



Australian
Academy of Health and
Medical Sciences

Submission from AAHMS to the Senate Finance and Public Administration Committee on the lessons learnt from the bushfire season 2019/20

A SUBMISSION BY THE AUSTRALIAN ACADEMY OF HEALTH
AND MEDICAL SCIENCES

April 2020

The Australian Academy of Health and Medical Sciences



Key messages

- **Impacts on health are wide-ranging and potentially long-term. The extent, duration and intensity of the 2019/20 bushfires have affected a substantial proportion of the population, bringing new health challenges, some of which are not well understood.** Exposure to heat, smoke and other contaminants can impact directly on health through the respiratory system, eyes and skin, and fine particles can enter the bloodstream causing further risks. Mental health can be seriously affected in multiple ways, especially for first responders and individuals directly affected by fires. Indirect implications may arise through contamination of waterways and food systems.
- **Australia will need to better understand the short-, medium- and long-term impacts on health if we are to mitigate, adapt and support those affected in future, particularly given that such events are expected to become more common.** There are gaps in our knowledge of impacts on first responders and affected communities, as well as the wider population, especially when the response or threat of fire is so prolonged.
- **There is an opportunity now to undertake research to fill these knowledge gaps – we must take it.** Funding calls from organisations such as the National Health and Medical Research Council and Medical Research Future Fund are welcome, but will need to be supplemented by further work. We know from previous incidents, such as the Black Saturday fires and the Hazelwood mine fire, that the health impacts – both physical and mental – extend far beyond the duration of the fires. Research is crucial to gaining an adequate understanding of these complex outcomes.
- **Targeted advice and plans are needed for vulnerable population groups.** Targeted interventions and early warnings are needed to prevent impacts such as respiratory problems and heat stress in vulnerable populations groups, including infants, children, the elderly, individuals with pre-existing conditions, pregnant women and Aboriginal and Torres Straits Island Peoples and communities. Emergency situations can also exacerbate health inequalities.
- **Clear public health advice is needed and will rely on evidence.** There was insufficient health advice available to the public in relation to bushfires this season, in some cases because the evidence does not exist and in others, because it has not been collated and synthesised.
- **Future health system needs must be assessed, including long-term modelling of costs.** The communities most directly impacted are often rural or remote communities with limited services – mechanisms are needed to augment access to medical specialists, potentially at short notice. The quality of this acute response can determine long-term outcomes – poor care after burn injuries, for example, can lead to chronic disease. Further afield, given the widespread impacts across the country, we need to ensure health professionals such as those in primary care, are equipped to provide the best care and advice. The health system will also need capacity to deal with long-term follow up.

Introduction

The Australian Academy of Health and Medical Sciences' (AAHMS) welcomes the opportunity to respond to the Finance and Public Administration References Committee's inquiry into the 'Lessons to be learned in relation to the Australian bushfire season 2019-20'.

The 2019/20 bushfire season has had a devastating impact on communities and the environment across Australia. Fires on this scale bring significant implications for human health and societal wellbeing. Impacts of smoke exposure and the challenges for mental health have been two widely reported areas of concern, and the fires have revealed gaps in our understanding of these and other aspects of health.

AAHMS is Australia's Learned Academy for health and medical sciences. Our mission is to advance health and medical research in Australia and its translation into benefits for all, by fostering leadership within our sector, providing expert advice to decision makers, and engaging patients and the public. The Academy is

the impartial, authoritative, cross-sector voice of health and medical science in Australia. Through its independent and interdisciplinary body of 398 Fellows, elected by their peers for their exceptional contributions to health and medical science in Australia, the Academy is well placed to advise the Government on the known and unknown health impacts from the recent bushfire season. **Our response therefore focuses on the terms of reference most relevant to health issues associated with bushfires.**

(a) advice provided to the Federal Government, prior to the bushfires, about the level of bushfire risk this fire season, how and why those risks differed from historical norms, and measures that should be taken to reduce that risk in the future;

According to the Intergovernmental Panel on Climate Change and Bureau of Meteorology, we are likely to see higher frequency and severity of climate related events over the coming decades.^{1,2} This will bring new challenges for health, as has been acknowledged here and overseas.^{3,4} Health impacts must therefore be addressed in preparedness strategies and action plans for our communities in advance of future bushfires.

