

**INQUIRY INTO HEALTH IMPACTS OF EXPOSURE TO
POOR LEVELS OF AIR QUALITY RESULTING FROM
BUSHFIRES AND DROUGHT**

Organisation: Australian Medical Association (NSW) Ltd
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Health impacts of exposure to poor levels of air quality resulting from bushfires and drought

Thank you for the opportunity to provide a submission to the Inquiry into the health impacts of exposure to poor levels of air quality resulting from bushfires and drought.

AMA (NSW) welcomes this Inquiry, which will provide the NSW Government with an important opportunity to examine the short and long-term health impacts of poor air quality resulting from the 2019/2020 bushfires, as well as the ongoing drought. We also support the need to measure and report on air quality, in addition to ensuring the State has strategies in place to sufficiently plan for, and improve, poor air quality.

PARTICULATE MATTER

PM10: Particles with a diameter of 10 micrometres or less. These particles are small enough to pass through the throat and nose and enter the lungs.

PM2.5: Particles with a diameter of 2.5 micrometres or less. These particles can get deep into the lungs and enter the bloodstream.

Particulate matter (PM10 and PM2.5) results from bushfires, wind-blown dust, motor vehicle transmissions, industry emissions, mining activity, agricultural practices, wood-burning, unflued gas heating and cooking, and cigarette smoke.

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Particulate matter (PM) is a dangerous pollutant and considered a carcinogen by the International Agency for Research on Cancer.ⁱ

HEALTH IMPACTS

Bushfires There is currently no evidence, despite extensive epidemiological research, of a threshold below which exposure to particulate matter does not cause any health effects. Health effects can occur after both short and long-term exposure to particulate matter.

Bushfire smoke contains particulate matter (PM_{2.5}) and gases that is known to contribute to a range of acute and chronic health problems and, potentially, premature mortality.

Fine particles can penetrate deep into the respiratory system causing an inflammatory response and enter the bloodstream to affect other parts of the body. The higher the exposure to air pollution, the greater the health risk. Exposure to smoke can result in mild symptoms, including sore eyes, runny nose, throat irritation, headaches, shortness of breath and cough. For most people, mild symptoms are temporary. However, smoke from bushfires can exacerbate chronic lung and heart conditions, causing severe illness. People with emphysema, angina, and asthma may experience worsening of their conditions causing an asthma attack or heart attack.

Australian research on the acute effects of exposure to bushfire smoke indicates that there is a substantial health burden associated with smoke from bushfires and hazard reduction burns, including premature deaths.^{ii iii}

Health effects from poor air quality also strain the NSW Health system. Health authorities recorded a 30% increase in ambulance call outs across NSW, and hospitalisations for respiratory issues rose by 25% in early December 2019.^{iv} This coincided with data from the NSW Department of Environment which showed Sydney's air quality during the 2019 bushfire season was three times worse than any moment in the past five years.^v

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Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

Sydney Air Quality 10 December 2019 recorded at 0900am:

Sydney East	1517
Sydney North West	1789
Sydney South West	1042

Source: <https://hsu.net.au/2019/12/ohs-nsw-bushfires/>

When combined with high temperatures, the health risks associated with poor air quality are heightened, with increased effect on mortality.^{vi}

The devastating 2019/2020 bushfires in NSW were unique in that the extended period of bushfire activity resulted in residents experiencing poor levels of air quality for longer periods of time than previous bushfire seasons.

As bushfire seasons continue to get longer – starting earlier and finishing later – and extreme weather conditions caused by climate change make these fires more intense and difficult to control, the dangers of poor air quality will increase. NSW needs to put a strategic health plan in place to protect residents.

At-risk groups

Australian research found excess deaths caused by landscape fire smoke exposure were likely to be in vulnerable groups, such as young children, older people, pregnant women, outdoor workers and people in lower socio-economic groups.^{vii}

Age is a determining factor in the health risks associated with poor air quality. Young children are at greater risk from exposure to smoke as they breathe in more air per bodyweight and their lungs are still developing. Older people face increased risk because of their age and or the existence of a pre-existing chronic health condition, such as diabetes,

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asthma, chronic obstructive pulmonary disease or other respiratory condition, or cardiovascular illness.

There is evidence that suggests exposure to bushfire smoke during pregnancy is associated with reduced birthweight and increased risk of gestational diabetes in pregnant women.^{viii ix}

People who spend more time outdoors are also at risk. This includes outdoor workers and homeless people.

