

Lessons to be learnt in relation to the Australian bushfire season 2019-20

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Healthy planet, healthy people.

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Doctors for the Environment Australia

Doctors for the Environment Australia (DEA) is an independent, self-funded, non-Government organisation of medical doctors in all Australian States and Territories. Our members work across all specialties in community, hospital and private practices. We work to prevent and address the diseases - local, national and global - caused by damage to our natural environment. We are a public health voice in the sphere of environmental health with a primary focus on the health harms from pollution and climate change.

Doctors for the Environment Australia welcomes the opportunity to comment on the Senate enquiry into 'Lessons to be learned in relation to the preparation and planning for, response to and recovery efforts following the 2019-20 Australian bushfire season'.

Introduction

The scale of last summer's bushfires was unprecedented. They affected nearly 80% of the Australian population, either directly or through exposure to bushfire smoke. (1) The health impacts of fires on this scale are serious, complex and wide-ranging and must be considered integral to governmental preparation for and response to bushfires.

While Australia has a long history of bushfires, the recent fires cannot be regarded as typical. Unlike previous fire seasons, they occurred over an exceptionally large geographical area, they occurred in the absence of El Nino conditions, and they were preceded by record-breaking heat and drought conditions that were the most severe since Australian records began.

Over 17 million hectares of land was burnt (2), causing massive loss of wildlife and habitat, accelerating biodiversity and environmental crises that, together with climate change, threaten the very sustainability of Australian ecosystems. It has long been Doctors for the Environment stance that human health relies upon and is inextricably linked to clean air, security of food and water supplies and a stable climate. (3)

Climate change increases bushfire risks

Climate scientists and fire experts agree climate change is increasing the frequency and intensity of bushfires in Australia and contributed to the extent and severity of last season's fires. Climate change is a global issue requiring a focussed and co-ordinated global response and a fundamental shift in global energy usage and policies.

Without immediate and effective action to attenuate global greenhouse gas emissions, worsening droughts and heatwaves will contribute to longer, hotter and more extreme fire seasons for Australia's future. (4,5)

Doctors for the Environment wishes to make comment and make recommendations on three of the nine Terms of Reference most relevant to the health issues.

(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;

Advice on increased bushfire risk

There have been repeated and consistent warnings for many years about Australia's worsening levels of bushfire risk from both climate scientists and fire experts.

Major scientific organisations such as the CSIRO, BOM, WMO and the IPCC have predicted a higher frequency and intensity of droughts and heatwaves, and more frequent and more intense bushfires as global emissions continue to rise and contribute to global warming. (6,7,8,9,10)

The biennial CSIRO and BOM report on the State of the Climate (10), last published in 2018, states there has been a long-term increase in extreme fire weather and the length of the fire season across large parts of Australia. The report is underpinned by science that draws on the latest monitoring, scientific and projection information that paint a consistent picture of long-term climate change increasing frequency and intensity of heat events, fires and drought.

The BOM website states that "climate change is influencing the frequency and severity of dangerous bushfire conditions in Australia... through influencing temperature, environmental moisture, weather patterns and fuel conditions. There have been significant changes observed in recent decades towards more dangerous bushfire weather conditions for various regions of Australia."

A CSIRO study from 2005 predicted that by 2020, 'very high' or 'extreme' risk fire days could increase by 4-25%. The same study predicted an increase of 15-75% by 2030. (11) The Garnaut Climate Change Review of 2008 stated that "Recent projections of fire weather suggest that fire seasons will start earlier, end slightly later, and generally be more intense. This effect increases over time but should be directly observable by 2020." (12)

Prior to the 2019-20 fire season, a group of 23 senior fire and emergency leaders with first-hand experience of fighting fires - Emergency Leaders for Climate Action - tried repeatedly to meet with the Prime Minister to discuss the urgent need for more equipment to tackle bigger, faster and hotter bushfires. (13) The requests were refused.