(d) the adequacy of the Federal Government's existing measures and policies to reduce future bushfire risk, including in relation to assessing, mitigating and adapting to expected climate change impacts, land use planning and management, hazard reduction, Indigenous fire practices, support for firefighters and other disaster mitigation measures;

We would highlight the importance of adequately preparing for the health impacts on first responders, such as firefighters and frontline volunteers, especially given the prolonged and intense response required by these groups during the 2019/20 bushfire season. Health impacts on these groups include issues related to respiratory health, mental health, exposure to contaminants, burns and other injuries. Health risks need to be included in mitigation plans and preparation, and there are various aspects of these risks that need to be further researched and understood, including:

- The respiratory health impacts on firefighters and volunteers can be significant. We need to better understand the long-term health impacts of prolonged exposure from bushfire smoke. The acute effects of smoke exposure on first responders have been described in international studies.^{5,6} However, there are still many unknowns regarding the long-term effects, especially in the Australian context, but we know from research elsewhere, e.g. following 9/11, that they can be profound.⁷
- First responders, firefighters and volunteers can face mental health challenges due to the physical and mental strain involved in responding to the bushfires, which occur while they may also be dealing with impacts personally and in their community. We need to better understand the full impact on first responders and volunteer mental health. Alongside physical health, mental health follow-up for firefighters, both professional and voluntary, is critical to enable the most appropriate and effective care. While there are often mechanisms in place to provide mental health support to firefighters in the short term, resource limitations mean that long-term follow-up can be difficult, especially for voluntary organisations. Appropriate long-term follow-up is crucial if we are to support first responders through the full range of mental health impacts, some of which may not emerge for many years.
- Contaminants from bushfire and other material can put the health of firefighters and volunteers at risk. Contaminants come not only from bushfire smoke, but as a result of the burning of household chemicals and materials (e.g. asbestos), fuel or other materials, as well as firefighting foam. When they enter the bloodstream, whether through the lungs, ingestion, skin or otherwise, these contaminants can cause harm and can potentially endure in the body for long periods. In many cases, we do not know the long-term impacts of such exposure.

(g) the role and process of advising Government and the federal Parliament of scientific advice;

Scientific evidence and advice are essential to guiding the government responses to bushfire events. Although Australia has experienced many bushfire seasons, the length and extent of the 2019/20 season's fires and the level of smoke exposure raise new questions, especially on the long-term health impacts.

Health did not appear to be incorporated into discussions regarding scientific advice during the crisis – it is surprising that the research questions and evidence-based required to respond to health needs were seen as separate. These issues are interconnected and should not be seen in isolation. In this submission, we highlight various knowledge gaps in health; targeted and interdisciplinary research to better understand these unknowns, and to offer a scientific basis for the response, is now needed to support ongoing recovery efforts and to prepare for future events.

(h) an examination of the physical and mental health impacts of bushfires on the population, and the Federal Government's response to those impacts

There are a number of direct and indirect health impacts of bushfires on communities – some of which are well understood, while others are only partially understood or remain unknown. Governments in Australia have funded research following previous events, such as the Black Saturday fires and the Hazelwood coalmine fire, which has helped to reveal some of these impacts. Knowledge from such work can help prepare and respond, and should be used to shape long term actions following this season and to prepare for the future. We also need to build on that work to fill remaining gaps in our understanding. The 2019/20 bushfire season provides a good opportunity to pursue research in such areas.

We have summarised these impacts below in some key health areas. Appropriate government responses to these health impacts can help recovery now and preparation for the future. We note under section (d) above the risks to first responders including firefighters. We focus here on risks to communities and the wider population, the latter being especially relevant this year given the extent, breadth and duration of the fires.

Bushfire smoke and respiratory issues

Exposure to bushfire smoke can cause respiratory complications, including breathing difficulties and coughing, due to the complex mixture of molecules including varying levels of carbon monoxide, sulphur dioxide and nitrogen dioxide, as well as particulate matter. There are two categories of particulate matter: PM₁₀ and PM_{2.5}. PM₁₀ particles (which have a diameter of 10µm (micrometres) or less), are small enough to pass through the nose and throat and enter the lungs. Fine particles, or PM_{2.5} (which have a diameter of 2.5µm or less) are small enough to penetrate deeply into the lung and enter the bloodstream, causing issues beyond the respiratory system. These smaller particles potentially pose a serious risk, especially for individuals with pre-existing conditions such as heart, lung diseases, asthma and diabetes, and those in vulnerable population groups such as the elderly, children and pregnant women.

