GRATTAN Institute

The health effects of the 2019-20 bushfires

Submission to the Inquiry into the 2019-20 Victorian Fire Season

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1 The health impacts of the 2019-20 bushfires

Hundreds of bushfires ravaged south-eastern Australia over the 2019-20 summer, burning millions of hectares and billowing large plumes of smoke into the atmosphere. The fires and the smoke claimed many lives, and caused mental health problems that will last.

This 2019-20 bushfire season was not a one-off. Climate change is increasing the likelihood of ever more severe, intense, and longer-lasting bushfires into the future.

1.1 There was extreme fire risk leading up to the 2019-20 bushfires

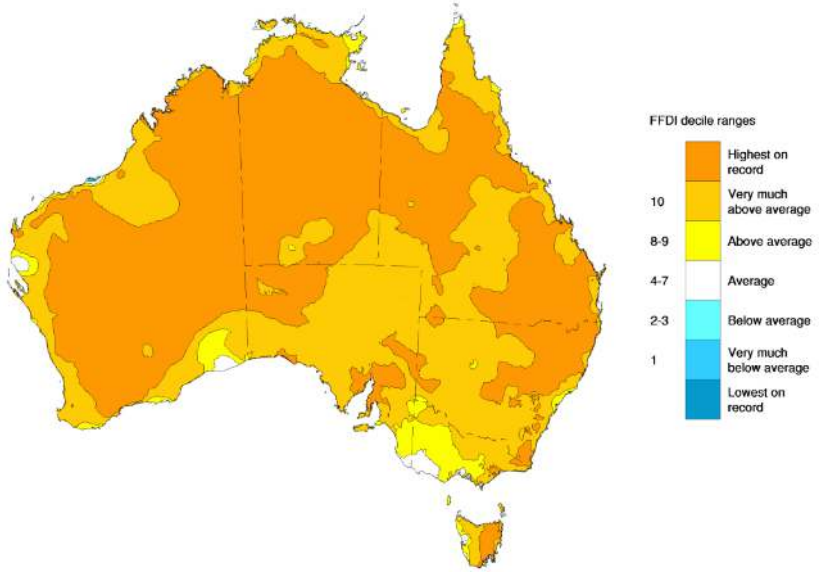
Hot weather and drought leading up to the summer of 2019-20 primed much of south-eastern Australia for bushfires.

2019 was Australia's hottest year on record.[1] Temperatures across the country were 1.5 degrees warmer than the long-term trend.[2] 2019 was also Australia's driest year on record.[3] Areas of south-eastern Australia that subsequently burned had their lowest rainfall on record.[4]

There had been extensive hazard reduction burns in the decade leading up to the 2019-20 summer, but dry and hot conditions limited the scope of hazard reduction burns in the winter before.[5]

By the spring of 2019, the Bureau of Meteorology reported that most of Australia had the highest fire danger weather on record (Figure 1.1).[6] In early September the fire season had kicked in, just five months after

Figure 1.1: Fire danger in the lead-up to the 2019-20 summer was high
Forest Fire Danger Index (FFDI) in spring 2019



Source: Bureau of Meteorology (2019a, p. 11).

1. Bureau of Meteorology (2020a).
2. Long-term trend is the average between 1961 and 1990.
3. Bureau of Meteorology (2020a).
4. Ibid.
5. RMIT ABC Fact Check (2020); and Hannam and Mannix (2020).
6. Bureau of Meteorology (2019a).

the previous season ended.[7] By 9 September, more than 50 fires were burning in NSW, and 80 in Queensland.[8]

The dangerous fire weather continued through the summer. In December, the fire danger index was the highest on record across most of the country.[9]

By the end of January 2020, about 21 per cent of all Australia's forests had burnt.[10]

In Victoria, the bushfires were concentrated in the eastern part of the state, particularly around Gippsland (see Figure 1.2).

