



AFTER THE BUSHFIRES: ADDRESSING THE HEALTH IMPACTS

BUSHFIRE EXPERT BRIEF SEPTEMBER 2020

OVERVIEW

- Bushfires have adverse effects on people's physical and mental health.
- Individuals are affected by direct exposure to the flames, exposure to extreme heat, prolonged smoke inhalation, contamination of waterways and food, and through trauma from the fires themselves.
- The prolonged and widespread nature of the 2019–20 bushfires resulted in more people being affected by bushfire-related health issues than previous events.
- Clearer and more consistent public health advice on how individuals and communities identify, manage and treat health impacts is needed, including targeted information and plans for vulnerable population groups.
- Knowledge gaps need to be addressed if we are to better manage future impacts on human health, particularly in the context of climate change.
- The scale and intensity of the 2019–20 fire season presents an opportunity to address these knowledge gaps.

AFTER THE BUSHFIRES: ADDRESSING THE HEALTH IMPACTS

The Australian bushfire season of 2019–20 had a devastating impact on the environment, economy and communities and resulted in significant negative implications for human health and societal wellbeing.^{1,2} The extent, duration and intensity of the 2019–20 fires affected an extraordinarily high proportion of the population; an estimated 78.6% of Australians were either directly affected, or indirectly through family and friends.^{3,4}

The scale of the bushfires brought new health challenges, some of which are not yet well understood and some of which may not yet even be evident. The extent of the fires also highlighted gaps in our knowledge about the health implications which must be addressed.

Due to the impacts of climate change, Australia is likely to see increasing frequency and severity of fires over the coming decades.⁵ There is a strong need to understand the changing health consequences of bushfire to provide the support services required.

Fire and heat exposure

Bushfires and heat stress pose a severe risk for anyone in proximity to the flames or within range of the radiant heat released. Burns to parts of the body

can be life-threatening or lead to lasting disabilities that require long-term medical treatment and support. Heat can also be a severe stressor, causing dizziness, confusion, dehydration, nausea, exhaustion and heat stroke, which in extreme cases can be fatal.^{6–8}

Those who may be affected include residents, visitors and emergency personnel—anyone near the fire or in locations experiencing extreme heat from the fire or the weather. Heat stress, induced by weather, has an impact on pregnancies, is associated with an increase in mortality in elderly populations and long-term neurological effects.^{6–8} The consequences of extreme heat exposure on human health, due to bushfire, are not yet clear.

Mental health

A range of psychological factors results from the processing of trauma following bushfire events, with people located at or near a bushfire and those further away experiencing mental health issues. Common mental health impacts include anxiety, depression, substance abuse and post-traumatic stress disorder (PTSD).⁹ Some people may also experience heightened suicidal risk, acute stress or poor sleep quality.^{10,11}

Research on disaster survivors has consistently demonstrated that most people recover without professional intervention within a number of

months.^{12,13} However, while most people eventually recover over time, a sizeable minority experience mental health problems in the months or even years after the initial event. Recovery from bushfires can be a long process—mental health impacts can emerge at any time following the bushfire event and can last for years. One in five individuals affected by the Victorian Black Saturday fires in 2009 still had a psychological disorder five years later, which were more likely to be driven by factors like financial strain and community recovery than by the direct experience of the fires.^{9,11} And long-term studies of the Ash Wednesday bushfires in South Australia revealed that the mental health impact of the fire could still be detected in the children of affected families twenty years after the event.¹⁴ Ongoing post-disaster stressors, such as rebuilding challenges and social and economic disruption, can also contribute to mental health problems.¹⁵

Women living in highly affected communities are more likely to experience domestic violence than those living in less-affected communities, and this is linked to financial strain and mental health issues such as PTSD.¹⁶ Aboriginal and Torres Strait Islander peoples are also more likely to have poorer mental health status and other socioeconomic vulnerabilities.¹⁷

Respiratory health

Exposure to bushfire smoke, which can be many kilometres away from the fire, can cause respiratory complications such as breathing difficulties and coughing. This is caused by exposure to a complex mixture of gases including varying levels of ozone, carbon monoxide, sulphur dioxide and nitrogen dioxide, as well as particulate matter, interacting with the respiratory tract.¹⁸ These air pollutants can also cause oxidative stress and inflammation of the lungs, which can exacerbate existing respiratory and cardiovascular conditions or increase the risk of new infections.^{19–22}

There are two main categories of particulate matter: PM₁₀ and PM_{2.5}. PM₁₀ particles, which have a diameter of 10µm or less, are small enough to pass through the nose and enter the lungs, potentially also affecting the heart.²³ Even finer particles with a diameter of 2.5µm or less, PM_{2.5}, are small enough to penetrate deeply into the lungs and enter the bloodstream, causing systemic health issues beyond the respiratory system.^{23–25}

Exposure to bushfire smoke can increase mortality and hospital admissions. In one study, researchers estimated that during the 2019–20 bushfires, exposure to bushfire smoke in Australia resulted in over 400 deaths, over 1100 hospitalisations for cardiovascular problems and over 2000 for respiratory problems, and over 1300 asthma presentations in emergency departments.

