

Bushfires in Australia: a serious health emergency under climate change



Australia is burning. Both New South Wales and Queensland have declared a state of emergency after seeing new record high in property losses during this fire season. Recently, “fires near me” has become Google’s most searched words in Australia, with perhaps months of serious fire weather still to come. The unprecedented fire conditions have threatened lives and homes. At least 2.7 million hectares of New South Wales has been burnt since September, 2019, which was a much earlier start of the fire season than in previous years. The burned area is three times larger than 2019 fires in the Amazon (906 000 hectares) and is still expanding.

The ongoing bushfires (wildfires) have confirmed researchers’ warnings several years ago about increasing bushfires due to climate change in Australia.¹ Bushfires in Australia have been promoted by both a decrease in rainfall and an increase in extremely hot temperatures (figure).² According to the Australian Bureau of Meteorology, the Southern Downs (QLD) and Northern Tablelands (NSW) have had the record for lowest rainfall from January to August. Lack of rainfall makes vegetation very dry and flammable. Australia has warmed by more than 1°C since 1910. The warming climate in Australia has been accompanied by heatwaves characterised by increased frequency of occurrence, duration, and maximum temperatures. In 2019, both states entered the bushfire season after a year of hot temperatures and low rainfall, putting many districts under high risk of bushfires. A similar situation occurred in the 2009 Black Saturday fires in Victoria, when Melbourne reached a record-breaking high temperature (46.4°C) following a long drought.³

Bushfires can be catastrophic to lives. The ongoing bushfires in New South Wales have destroyed about 700 homes and untold wildlife, including seriously threatening koala populations due to habitat loss. It has been estimated that major Australian bushfires during 1967–2013 resulted in over 8000 direct injuries and 433 direct fatalities, costing approximately Australian \$4.7 billion.⁴ However, this estimate did not consider indirect costs, which mainly come from adverse health effects of bushfire smoke. According to the US Environmental Protection Agency, the indirect

effects of air pollution from wildland fires on excess premature deaths and morbidity in the USA during 2008–12 had an estimated cost of US\$513 billion.⁵

The best documented hazardous components of bushfire smoke are PM₁₀ and PM_{2.5}. Because of the bushfire, in most areas of Sydney, 24-h average PM_{2.5} concentrations this December have exceeded 100 µg/m³ (and could reach 500 µg/m³), which is four-times higher than the WHO guideline value of 25 µg/m³. By comparison, the daily average PM_{2.5} concentration before the bushfire was around 20 µg/m³. Such an increase in daily PM_{2.5} concentration is estimated to induce an increase of at least 5.6% in daily all-cause mortality, 4.5% in cardiovascular mortality, and 6.1% in respiratory mortality, according to our global study from 2011, which included Sydney.⁶ These estimates are close to a previous observation on the effects of bushfire events between 1997 and 2004, in Sydney.⁷

In addition to its fatal effects, bushfire smoke has also been related to increased risks of hospitalisation and emergency department visits due to respiratory diseases such as asthma, chronic obstructive pulmonary disease, and respiratory infections.³ Increasing evidence also suggests bushfire smoke might increase

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For the Australian Bureau of Meteorology see <http://www.bom.gov.au/>

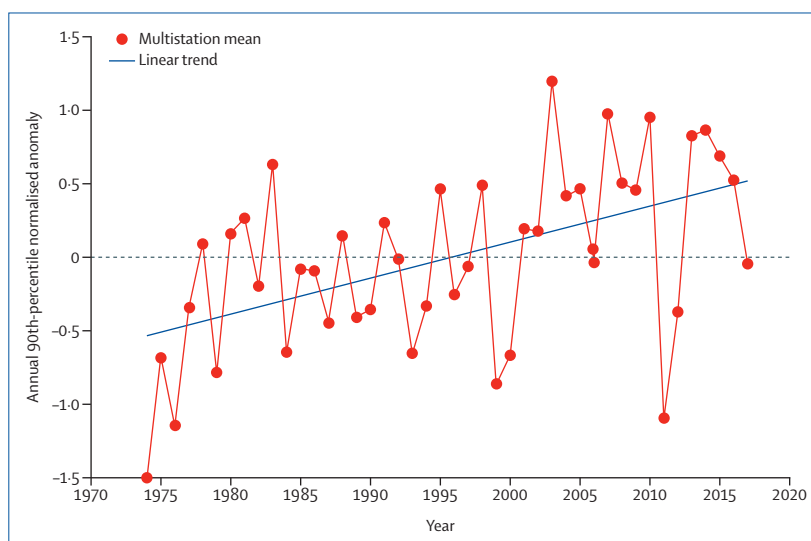


Figure: Time series of 90th percentile annual anomaly of the McArthur Forest Fire Danger Index (July–June) at 39 stations in Australia (1973–2017)²

The McArthur Forest Fire Danger Index is used as a general proxy for the characteristics of the fire–weather climate.

cardiovascular morbidity, psychological disorders, adverse birth outcomes, and eye irritation.^{8,9} However, our knowledge about the health effects of bushfire smoke is still insufficient. The long-term and lasting effects of bushfire smoke and which subgroups are most vulnerable to bushfire smoke remain largely unknown.^{8,9} It has been suggested that PM₁₀ generated from bushfires might have different health effects compared with PM₁₀ from urban background sources (eg, traffic emissions).³ Therefore, more studies are required to focus on air pollutants from bushfires.

Unfortunately, there is no effective way to reduce the effects of bushfire smoke on human health, although wearing facemasks and staying indoors are commonly recommended, and many people consider facemasks the best protection. However, facemasks might be not effective or sometimes provide a false sense of security. Their effectiveness depends on their filtration capacity: fine particles can still get through them if capacity is low. Additionally, individual wearing behaviour and characteristics (eg, facial hair, or duration and frequency of wearing a facemask) also affect the efficiency of the facemask. Importantly, wearing a facemask can be uncomfortable in very hot weather when bushfires happen. Even if facemasks could protect adults, it is still questionable whether they could protect children, older individuals, pregnant women, and those with chronic diseases, as these groups often cannot tolerate the inconvenience and discomfort of wearing a mask.

Staying indoors might provide some protection against bushfire smoke, but this depends on building quality and ventilation. In general, most residential houses are not equipped with air purifiers or air conditioning systems with high-efficiency filters. Hence, outdoor pollutants can still penetrate into houses, if they are in bad conditions or equipped with air conditioning systems without air filters. Therefore, indoor and outdoor concentrations of fine particles are often very close.

Climate change will continue to exacerbate catastrophic bushfire conditions. It has been estimated that days with high-to-extreme risk of fire will increase by 15–70% by 2050, and by more than 100% by 2100, compared with 2010.¹ Although some politicians claim that climate action is too expensive, the increasing intensity and

frequency of bushfires clearly indicate that the price of climate inaction is even higher. Unfortunately, the Australian Government has not engaged well in climate action over the past decade.¹⁰ Australia is on the track to meet less than half of its carbon emission reduction targets, which are to reduce emissions by 26–28% relative to 2005, by 2030, and achieve net zero emissions by 2050.

Without immediate and efficient climate action, catastrophic bushfires will become a common disaster and might destroy the future of Australia and possibly of humanity.

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