1.2 The bushfires had direct impacts on many Australians

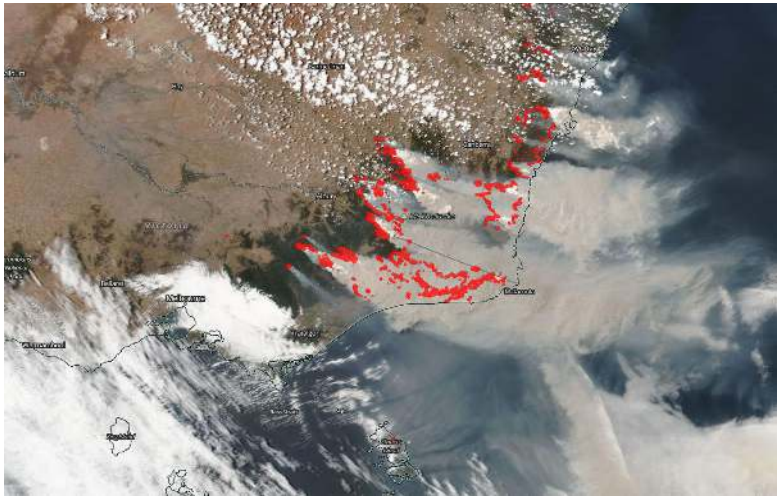
Across south-eastern Australia, the fires directly killed at least 34 people and destroyed 2,100 homes; including in Victoria.

A survey of 3,000 Australians in January 2020 found that one-in-seven were directly affected by the bushfires through their property being damaged or threatened, or by being told to evacuate.[11]

Figure 1.3 shows that 10 per cent of Australians reported being directly threatened by the fires. About 1.8 million people were forced to evacuate their homes.[12]

Figure 1.2: The bushfires blanketed Victoria's east with large plumes of smoke

Active fires shown in red



Note: Image taken from NASA's Aqua satellite on 5 January 2020.

Source: Lunsford (2020).

7. Bureau of Meteorology (2019b).
8. Ibid (p. 25).
9. Bureau of Meteorology (2020b, p. 9).
10. Boer et al (2020). This figure excludes the fires in Tasmania.
11. Biddle et al (2020, p. 5).
12. Ibid (p. 5).

1.3 The bushfires caused dangerously poor air quality for prolonged periods

As fires burned across south-eastern Australia, many people were exposed to the smoke that rose, drifted, and blanketed towns and cities. The bushfire smoke caused air pollution to be many times the 'hazardous' levels. About 11 million Australians reported some exposure to smoke caused by the 2019-20 bushfires (Figure 1.3).[13]

Smoke covered large parts of Victoria for a prolonged period, particularly in January 2020. It drifted from eastern parts of the state to Melbourne and its surrounds, exposing millions of Victorians to harmful levels of air pollution (see Figure 1.4).

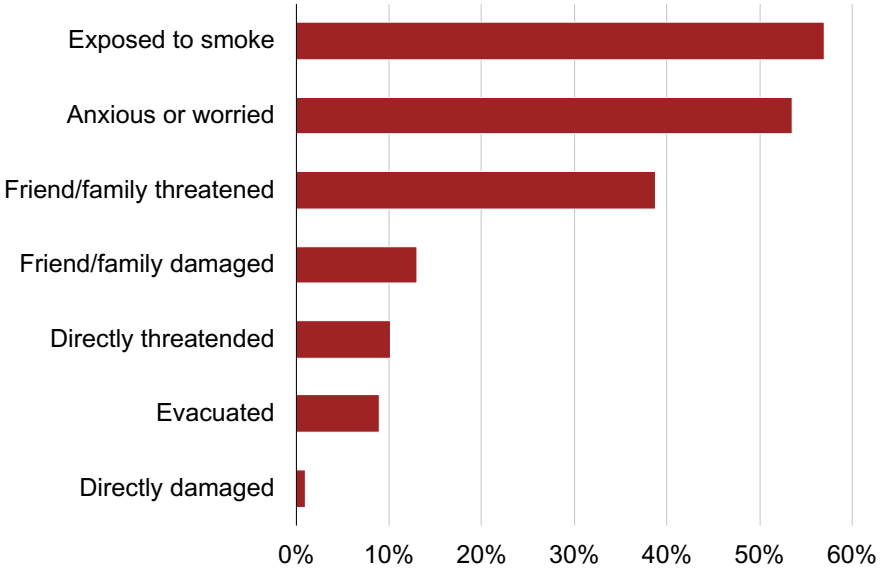
Bushfire smoke is made up of a complex mix of particles and gases. This includes particles less than 2.5 micrometres in diameter ('particulate matter', known as $PM_{2.5}$) – about 30 times thinner than a human hair.[14]

