	5.39	17.66	5.27	
Volunteering (hrs/wk)	4.30	6.78	5.06	9.27	5.08	6.46	
Resilience (CD-RISC)	66.81	13.49	68.25	13.84	68.42	11.99	
Mastery	22.13	3.57	22.40	3.42	21.75	3.42	
Blood pressure (sys)	0.79	0.07	0.79	0.07	0.79	0.06	
Blood pressure (dias)	130.35	16.21	128.43	17.04	129.87	16.94	
Lung function (FEV/FVC)	82.99	10.30	81.96	9.97	83.51	9.25	

*$P<0.05$

7.4. Bushfire questionnaire

Many areas of Australia have been impacted by bushfires during the 2019-2020 fire season and the negative effects of fire such as reduced air quality. Some areas still remain under threat of fire. The following questions ask about your experiences with these fires:

Q405 Was the area in which you live or work put on alert because of the threat of fire?

- Yes (1)

- No (2)

Q406 Was the area in which you were temporarily located put on alert because of the threat of fire? (ie. Holiday accommodation, travelling, visiting relatives)

- Yes (1)

- No (2)

Q407 Were you evacuated from your home, workplace or other accommodation because of the threat of fire?

- Yes (1)

- No (2)

Q408 Did you change plans/activities because of the threat of fire, eg. Stay home from work, cancel excursions, reduce physical activity?

- Yes (1)

- No (2)

Q409 Did you change plans/activities because of the effects of fire such as smoke inhalation, eg. Stay home from work, cancel excursions, reduce physical activity?

- Yes (1)

- No (2)

Q410 Were you personally involved in fighting bushfires threatening your own home or neighbourhood?

- Yes (1)

- No (2)

Q411a Apart from defending your own home and neighbourhood, did you do any work (paid or voluntary) in response to the bushfires? (e.g. fighting fires, keeping order, dealing with health effects, restoring power, caring for persons or animals affected by fire).

- Yes (1)

- No (2)

Q411b If yes, what work were you doing? *Tick all that apply*

- Firefighting as your paid profession (1)
- Voluntary firefighting secondary to your usual profession (2)
- Construction as a result of fire damage (3)
- Environmental or asset damage assessment (4)
- Media, journalism or communications (5)
- Keeping order (security, traffic control) (6)
- Evacuating people or goods from fire threatened areas (7)
- Restoring power or phone lines (8)
- Caring for persons affected by fires (9)
- Caring for animals affected by fires (10)
- Logistics (delivering supplies) (11)
- Other (please specify:<free text>

Q412 Were buildings in your suburb/town damaged or destroyed by fire?

- Yes (1)
- No (2)

Q413 Was your own home, possessions or workplace damaged or destroyed?

- Yes (1)
- No (2)

Q414 Did any relative or friend have their home, possessions or workplace damaged or destroyed?

- Yes (1)
- No (2)

Q415 Did you suffer any injury or other health issues due to the fires, or effects of fires such as smoke inhalation? *Please tick all that apply*

- Yes, asthma attack or respiratory issue (1)
- Yes, other injury or health issue (1)
- No (2)

Q416 Did any relative or friend suffer any injury or other health issues due to the fires or effects of fires such as smoke inhalation? *Please tick all that apply*

- Yes, asthma attack or respiratory issue (1)
- Yes, other injury or health issue (1)
- No (2)

Q417 Did any animals you own suffer as a result of the fires?

- Yes (1)
- No (2)

Q418 Did you feel very frightened or upset during the period of the fires?

- Yes (1)
- No (2)

Q419 Did you seek help for emotional distress or other mental health problems relating to the fires?

- Yes (1)
- No (2)

If yes, skip to Q420B.

Q420a. Do you feel the need to seek professional help for emotional distress and/or other mental health problems relating to the fires?

- Yes (1)
- No (2)

Q420b. Do you feel that there is a need for professional help for someone else you know well, for emotional distress and/or other mental health problems relating to the fires?

- Yes, a family member (1)
- Yes, someone else I know well (2)
- No (3)

Q421 Did you feel well prepared for the current bushfire threat?

- Yes (1)
- No (2)

Q422 Did you have any other major loss associated with the fires that you would like to tell us about?

The next three questions ask about your previous experience of bushfires, prior to the latest bushfire season in 2019/2020.