Eye health

Dust, fumes, gases and fine particles can irritate the eyes. People with pre-existing conditions such as dry eye, eyelid inflammation or allergic conjunctivitis can be particularly sensitive to irritation from smoke, which can sometimes trigger severe symptoms of stinging, grittiness, burning and itching.²⁶

Air pollution can also increase the frequency of such conditions—a study from China, for instance, found that individuals with long-term exposure to air pollution are three to four times more likely to experience dry eyes.²⁷ In another study investigating the long-term impact of particulate matter on eye health, researchers suggest that exposure to higher levels of fine particles may cause conditions such as glaucoma.²⁸

Digestive health, food and water

Bushfires cause loss of vegetation and can alter soil composition and structure.^{29,30} If heavy rain follows a bushfire, soil erosion due to water runoff can occur. Runoff can carry sediments and pollutants from bushfire locations and contaminate drinking water supplies. This increases the risk of gastroenteritis, the symptoms of which, such as diarrhoea and vomiting, can cause dehydration and weakness in those affected.³¹ Runoff following high-intensity fires may also include inorganic components such as phosphorus and nitrogen. These compounds can stimulate the growth of blue-green algae that release harmful toxins into drinking water. High-intensity fires may also increase the exposure of trace metals.³² Burned materials, such as debris, and elevated water turbidity can also hinder water treatment processes.³³

Smoke and embers can contaminate water in tanks on properties not connected to town water supplies, making the water undrinkable or blocking pumps.

Bushfire can also damage the energy distribution grid, causing a loss of power for refrigeration which increases the risk of salmonella and campylobacter infections and other pathogens from spoiled foods.

Access to emergency services and information

Loss of power and fire or heat damage to telecommunications and internet infrastructure can prevent people calling emergency services in life-threatening or serious health situations. This can also prevent urgent safety alerts being received by those in the path of fires, putting them at increased physical risk.

Health effects of other contaminants

Beyond bushfire smoke, contaminants can arise from the burning of household chemicals and materials such as asbestos and fuel.^{34,35} When these contaminants enter the bloodstream, whether through the lungs, ingestion, skin or otherwise, they can cause harm and can potentially endure in the body for long periods.^{36,37}

ARE THERE ANY POPULATIONS AT PARTICULAR RISK?

People who are particularly vulnerable to the health impacts of bushfires and bushfire smoke include those with pre-existing health conditions such as acute or chronic respiratory infections, heart and lung diseases, and asthma. Children, pregnant women, people with a disability, people who are homeless, those with age-related frailty, and Aboriginal and Torres Straits Islands peoples and communities are also more vulnerable to the health impacts of bushfire.³⁸ A recent study reported that over one-quarter of the Indigenous population of New South Wales and Victoria live in areas directly affected by the 2019–20 bushfires (not including bushfire smoke), and that Aboriginal people were among those most affected.¹⁷

Women, children, those with greater direct exposure to the fire and people with low or negative social support and prior mental health conditions are at higher risk of post-disaster mental health problems.¹⁰

Pregnant women tend to breathe at a faster rate, which may make them more vulnerable to smoke exposure. Some research has linked extended exposure to fine particle pollution from fires to unwanted pregnancy outcomes such as pre-term births and lower birth weight.^{39,40} We also do not know whether fine particles and other toxins are transferable through breast milk to babies, or how heat stress or the stress of an emergency may affect infants.

Children are particularly vulnerable due to their level of activity, the fact that their respiratory system is still developing, and their relatively high air intake compared to their body size.⁴¹

Emergencies potentially exacerbate health inequalities. Access to services and information, including on the management of pre-existing conditions, may be lacking. For example, authorities may advise people to avoid bushfire smoke by staying indoors and by using air conditioning, or in severe cases, air purifiers and facemasks. Still, there are socio-economic factors that make it difficult for financially vulnerable groups to implement these measures. Housing standards may also not provide adequate protection from air pollution.

In addition, people in regional and remote areas already have reduced access to health services compared to those in metropolitan areas, which is exacerbated in times of emergency. We know that the quality of the acute response can influence long-term outcomes.

WHAT SHOULD WE DO NOW?

Climate models suggest that there will be more bushfires over the coming decades and those fires will be more intense than in the past.⁵ There is a need to prevent or better plan for and manage bushfires where possible, and to better mitigate and manage the health impacts of increased fire risk and provide appropriate information and support for patients, communities and health professionals wherever the location.