The micrograms of these small particles per cubic metre of air – $PM_{2.5}\mu g/m^3$ – is the key measurement to monitor air quality related to bushfires.[15]

While there is no safe level of $PM_{2.5}$ exposure, the World Health Organisation[16] and the Australian National Air Quality Standards[17] set the 'safe' threshold at 25 $PM_{2.5}\mu g/m^3$ on average over 24 hours.

Figure 1.3: Three-in-five Australians were affected by bushfire smoke last summer

Proportion of Australian adults



Source: Biddle et al (2020, p. 5).

13. Ibid (p. 5).
14. United States Environmental Agency (2018).
15. Particulate matter is predominately made up of mineral dust, water, black carbon, sodium chloride, sulphate, ammonia, and nitrates: World Health Organisation (2018). The toxicity of $PM_{2.5}$ from bushfire smoke can vary dramatically and will depend on what materials are being burnt: Johnston et al (2019).
16. World Health Organisation (2018).
17. *National Environment Protection (Ambient Air Quality) Measure* (2016, Schedule 2, Table 1).

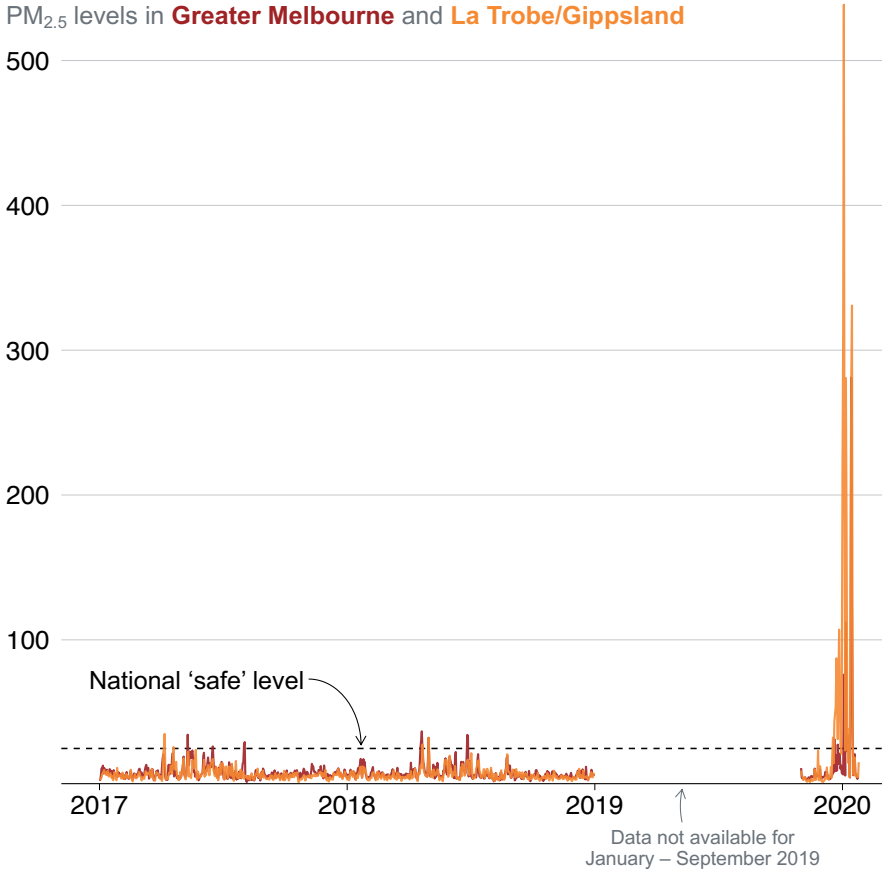
The Victorian Environmental Protection Agency (EPA) is responsible for monitoring air quality and managing associated public health impacts.[18] Most of the EPA's air quality monitors are in Melbourne and its surrounds, and in the Latrobe Valley.[19] There are no $PM_{2.5}$ monitoring stations in the state's west.