Q423 Since your last interview in 2012/2013 and prior to the latest bushfire season in 2019/2020, did you do any work (paid or voluntary) in response to bushfires? (e.g. fighting fires, keeping order, dealing with health effects, restoring power, caring for persons or animals affected by fire)?

- Yes (1)

- No (2)

Q424 Since your last interview in 2012/2013 and prior to the latest bushfire season in 2019/2020, have you been evacuated from your home, workplace or other accommodation because of the threat of fire?

- Yes (1)

- No (2)

Q425 Since your last interview in 2012/2013 and prior to the latest bushfire season in 2019/2020, have you been injured or suffered a major loss as a result of bushfires?

- Yes (1)

- No (2)

Q426-435 Please consider the following reactions that sometimes occur following such an event. The following questions are concerned with your personal reactions to the bushfires. Please indicate whether or not you have experienced any of the following <u>at least twice in the past week</u>.

	Yes (1)	No (2)
Upsetting thoughts or memories about the bushfires that have come into your mind against your will. (1)	o	o
Upsetting dreams about the bushfires. (2)	o	o
Acting or feeling as though the bushfires were happening again. (3)	o	o
Feeling upset by reminders of the bushfires. (4)	o	o
Bodily reactions (such as fast heartbeat, stomach churning, sweating, dizziness) when reminded of the bushfires. (5)	o	o
Difficulty falling asleep. (6)	o	o
Irritability or outbursts of anger. (7)	o	o

	Yes (1)	No (2)
Difficulty concentrating. (8)	o	o
Heightened awareness of potential dangers to yourself and others. (9)	o	o
Being jumpy or being startled at something unexpected. (10)	o	o

Q436-443 Please indicate how much you agree with the following statements as they apply to you.

	Not at all true of me (1)	Somewhat true of me (2)	Mostly true of me (3)	Exactly true of me (4)
I think I am able to manage my feelings pretty well in difficult and challenging situations. (1)	O	o	o	o
In a natural hazard/disaster situation I would be able to cope with my anxiety and fear. (2)	O	o	o	o
I seem to be able to stay calm in most difficult situations. (3)	O	o	o	o
I feel reasonably confident in my own ability to deal with stressful situations that I might find myself in. (4)	O	o	o	o
When necessary, I can talk myself through challenging situations. (5)	O	o	o	o
If I found myself in a natural hazard/disaster situation I would know how to manage my own response to the situation. (6)	O	o	o	o
I know which strategies I could use to calm myself in a natural hazard/disaster situation. (7)	O	o	o	o
I have a good idea of how I would likely respond in an emergency situation. (8)	O	o	o	o

Q444-449 Please indicate how often you have used any of the following as a result of the bushfires during periods of reduced air quality.

	Never(1)	Some of the time(2)	Most of the time(3)	All of the time (4)
Wearing a face mask of at least P2/N95 filtration (1)	O	o	o	o
Using air filtration devices or recycling air conditioners at home (2)	O	o	o	o
Using air filtration devices or recycling air conditioners at work (3)	O	o	o	o
Staying inside my home (4)	O	o	o	o
Avoiding usual outdoor physical activity (5)	O	o	o	o
Staying outside areas with hazardous air quality (6)	O	o	o	o

Q450-462 Have you experienced any positive effects as a result of the bushfires?

	None (1)	A little (2)	A moderate amount (3)	A lot (4)
Opportunity to give back to others in need (1)	O	o	o	o
Greater sense of life priorities (2)	O	o	o	o
Sense of community resilience (3)	O	o	o	o
Greater connection with nature (4)	O	o	o	o
Greater public awareness and discussion on environmental issues (5)	O	o	o	o
Opportunity to spend more time with family or friends (6)	O	o	o	o
Increased face to face interaction with others (7)	O	o	o	o
Opportunity to learn and be resourceful (8)	O	o	o	o

	None (1)	A little (2)	A moderate amount (3)	A lot (4)
Opportunity to emotionally support others (9)	O	o	o	o
Sense of care and support from local community (10)	o	o	o	O
Sense of care and support from the wider community (11)	o	o	o	O
Understanding of how to better prepare for future bushfire events (12)	o	o	o	O
Opportunity to rebuild and improve infrastructure (13)	o	o	o	O

Q463 Is there anything else you would like to tell us about your bushfire experience?