It is clear from the 2019–20 bushfire season that many unknowns remain about how bushfires impact on health in the short, medium and long term. This is especially so when the threat of fire and the required responses are so prolonged. The lack of knowledge makes it difficult to provide accurate health advice which has caused anxiety among affected communities and the wider public.

Building our understanding and evidence base

There is an opportunity to address the knowledge gaps regarding the impacts of bushfire on human health to assist in the development of clear guidelines and more informative health advice, as well as better delivery of health and support services. Some of these knowledge gaps include:

- **mental health impacts**, particularly on first responders and vulnerable groups. In the case of first responders, although fire services and other organisations may provide short-term mental health support, resource limitations can sometimes mean that long-term follow-up and support is difficult. Research tracking the long-term mental health outcomes for first responders in Australia is limited. Overseas data suggests that long-term mental health outcomes can be considerable.⁴² However, appropriate long-term follow-up of Australian first responders is crucial if we are to provide adequate support through the full range of mental health impacts, some of which may not emerge for many years
- **underlying biological mechanisms** for how air pollution from bushfire smoke causes respiratory problems and exacerbates existing conditions are poorly understood. It is important to better understand the chemical composition and toxicity of bushfire smoke, and how people can protect themselves
- **health impacts of prolonged exposure to bushfire smoke**, fine particulate matter and other contaminants on firefighters, other first responders, vulnerable groups, perinatal and neonatal infants, and the general population.
- **reliable metrics and methods to measure and communicate air quality conditions and the health impacts of bushfire smoke**. A system needs to be established, specifically for different exposure and pollutant levels.

Developing appropriate plans and advice

Health advice available to the public concerning bushfires during the 2019–20 bushfire season should be improved to increase community readiness for future disaster events. The bushfire season also revealed several areas where planning for a bushfire emergency and response need to be improved. It is important to provide accurate, nuanced and consistent health advice.

The following changes are required to improve public advice and planning:

- **Vulnerable individuals and communities**—When planning an emergency response or evacuation for bushfire or smoke haze, specific health and health protection advice must be provided and targeted for these communities. For example, pregnant women, postnatal women, their babies and the emergency and health services who support them require guidelines on when and how to evacuate and clear policies to help infant feeding; Australia does not have an ‘infant and young child feeding in an emergency’ (IYCF-E) plan, which aims to ensure that nutritional needs are met.⁴³
- **Use of and access to facemasks**—The correct fit of a P2 or N95 facemask, which is easily compromised by factors such as facial hair, is an essential component in determining whether they protect the user. Incorrect use of facemasks can lead to a false sense of security, meaning the user may be unknowingly exposed to unhealthy levels of air pollution. Respirators are another face cover option for filtering air. However, their relatively higher cost may make them less accessible. If the use of facemasks or respirators are part of future mitigation and adaptation strategies, clear advice on correct usage is needed, which must be supported by more evidence on the effectiveness of masks and respirators. When children have to spend time outdoors, appropriately sized facemasks should be available. Similarly, clear advice on the effectiveness of staying indoors and the use of air conditioning and air filtration systems is also required.

- **Integrate health and mental health care into disaster planning.** The immediate need and cost of health services during a bushfire, and their demand during recovery, must be assessed. The communities impacted most directly are often those in rural or remote areas with limited services. Mechanisms are needed to enable access to medical specialists and mental health professionals, potentially at short notice and using digital technology such as telehealth if appropriate. Support services must be better prepared to deal with co-occurring physical and mental health problems, the complexity of which may require long-term support. Burns in childhood, for instance, can increase the likelihood of being admitted to mental health care later in life by up to five times.⁴⁴

Further research to develop a strong evidence base of the human health consequences of bushfire and subsequent community needs will ultimately enable us to create better plans and health advice that caters to all Australians. Targeted advice and strategies are particularly needed for vulnerable population groups.

Importantly, in planning for the future impacts of bushfire on human health, plans must consider the broader context of current situations. Bushfires do not occur in isolation to other events and the collective negative effects of multiple events may be compounding. For example, access to mental health services by individuals affected by bushfire can become further strained due to the additional pressure of COVID-19.

PREPARATION OF THIS BRIEFING

This briefing has been informed by contributions from Fellows from both the Australian Academy of Science and the Australian Academy of Health and Medical Sciences, and other experts in fields including environmental health, respiratory health, mental health, maternal and child health, burns, Indigenous health, public health and eye health, including through an Australian Academy of Health and Medical Sciences expert roundtable on 13 February 2020*. We are grateful for their valuable contributions.

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* To read a full report of this roundtable, visit https://aaahms.org/wp-content/uploads/2020/04/The-Australian-Bushfires-and-the-impact-on-health_evidence-doc.pdf

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