People in lower socio-economic groups are potentially at risk, as they may face insecure housing, or poor housing, lower health literacy and inability to take preventative measures. People in this socio-economic population are more likely to live in areas with high pollution levels (e.g. close to major roads or industrial facilities, where house and land prices are usually less expensive). People in low socioeconomic populations also have higher rates of chronic disease, which can exacerbate negative health impacts from poor air quality.^x

Aboriginal and Torres Strait Islander communities also face significant health impacts from poor air quality, particularly from bushfires and dust. In addition, Indigenous Australians experience higher rates of chronic health conditions making individuals more susceptible to the health effects of poor air quality.

There is limited research on the health effects of poor air quality on vulnerable and disadvantaged communities. One study, which involved an exposure response analysis of the health effects of PM10 from ambient biomass smoke in Darwin, found a disproportionate risk for respiratory and cardiovascular hospital admissions in the Indigenous populations.^{xi}

The AMA supports further research be undertaken to investigate the impact of poor air quality on Indigenous populations as a priority, and recommends a precautionary principle should guide the development and implementation of air quality standards and management policies relating to vulnerable or disadvantaged groups, including Indigenous communities, children, and people from low socio-economic backgrounds.^{xii}

Medium term exposure and long-term impacts

There is limited research about the impacts of medium-term exposure to smoke pollution (weeks and months).

However, The Hazelwood Health Study investigated the health outcomes of populations exposed to six weeks of smoke from the 2014 Hazelwood coal mines in Victoria and found more than a year after the event occurred, adults had increased rates of respiratory

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symptoms. Parents also reported that children who were exposed to fire smoke from the mine either in the womb or in their first two years of life had more respiratory tract infections. In addition, the study found a link between fire smoke exposure and increased lung stiffness in children who were aged up to two at the time of the fire.^{xiii}

A 2013 review conducted by the World Health Organisation (WHO) found long-term exposure to fine particles (PM2.5) can result in atherosclerosis, adverse birth outcomes and childhood respiratory diseases.^{xiv}

It also suggested a link with neurodevelopment, cognitive function and diabetes, and indicates that recent research has further strengthened the causal link between PM2.5 and cardiovascular and respiratory deaths.^{xv}

The lack of clinical and public health research evidence about the long-term impacts of exposure to poor air quality made public education challenging during the 2019/2020 bushfires. More research into bushfire smoke will provide greater insight into prevention measures and arm doctors with better clinical solutions to care for communities affected by future extreme bushfires and other air quality emergencies.

The AMA supported the Federal Government's \$5 million funding commitment for research into both the physiological and mental health impacts of prolonged exposure to bushfire smoke. We support research that builds on existing knowledge of air quality and human health, in particular, research on the impact of the 2019/20 bushfires. The findings of this research could be applied into clinical and public health practice across Australia, to facilitate comprehensive care and treatment and improve health literacy.

We support extra funding to aid researchers in completing this work ahead of future bushfire and hazardous air quality emergencies.

Effectiveness of protective materials/strategies

During periods of poor air quality due to bushfire smoke, health advice is related to short-term measures aimed at reducing exposure. People who are sensitive to smoke, particularly those with pre-existing heart and lung conditions are advised to take extra care. These measures include remaining indoors, with windows and doors closed, and avoiding use of evaporative air conditioners which draw air into the house from outside. People are also advised to avoid strenuous exercise outdoors.

Other general advice includes urging residents to ensure they have access to medication and continue taking as prescribed. People with asthma are encouraged to follow their asthma action plan. While anyone experiencing wheezing, chest tightness, or difficulty

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breathing are advised to seek urgent medical attention, and in the event of a medical emergency call triple-zero (000).

Evidence shows P2 and N95 masks do filter some smoke and are most commonly used in occupational settings where exposure to airborne particles occur on a regular basis. However, they cannot completely eliminate exposure to smoke, as they can be difficult to fit and use appropriately, particularly for children. They are not recommended for use in the general community as an alternative to avoiding outdoor exposure.

We also note that the provision of protective materials such as P2 and N95 masks during periods of poor air quality poses significant issues, such as resource allocation. Prioritisation of scarce resources can place practitioners and health agencies in an ethical dilemma. Practical and medical considerations must also inform decisions about whether to recommend and distribute facemasks during periods of poor air quality to vulnerable populations, outdoor workers and the general public.