In Melbourne, $PM_{2.5}$ levels reached over 300 during the 2019-20 summer. In the bushfire-affected region of Gippsland, they reached $PM_{2.5}$ over 500 (see Figure 1.4).

EPA Victoria sets the 'hazardous' level of $PM_{2.5}$ at over 177 $\mu g/m^3$(over 24 hours).[20] Some days last summer were above the 'hazardous' level. Several other days fell within the EPA's categories of 'very poor' (40-177) and 'poor' (25-40).

Figure 1.4: Air pollution from the bushfires was many times the 'safe' level in Victoria

$PM_{2.5}$ levels in **Greater Melbourne** and **La Trobe/Gippsland**



Source: Grattan analysis of Victorian air quality data.

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18. In 2016, environmental health functions were moved from the Department of Health and Human Services to the EPA: EPA Victoria (2017).
19. EPA Victoria (2020a).
20. EPA Victoria (2020b).

1.4 The bushfire smoke damaged people's physical health

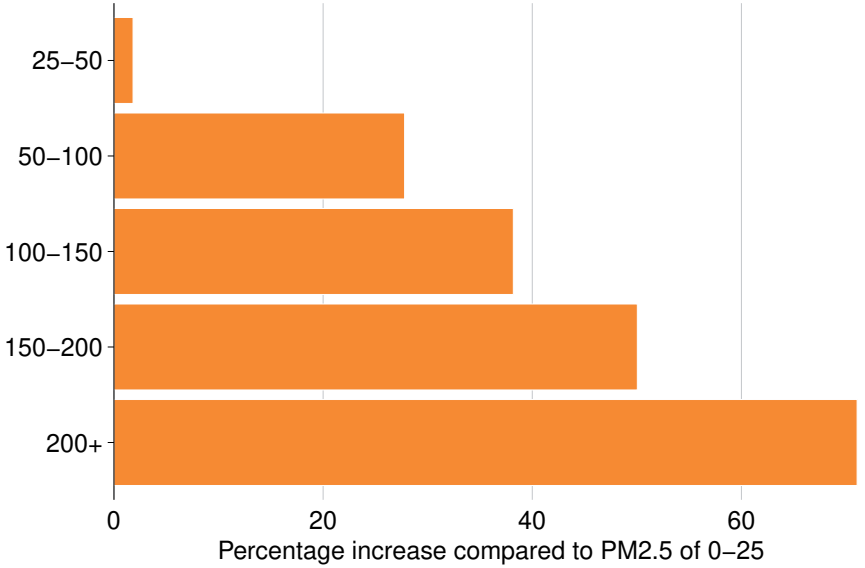
Bushfire smoke most commonly causes people to suffer eye and throat irritation, coughing, headaches, and anxiety.[21]

But inhaling particulate matter from bushfire smoke can also cause many serious health problems.[22] The link between respiratory issues and particulate matter is well established:[23] small particles can be inhaled deep into the lungs, causing difficulty breathing.

Victorian and ACT emergency department data show that the number of people going to hospital with respiratory problems increased significantly on days with poor air quality – by 27 per cent on days with $PM_{2.5}$ levels between 50 and 100, and by 70 per cent on days with $PM_{2.5}$ levels above 200 (compared to days with $PM_{2.5}$ levels below 25) (Figure 1.5).