It has been clear from this season's fires that there remain many unknowns about how bushfires impact on respiratory health in the short-, medium- and long- term. This has made it difficult to provide accurate health advice and has caused anxiety among affected communities and the wider public. Gaps in our knowledge relate not only to the health outcomes, but also to the underlying biological mechanisms and our ability to monitor and assess the risks – and then to provide sound advice on management, as follows:

- Exposure to fine particles (i.e. PM_{2.5} and PM₁₀) can have a harmful effect on respiratory and other pre-existing conditions. We do however not fully understand the underlying biological mechanisms for how air pollution from bushfire smoke causes respiratory problems and exacerbates existing conditions, particularly in the Australian context.
- The national air quality standards for Australia specify that air quality levels of PM_{2.5} should not exceed the average of 25 µg/m³ per 24-hour exposure or an average of 8 µg/m³ annually. There is however no established safe threshold for PM_{2.5}.⁸ The current air quality standards may not provide enough detail to inform health advice, since they are based on particle size and not the composition of the particles, which could be an important factor in determining the health effects – bushfire pollution may not necessarily be the same as traffic pollution, for instance. Research is needed to establish the levels at which health is compromised – and to what extent.

- Biomarkers can help in setting clearer guidelines, based on known health risks at different levels of pollution, enabling more informative advice to the public. We have not yet identified the most appropriate biomarkers to quantify the health impacts at particular levels of air pollution.
- Incorrect use of facemasks can lead to a false sense of security, when the user may unknowingly still be exposed to unhealthy levels of air pollution. The correct fit of a P2/N95 mask, which is easily compromised by factors such as facial hair, is key to sufficiently protecting its user. We need more guidance on the effective use of face masks.

Mental health

There are a range of psychological factors relating to the processing of trauma following bushfire events, especially for the individuals and communities directly impacted, and for first responders. Mental health impacts can include anxiety, depression, post-traumatic stress disorder (PTSD) and other forms of psychological distress.

Recovery from bushfires is a long process and mental health impacts can emerge at any time. Longitudinal research following the Black Saturday fires in 2009 show that one in five individuals in affected regions still had a psychological disorder five years after the fires, and such outcomes were more likely to be driven by issues like financial strain and community recovery, rather than the direct experience of the fires.⁹ Furthermore, women living in highly disaster-affected communities are more likely to experience domestic violence than those living in less affected communities.¹⁰

Findings like these should inform targeted responses to disasters and we must continue to probe remaining evidence gaps so that we can better support the Australian community through these sorts of disasters in future – for example, mental health service uptake can be lower than expected during bushfire recovery. The uptake of mental health such services following emergencies needs to be better understood to equip us to provide the most appropriate support to impacted communities and to improve mental health services uptake.

Eye health

Eye irritation is a common issue resulting from exposure to bushfire smoke. In the case of bushfires – dust, fumes, gases (e.g. nitrogen oxides) and fine particles can irritate the eyes. Individuals with pre-existing eye conditions such as dry eye, eyelid inflammation or allergic conjunctivitis can be particularly sensitive to irritation from smoke triggering sometimes severe symptoms of stinging, grittiness, burning and itching.¹¹ Dry eyes are three to four times more likely in individuals with long-term exposure to air pollutants.¹² Long-term exposure to higher levels of PM_{2.5} may for example be associated with increased cases of glaucoma.¹³ Particulate matter in the air also impacts the retinal vasculature, and thus may exacerbate common retinal vascular diseases that have the potential to reduce vision, such as diabetic retinopathy.¹⁴

Water/food

Runoff from bushfires can cause contamination of drinking water supplies, which increases the risk of gastroenteritis.^{15,16} The related symptoms such as diarrhoea and vomiting can lead to dehydration and weakness in those affected. The burned materials from bushfires, including organic matter, not only pose a risk to drinking water quality, but can also impede treatment processes.¹⁷ Higher intensity fires can cause the release of inorganic compounds, which, after rainfall, can lead to water contamination from phosphorus, nitrogen, and potentially increase the levels of trace metals.¹⁸ Phosphorus and nitrogen can stimulate the growth of blue-green algae, which can cause illness in humans and animals.