Advising residents – particularly outdoor workers – to stay indoors is impractical for long periods of time, as it limits a range of necessary daily activities. As well, it impacts on residents' ability to exercise, particularly those without access to indoor sports facilities.

Furthermore, advising NSW residents to stay indoors is also made problematic due to the housing construction in Australia – with older homes allowing bushfire smoke to leak indoors over time creating unhealthy indoor air quality conditions. Modern apartments, shopping centres, new office buildings, and some public places such as libraries, typically have well sealed, air conditioned environments; however, these are not accessible to all residents – particularly those with restricted mobility or older residents. Other measures, such as temporarily relocating vulnerable groups to safe indoor locations could be impractical for large population centres, expensive and potentially stressful for residents.

Giving residents more specific information regarding air quality forecasts and patterns of PM2.5 concentrations would help people to plan their daily activities and exercise to coincide with lower levels of smoke exposure.

Residents need timely and relevant public health advice when bushfire smoke exposure does occur, particularly those who are most susceptible to the health effects of air pollution. Coordination with health professionals is necessary to ensure early warning systems incorporate relevant information, such as preventative health and protective actions, and are communicated appropriately.

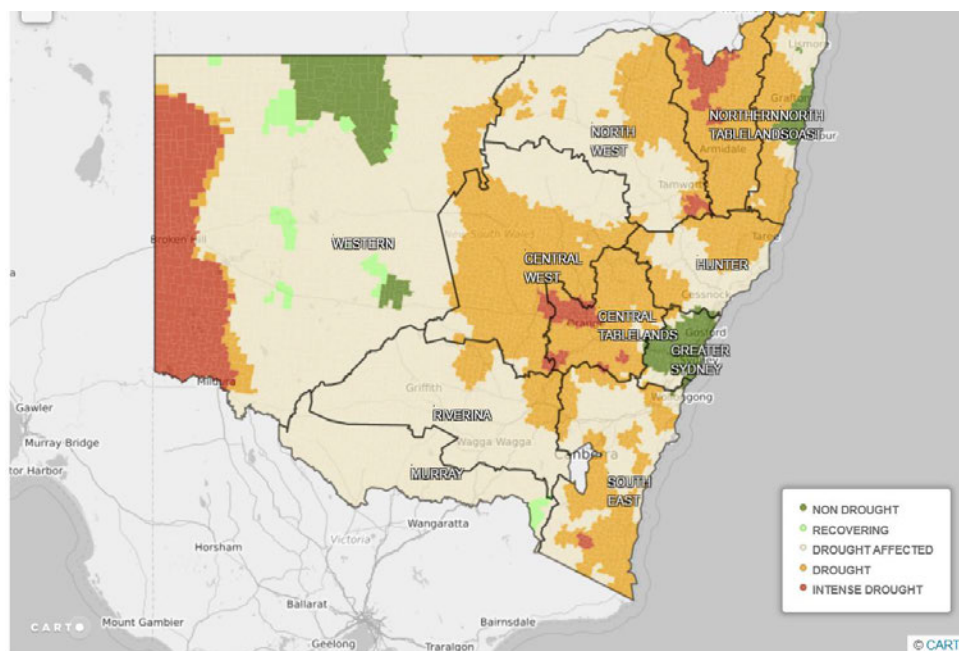
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Communication of health messaging is important and must be specific for at-risk groups. It's important to recognise information in electronic media may not reach groups such as older people, and therefore a means of more effective communication targeting that population is necessary.

Drought Drought is characterised by a prolonged period of precipitation shortage and soil moisture deficit, combined with high temperatures.

Severe drought conditions can negatively affect air quality. During drought, there is an increased risk of dust storms and bushfires. The combined effects of drought on deposition, natural emissions (bushfires, biogenic volatile organic compounds and dust), and chemistry, contribute to elevated ozone and PM2.5.



CDI = Combined Drought Indicator. RI = Rainfall Index. SWI = Soil Water Index. PGI = Pasture Growth Index. DDI = Drought Direction Index

As of 11 March 2020 Source: <https://edis.dpi.nsw.gov.au/>

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The AMA's Position Statement *Climate Change and Human Health - 2004. Revised 2008. Revised 2015* outlines the link between climate change and drought and the effects of drought on human health.