A recent study estimated that pollution from the bushfires caused 2,027 people to be admitted to hospital with respiratory problems, and 1,305 people to go to emergency departments with asthma-related conditions.[24] About 1,100 people were admitted to hospital with cardiovascular problems caused by the fires. And the bushfire smoke was responsible for 417 deaths.[25]

Figure 1.5: More people go to hospital for respiratory illness when $PM_{2.5}$ levels are high



Source: Grattan analysis of emergency department data from ACT Health and the Victorian Department of Health and Human Services. The model controls for seasonal, day, temperature, and population effects.

21. FluTracking (2020).
22. See Reid et al (2016, table 1) for a critical review of the health impacts of exposure to bushfire smoke. The wide-ranging health problems exacerbated by particulate matter include respiratory, cardiovascular, Parkinson's disease, diabetes, phlebitis, thrombophlebitis, and thromboembolism: Wei et al (2019).
23. See, for example, Arriagada et al (2019), Rappold et al (2017), Broome et al (2016), Reid et al (2016), Dennekamp and Abramson (2011), Ana G. Rappold et al (2011) and Tham et al (2009).
24. Arriagada et al (2020). This analysis covered the regions of NSW, Queensland, the ACT, and Victoria.
25. Ibid.

1.5 The bushfires damaged people's mental health

Bushfires destroy homes, livelihoods, and lives. People from affected communities suffer emotional distress, anxiety, and depression.[26]

About one-fifth of the people affected by the 2003 Canberra bushfires reported high to very-high levels of psychological distress three years later.[27]

The 2009 Black Saturday bushfires in Victoria, which killed 173 people and destroyed more than 2,000 homes,[28] also caused devastating and long-term mental health problems.[29] Three years after the fires, people in 'highly affected' communities – those in which people had died or properties had been damaged – were more than twice as likely to suffer from post-traumatic stress disorder (PTSD), depression, or severe distress than people in less-affected communities.[30] Although many people recovered, these communities still had higher rates of mental health problems than the general population five years later.[31] These mental health problems are worse for people who confront difficulties with insurance or rebuilding their properties.[32]

Firefighters on the front-line are even more likely to suffer mental health problems.[33] About 15 per cent of firefighters suffer PTSD after fighting a bushfire.[34] Alcohol abuse and domestic violence rates also increase.[35]

It's too early to know the full extent of the mental health consequences of the bushfires of 2019-20. But a January 2020 survey of 3000 Australians found that more than half (54 per cent) felt anxious or worried about the safety of themselves and others during the fires (see Figure 1.3).[36] This equates to many millions of people feeling an impact on their mental well-being – people living in both regional areas and cities.

A quarter of Indigenous Australians in Victoria and NSW live in areas that were affected by the bushfires.[37] And Indigenous Australians may feel the effects of bushfires differently to other Australians. The Yuin people from the south-coast of NSW, for example, fear that many sacred sites were damaged or destroyed in the 2019-20 bushfires.[38]

1.6 Climate change means more frequent, more intense, and longer-lasting bushfires

Bushfires have long been a part of Australian life. But a warming climate means longer heatwaves and less rainfall. These conditions mean there are more days of extreme fire risk, and larger and longer-lasting bushfires.

A study released in March 2020 found that human-caused climate change had made the 2019-20 bushfires 80 per cent more likely to happen.[39]

It found that if global temperatures continue to rise to 2^{o}C above pre-industrial levels, bushfires in Australia like those of 2019-20 will be about eight times more likely.[40]

26. Bryant et al (2018).
27. Camilleri et al (2010).
28. Victorian Bushfires Royal Commission (2009, p. 13).
29. Bryant et al (2018).
30. Bryant et al (2014).
31. Bryant et al (2018).
32. Ibid (pp. 547–549).
33. Beyond Blue Ltd (2018); and Aisbett and Nichols (2007).
34. Fullerton et al (2004, p. 1374).
35. Bryant et al (2018).
36. Biddle et al (2020, p. 5).
37. Williamson et al (2020).
38. Pickrell (2020); Perry and Hayman-Reber (2020)
39. Oldenborgh et al (2020, p. 26). The lower-bound estimate was 30 per cent. Both estimates are likely to 'severely underestimate' the attribution (p. 26) due to underestimations of the main heatwave inputs (p. 1).
40. Oldenborgh et al (ibid, p. 27). Lower bound is four times more likely.