Bushfires may also impact the energy grid, and hinder the power supply for several days or weeks, especially in more remote areas. The loss of power for refrigeration can increase the risk of salmonella, campylobacter infections or other pathogens from spoiled foods.¹⁹

Burns and heat stress

Bushfires and heat stress pose a severe risk for anyone in proximity to the flames, but those nearby can also be affected by radiant heat. Burns can be life-threatening or lead to lasting disabilities that require long-term medical treatment and support. Heat can be a serious stressor, causing dizziness, confusion, dehydration, nausea, exhaustion and heat stroke, which in extreme cases can be fatal. Firefighters and volunteers are at the greatest risk of sustaining burn injuries and suffering from heat stress, but other population groups are also at risk. Heat stress in pregnancy has been linked to pre-term births, while heatwaves have also been associated with a 28% increase in the average deaths in the elderly population.^{20,21} Heat stroke has also been associated with long-term neurological effects, even among the young or individuals without pre-existing medical conditions.²² We need to be better prepared to deal with co-occurring physical and mental health problems; these sorts of complex health needs may require long-term support.

Impacts on vulnerable groups and health inequalities

Vulnerable groups include those with pre-existing health conditions such as asthma, chronic respiratory diseases, and cardiovascular conditions, as well as pregnant women and individuals that have age-related frailty or disabilities. Aboriginal and Torres Straits Island Peoples and communities can be vulnerable during bushfire emergencies and smoke haze. Indigenous children and adults, for instance, are more likely to suffer from acute or chronic respiratory infections – conditions can be exacerbated by bushfire smoke.²³

Health inequalities are potentially exacerbated by emergency situations, where access to services and information, including on the management of pre-existing conditions may be lacking. Authorities have advised staying indoors, using air conditioning when possible, or in severe cases air purifiers, to avoid bushfire smoke, but financially vulnerable groups may not be able to afford this. Areas where further work is needed to inform future preparation include:

- Extended exposure to air pollution from PM_{2.5} has been linked to adverse pregnancy outcomes such as pre-term births and low birth weight.²⁴ We need to better understand how bushfires and air pollution from bushfire smoke affect pregnant women, unborn and newborn babies in the Australian context. We need to explore how stress on mothers in emergency situations, or other impacts such as heat stress, affect their infants, for example whether fine particles and other toxins are transferable through breastmilk to babies.
- Pregnant women and families with young children need more comprehensive information during bushfire situations to reduce their risk. There is also a need to better inform emergency services and health services about how to support pregnant women, and parents with newborns during bushfires and smoke haze. This includes clear guidelines for when and how to evacuate them, and policies to support infant feeding. Australia does not currently have clear ‘young child feeding in emergency’ (IYCF-E) plans. IYCF-E plans concern infant feeding in disaster situations with a focus on the nutritional needs of infants relying on breastmilk and formula in emergency situations. Plans are needed at Federal level, in line with international standards, to support mothers and infants in emergency situations.²⁵
- Children are particularly vulnerable due to their level of activity, developing respiratory system and their relatively high air intake compared to their body size. We need targeted health/health protection advice for families with children, especially considering that children sized facemasks are not readily available. Evidence-based advice to parents is urgently needed.

We are grateful to the Fellows, Associate Members and external experts who contributed to this response.