By 2030, temperatures are expected to rise by 0.6 to 1.5°C across Australia compared with the 1980-1999 average, noting that temperatures already rose by an average of 0.6°C by 1990 compared with 1910.^{xvi} By 2070, temperatures are expected to rise by 1.0 to 2.5°C and 2.2 to 5.0°C.^{xvii}

The effects of these changes are expected to vary by region. Further decreases in average rainfall and more frequent and severe droughts are expected over southern Australia. While average rainfall in northern Australia may increase or decrease.^{xviii}

The number of extreme fire-weather days is expected to increase across southern and eastern Australia.^{xix}

Climate change is expected to have direct and indirect impacts on health.^{xx xxi xxii xxiii xxiv xxv} The direct effects of climate change include injuries and deaths from increased heat stress, floods, fires, drought, and increased frequency of intense storms. The indirect effects include adverse changes in air pollution. Increased frequency and intensity of drought, dust storms and bushfires, with increases in PM levels, is also likely to lead to increased asthma exacerbations, respiratory medication use and hospital admissions for asthma and other respiratory conditions.^{xxvi xxvii}

In addition, climate-related disasters, including persistent and severe drought are associated with significant mental health risks.^{xxviii} These impacts may be especially acute in rural communities where climate change places additional stresses on livelihoods.^{xxix xxx}

Rural Australians, low-income individuals and families, people with chronic diseases, children and elderly people, outdoor workers and Indigenous Australians will disproportionately feel the negative health impacts of climate change.^{xxxi}

We must act now on climate change to curtail the increasing risk of drought and extreme bushfires and pollution events.

WHS Occupational exposures to air pollutants

Workers in certain industries and occupations, particularly outdoor workers, are at heightened risk of adverse health outcomes during bushfires and periods of drought. Uneven application of current occupational and health safety regulations is particularly concerning.

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More data and surveillance are required for occupational diseases associated with poor air quality, to facilitate targeted preventative measures.

Recommendations:

1. As bushfire seasons continue to get longer – starting earlier and finishing later – and extreme weather conditions caused by climate change make fires more intense and difficult to control, the dangers of poor air quality will increase. NSW needs to put a long-term strategic health plan in place, which acknowledges and recognises the impact of longer bushfire seasons and subsequent sustained exposure to particulate matter.
2. Research on the impact of poor air quality on Indigenous populations should be a priority. Further research should be undertaken to better understand the health impacts to vulnerable and at-risk groups, including children, people with chronic health conditions, and people from low socio-economic backgrounds.
3. That a precautionary principle should guide the development and implementation of air quality standards and management policies relating to vulnerable or disadvantaged groups, including Indigenous communities, children, and people from low socio-economic backgrounds.
4. More research is needed to investigate the long-term impacts of exposure to poor air quality. AMA supports the Federal Government funding commitment to research and suggests findings be applied to improve clinical management and practice, as well as health literacy. We support extra funding to aid researchers in completing this work ahead of future bushfire and hazardous air quality emergencies.
5. Giving residents more specific information regarding air quality forecasts and patterns of PM2.5 concentrations would help people to plan their daily activities and exercise to coincide with lower levels of smoke exposure.
6. Information must be timely and relevant for different populations.
7. Current policy and planning frameworks need to take into account the likely impacts of climate change on air quality. Extreme weather has potential to not only increase the concentrations of certain hazardous particulate matter but may also render vulnerable populations more susceptible to experiencing adverse effects from poor air quality.
8. Current occupational health and safety regulations and standards need to be strengthened and enforced to support improvements in air quality in workplaces, particularly in highly exposed occupations and workplaces. Health surveillance should be regularly undertaken where there is an elevated risk of developing respiratory diseases.

Yours sincerely,

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ⁱ International Agency for Research on Cancer, *Air Pollution and Cancer. IARC Scientific Publication No. 161*, K. Straif, A. Cohen, and J. Samet, Editors. 2013: Lyon, France.

ⁱⁱ Horsley JA, Broome RA, Johnston FH, Cope M, Morgan GG. 2018. 'Health burden associated with fire smoke in Sydney, 2001–2013' *Med J Aust* 208 (7): 309-310.

ⁱⁱⁱ Morgan G, Sheppard V, Khalaj B, et al. Effects of bushfire smoke on daily mortality and hospital admissions in Sydney. *Australia. Epidemiology* 2010; 21:47-55.