As bushfires become more frequent and intense, they will affect more Australians more often.[41] People repeatedly exposed to bushfire smoke will be more likely to suffer serious health problems including stroke.[42]

Australia faces an increased risk of extreme weather events. Health authorities must be prepared and improve their response systems.

41. As discussed after the 2003 fires in Canberra: Hennessy et al (2005); and after the 2009 bushfires in Victoria: Booth (2009) and Garnaut (2011); and after the 2013 fires in NSW: Hennessy (2013).
42. Huang et al (2019); and Yuan et al (2019).

2 Recommendations

Victoria needs to act now to minimise potentially even worse health effects from bushfires in the future.

The EPA should improve its communication to the public of health risks from exposure to bushfire smoke. The Victorian Department of Health and Human Services (DHHS) should build more resilience in the healthcare system, so that bushfires do not compromise healthcare. Victoria also needs to address the mental health problems people suffer as a result of bushfires.

Victoria should align its bushfire health preparedness and response systems with other states and territories, by working through a national forum. It should continue to address the health effects of climate change.

2.1 Make people more aware of the health risks from bushfire smoke

Victoria should provide clearer, more detailed information that is easily available to the public when bushfire smoke causes high pollution.

Firstly, Victoria should improve its air monitoring coverage. The EPA has only a limited number of monitors, and they are concentrated in specific regions of the state (see Section 1.3). It is therefore less able to accurately communicate potential health risks in unmonitored parts of the state.

Secondly, Victoria could enhance its communication of bushfire smoke health risks by establishing a targeted alert system to directly warn people of risks to their health. Health warning systems can reduce the number of people who get sick, by advising communities of imminent risks to their health and steps they can take to protect themselves.

An alert system would allow EPA Victoria and DHHS to integrate detailed and targeted health warnings with communication of air quality levels. The system could use a similar framework to Victoria's existing heat health alert system.[43]

The air quality alert system could be made available as an app, or integrated into existing Victorian emergency warning apps. It should provide practical advice to the general public and at-risk groups.

The alert system should also give people guidance on:

- How to minimise air pollution in the home during short- and long-exposure periods.[44]
- How to minimise exposure to air pollution if staying at home is not possible.[45]
- Appropriate actions for employers, schools, and other organisations to reduce people's exposure, including whether outdoor activity should be prohibited.

Health messages should be tailored for different at-risk groups. For example, messages for people with asthma should be different to messages for pregnant women.[46]

The alert could also be used to warn of air quality risks before planned hazard reduction burns, which can increase $PM_{2.5}$ significantly.[47]

Thirdly, Victoria should work to get a nationally consistent approach to reporting air quality risks.

43. Also see, for example, NSW's air pollution health alerts: NSW DPIE (2020).
44. Vardoulakis et al (2020).
45. Ibid.
46. Arriagada et al (2019); and Abdo et al (2019).
47. Broome et al (2016).

At the moment there are inconsistencies. Jurisdictions set air quality categories at different pollution levels. Victoria sets 'hazardous' $PM_{2.5}$ at 177,[48] but NSW sets 'hazardous' $PM_{2.5}$ at 50.[49] The ACT has two 'hazardous' air quality categories; 'hazardous high' (177 to 250) and 'hazardous extreme' (250 and higher).[50] The corresponding health advice can also vary between jurisdictions in its level of detail. These differences may cause confusion and undermine the health advice overall.

2.2 Review health system preparedness for bushfires

Victoria's health system planning needs to take into account the likelihood of more severe, frequent, and longer-lasting bushfires due to climate change into the future.[51]

Health services need to plan for increased pressures on resources, workforce, infrastructure, and medication supply.[52] DHHS should review public health funding and accountability policies to ensure they are sensitive to surges and the incremental costs of short periods of high demand.

Contingency plans should include escalation protocols that quickly mobilise additional healthcare workers from outside an affected region. These protocols should include ready-to-go contractual arrangements for general practitioners to work in local evacuation centres and hospitals with high demand.[53] This would help ensure that local healthcare services that are feeling the pressure get the additional support they need.