-
- ¹ Reisinger, A., et al. (2014). *Australasia*; In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1371-1438.
- ² Bureau of Meteorology and CSIRO (2018). *State of the Climate 2018*. Available from: <http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2018.pdf>
- ³ Watts, N et al. (2019). The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. *The Lancet*, Volume 394, Issue 10211, p1836-1878, November 16, 2019.
- ⁴ Zhang, Y et al. (2019). The MJA -Lancet Countdown on health and climate change: Australian policy inaction threatens lives. *MJA* 209 (11) j 10 December 2018.
- ⁵ Slaughter, JC (2014). Association Between Lung Function and Exposure to Smoke Among Firefighters at Prescribed Burns. *J Occup Environ Hyg.* 2004;1(1):45-9.
- ⁶ Pedersen, JE (2018). Risk of asthma and chronic obstructive pulmonary disease in a large historical cohort of Danish firefighters. *Occup Environ Med.* 2018 Dec;75(12):871-876.
- ⁷ Zeig-Owens R, et al. (2018) Blood Leukocyte Concentrations, FEV1 Decline, and Airflow Limitation. A 15-Year Longitudinal Study of World Trade Center–exposed Firefighters. *Annals of the American Thoracic Society.* 2018;15(2):173-83.
- ⁸ World Health Organization (2006). *Air Quality Guidelines: Global Update 2005. Particulate matter, ozone, nitrogen dioxide and sulfur dioxide*. Copenhagen: WHO Regional Office for Europe, 2006.
- ⁹ Gibbs L, et al. (2016). *Beyond Bushfires: Community Resilience and Recovery Final Report*. November 2016, University of Melbourne, Victoria, Australia.
- ¹⁰ Molyneux, R et al. (2020). Interpersonal violence and mental health outcomes following disaster. *BJPsych Open* (2020) 6, e1, 1–7.
- ¹¹ American Academy of Ophthalmology (2018). *What to do when smoke get in your eyes*. Available from: <https://www.aaao.org/eye-health/tips-prevention/what-to-do-when-smoke-gets-in-your-eyes>
- ¹² Donhui, Y et al. (2019). Air Pollutants are associated with Dry Eye Disease in Urban Ophthalmic Outpatients: a Prevalence Study in China. *J Transl Med* (2019) 17:46.
- ¹³ Chua SYL, et al.; for the UK Biobank Eye and Vision Consortium (2019). The relationship between ambient atmospheric fine particulate matter (PM2.5) and glaucoma in a large community cohort. *Invest Ophthalmol Vis Sci.* 2019;60:4915–4923.
- ¹⁴ Pan, S-C et al. (2020). Association between air pollution exposure and diabetic retinopathy among diabetics. *Environmental Research*, Volume 181, February 2020, 108960.
- ¹⁵ Department of Health Tasmania (2018). *Preventing spread of disease in areas affected by bushfires*. Accessed on 5 March 2020. Available from: https://www.dhhs.tas.gov.au/publichealth/alerts/public_health_updates/preventing_spread_of_disease_in_areas_affected_by_bushfires
- ¹⁶ Water Quality Australia. *Bushfires and water quality*. Available from: <https://www.waterquality.gov.au/issues/bushfires>
- ¹⁷ Canning, A et al. (2020). Bushfires and the Risks to Drinking Water Quality: Factsheet. *Water Research Australia*, 2020. Available from: <https://www.waterra.com.au/publications/document-search/?download=1840>
- ¹⁸ Canning, A et al. (2020). Bushfires and the Risks to Drinking Water Quality: Factsheet. *Water Research Australia*, 2020. Available from: <https://www.waterra.com.au/publications/document-search/?download=1840>
- ¹⁹ Victoria State Government (2020). *Health concerns related to Victorian bushfires*. Published 24 January 2020. Available from: <https://www2.health.vic.gov.au/about/news-and-events/healthalerts/health-concerns-bushfires>
- ²⁰ Supriya, M et al. (2017). Examining the Effects of Ambient Temperature on Pre-Term Birth in Central Australia. *Int. J. Environ. Res. Public Health* 2017, 14, 147.
- ²¹ Cheng, J et al. (2018). Heatwave and elderly mortality: An evaluation of death burden and health costs considering short-term mortality displacement. *Environmental International*, Volume 115, June 2018, Pages 334-342.
- ²² Lawton, EM et al. (2019). Review article: Environmental heatstroke and long-term clinical neurological outcomes: A literature review of case reports and case series 2000–2016. *Emergency Medicine Australasia* (2019) 31, 163–173.
- ²³ Basnayake, T et al.(2017). The global burden of respiratory infections in indigenous children and adults: A review. *Respirology* (2017) 22, 1518–1528.
- ²⁴ Abdo, M et al. (2019). Impact of Wildfire Smoke on Adverse Pregnancy Outcomes in Colorado, 2007–2015. *Int. J. Environ. Res. Public Health* 2019, 16, 3720.
- ²⁵ Gribble, K et al. (2019). Emergency preparedness for infant and young child feeding in emergencies (IYCF- E): an Australian audit of emergency plans and guidance. *BMC Public Health* 19, Article number: 1278 (2019).