^{iv} <https://www.newscientist.com/article/2227070-will-sydneys-bushfire-smoke-pollution-have-long-term-health-effects/>

^v <https://www.abc.net.au/news/2019-12-03/sydney-air-quality-smoke-haze-worse-this-bushfire-season/11755546>

^{vi} Shaposhnikov BD, Revich BB, Bellander BT, et al. Mortality related to air pollution with Moscow heat wave and wildfire of 2010. *Epidemiology* 2014; 25:359-364.

^{vii} Horsley JA, Broome RA, Johnston FH, Cope M, Morgan GG. 2018. 'Health burden associated with fire smoke in Sydney, 2001–2013' *Med J Aust* 208 (7): 309-310.

^{viii} Holstius DM, Reid CE, Jesdale BM, et al. Birth weight following pregnancy during the 2003 Southern California wildfires. *Environ Health Perspect* 2012; 120: 1340–1345.

^{ix} Melody SM, Ford JB, Wills K, et al. Maternal exposure to fine particulate matter from a large coal mine fire is associated with gestational diabetes mellitus: a prospective cohort study. *Environ Res* 2019; 108956 [Epub ahead of print].

^x https://ama.com.au/sites/default/files/documents/AMA_submission_inquiry_into_health_impacts_of_air_quality.pdf

^{xi} Johnston, F, Bailie, R, Pilotto, L, Hanigan, I, (2007). Ambient biomass smoke and cardio-respiratory hospital admissions in Darwin, Australia. *BMC Public Health* 7(1):240-247.

^{xii} Ibid.

^{xiii} <https://hazelwoodhealthstudy.org.au/about>

^{xiv} Health Effects Institute (HEI), (2013). Understanding the Health Effects of Ambient Ultrafine Particles. HEI: Boston, Massachusetts.

^{xv} Ibid.

^{xvi} Bureau of Meteorology (BOM) and Commonwealth Scientific and Industrial Research Organisation (CSIRO), *The Report - State of the Climate 2014*. 2015, Commonwealth Government of Australia.

^{xvii} Ibid.

^{xviii} Ibid.

^{xix} Ibid.

^{xx} Smith, K.R., et al., *Human health: impacts, adaptation, and co-benefits.*, in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.*, C.B. Field, et al., Editors. 2014: Cambridge, United Kingdom and New York, NY, USA. p. pp. 709-754.

^{xxi} World Health Organization (WHO), *Protecting health from climate change: connecting science, policy and people*. 2009: Geneva Switzerland.

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^{xxii} World Health Organization (WHO), *Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s*, S. Hales, et al., Editors. 2014: Geneva, Switzerland. p. 1

^{xxiii} World Health Organization (WHO) and World Meteorological Organization (WMO), *Atlas of Health and Climate*. 2012: Geneva, Switzerland.

^{xxiv} Costello, A., et al., *The Lancet Commissions: Managing the health effects of climate change*. Lancet and University College London Institute for Global Health Commission. The Lancet, 2009. **373**: p. 1693-1733.

^{xxv} Watts, N., et al., *The Lancet Commissions: Health and climate change: policy responses to protect public health*. The Lancet, 2015.

^{xxvi} Jacob, D.J. and D.A. Winner, *Effect of climate change on air quality*. Atmospheric Environment, 2009. **43**: p. 51-63.

^{xxvii} Beggs, P.J. and C.M. Bennett, *Climate change, aeroallergens, natural particulates, and human health in Australia: state of the science and policy*. Asia Pac J Public Health, 2011. **23**(2 Suppl): p. 46S-53.

^{xxviii} Doherty, T.J. and S. Clayton, *The Psychological Impacts of Global Climate Change*. American Psychologist, 2011. **66**(4): p. 265-276.

^{xxix} Edwards, F., et al., *Climate change adaptation at the intersection of food and health*. Asia-Pacific Journal Of Public Health / Asia-Pacific Academic Consortium For Public Health, 2011. **23**(2 Suppl): p. 91S-104.

^{xxx} Edwards, B., M. Gray, and B. Hunter, *A Sunburnt Country: The Economic and Financial Impact of Drought on Rural and Regional Families in Australia in an Era of Climate Change*. Australian Journal of Labour Economics, 2009. **12**(1): p. 109-131.

^{xxxi} Hughes, L. and A. McMichael, *The Critical Decade: Climate Change and Health*. 2011, Climate Commission Secretariat (Department of Climate Change and Energy Efficiency).

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