DHHS should also review the resilience of its healthcare services to extreme weather events such as bushfires, to ensure there are as few disruptions to services as possible. Disasters can damage healthcare infrastructure and interrupt supply chains, compromising services.

For example, during the 2019-20 summer, Canberra Hospital's operations were affected by bushfire smoke that polluted the air inside parts of the hospital. Many elective surgeries were cancelled, and the MRI machines were affected.[54]

Victorians' access to health services can also be disrupted during bushfires if local services close. State emergency protocols should ensure affected people can get their prescribed medicines without requiring a new prescription.[55]

2.3 Review mental health support systems

Victoria should review its mental health support systems to ensure they can respond appropriately to the increased risks of and from extreme weather events such as bushfires. This should include both early intervention measures and a scaled response when a disaster does occur.

Efforts should focus on building at-risk communities' resilience to extreme weather events. Research shows the value of community development models that involve mental health literacy training and social networking.[56] People hit by bushfires need support from their friends, family, social networks, and community groups.[57]

48. EPA Victoria (2020b).
49. NSW DPIE (2020).
50. ACT Health (2020).
51. Fitzgerald et al (2019); CSIRO and Bureau of Meteorology (2018).
52. Rychetnik and Stewart (2019).
53. These contractual arrangements would authorise GPs to be paid as sessional Visiting Medical Officers during disasters, potentially covered under Health Program Grants made under Part IV of the Commonwealth's *Health Insurance Act 1973* and paid in lieu of fee-for-service payments.
54. SBS News (2020).
55. See for example NSW Health's special provision during the 2019-20 bushfires: NSW Health (2020)
56. Hart et al (2011).
57. Gibbs et al (2016).

DHHS should ensure that community mental health services are equipped to respond to bushfires immediately, and to provide long-term support. This is particularly important for regional and rural communities that already have fewer mental health services per person than larger towns or cities.[58]

2.4 Align government response systems to ensure a national approach

Victoria should work with other state governments and the federal government to better align bushfire planning and response systems. This should also apply to collaboration between government health authorities.

Australia's current national health response to extreme weather events is fragmented. For example, during the 2019-20 fires, there appeared to be limited collaboration between jurisdictions to manage the health impacts.

A national approach would help avoid inconsistent public messaging that may cause confusion.[59] For example, the inconsistent health risk ratings and messaging for bushfire smoke may have undermined the overall health advice last summer (see Section 2.1).

To build inter-jurisdictional collaboration, Victoria should support the establishment of a national climate change and health forum[60] that reports to Chief Health Officers.[61] This forum would include officials[62] from the Commonwealth and all states and territories.

A national climate and health forum would help Australia improve its health response to extreme weather events exacerbated by climate change, such as bushfires. Officials should meet regularly, share strategies, and encourage coordinated and consistent national action where appropriate.

2.5 Improve health response systems under a broader climate change and health agenda

Climate change is not only increasing the severity of bushfires (see Section 1.6), it is increasing the likelihood and intensity of other extreme weather events such as heatwaves, droughts, and floods.[63]

The 2019-20 summer should prompt Victoria to build on its work[64] to address the health risks from climate change.

58. National Rural Health Alliance (2017).
59. The inconsistent public messaging between states and also between states and the Commonwealth in response to COVID-19 has caused confusion. The Australian Medical Association said the mixed messaging potentially contributed to an increased public health risk, see Keane (2020).
60. This should be a collaborative and open forum, that does not carry any specific responsibilities or authority. It should easily be able to bring in officials from all relevant fields.
61. This could be via the Australian Health Protection Principal Committee (AHPPC), which is Australia's committee for health emergencies. It is made up of all state and territory Chief Health Officers and is chaired by the Australian Chief Medical Officer.
62. It should be made up of middle-level managers who are directly involved with implementing climate change and health policies.
63. CSIRO and Bureau of Meteorology (2018).
64. Victorian Government (2019).

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