Despite these clear warnings from climate scientists and fire experts, Australia was unprepared for the scale and intensity of last season's bushfires. Importantly, Australia is still not adequately addressing the role that climate change is playing in bushfire risk. Australia's emissions continue to rise, as new fossil fuels reserves are opened up for export overseas that will further contribute to global emissions.

Much of the success in the management of the COVID19 crisis has been due to the government's willingness to listen to scientific advice from medical experts. Yet the advice of scientific and fire experts in relation to fire risk and climate change goes unheeded. Climate modelling demonstrates this fire season may be a harbinger of future events. (14)

Recommendation: Acknowledgement that climate change is the main underlying driver for worsening fire conditions in Australia.

Recommendation: Acknowledgement that Australia is currently failing to reduce its greenhouse gas emissions by continuing its reliance on coal and gas for energy and is failing to introduce effective climate change policies.

The risks of climate change constitute a health emergency

The health impacts of major bushfires on communities and public health are severe, complex and wide-reaching. Last year, major Australian medical organisations declared a Climate Health Emergency. The Australian Medical Association, Doctors for the Environment and most Australian specialist medical Colleges, together representing over 80% of Australian medical practitioners, have recognised that climate change has significant negative health impacts for patients and communities now and into the future. (15,16,17,18,19) The AMA has called on the Federal Government to take specific and urgent steps to reduce emissions, including a rapid transition away from fossil fuels and establishing a national strategy for health and climate change. (20)

Doctors for the Environment's March 2018 policy paper: "Action on Climate Change and Health: Governance and Strategy" details the need for federal leadership and new Commonwealth laws to guide climate change mitigation and adaptation, with a focus on present and future threats to human health. As reflected in the World Health Organization position of 'Health in all Policies', human health and the environment are inextricably linked. Climate change is a national economic, health and security threat which merits statutory laws to guide implementation and governance. National leadership and reform of governance are urgently needed. (21)

Recommendation: That the Australian Federal government recognises that climate change, as a major contributor to bushfires, is a national economic, health and security threat which merits statutory action.

(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;

Reducing future bushfire risk

Australia's contribution to global emissions is significant. We are one of, if not the largest exporter of coal and gas in the world. (22,23) Australia's greenhouse gas (GHG) emissions when including Scope 3 as well as Scope 1 and 2, are nearly 5% of global GHG emissions. (24) With the opening up of new coal and gas resources in WA, NT and Qld, our contribution to global GHG emissions may be more than 10% of the total by 2030. (25) It is disingenuous and dangerous to ignore the impacts of emissions just because they are burnt overseas. The health impacts of GHG emissions are not limited by international borders as all emissions drive climate change and increase global temperatures. It is in the public health interest of Australians to consider emissions from the entire life cycle of major projects. Such accounting is necessary to inform the public, and guide government's energy and emissions policies and to make meaningful evaluations of the full health and environmental impacts of major developments.

The emissions we produce today will impact future generations of Australians. No matter what measures we put in place to adapt to bushfires and other climate change impacts, policies must include definitive action to reduce today's emissions to have any hope of mitigating future bushfire risks. As Australia opens up new coal and gas fields for export, there must be acknowledgement of our responsibility in contributing to global warming.

Recommendation: Acknowledgement of the contribution Australia's coal and gas exports are making to global emissions, and that our expanding coal and gas industry will continue to drive emissions over the next decades.

Recommendation: Implementation of immediate and effective climate change policies to reduce Australia's emissions as part of a global emergency response to human-induced climate change.

Post-fire logging

The science is clear that post-fire logging further damages burnt ecosystems and significantly delays their recovery. Logging of fallen trees remove shelter for recovering species, removes biomass for the food cycle of ecosystems and further adds to biodiversity loss. Logging increases soil damage and risks to waterways and heavy machinery disrupts young germinating plants in eucalypt ecosystems where many tree species naturally re-sprout as part of forest recovery. (26,27,28)

Recommendation: The cessation of post-fire commercial logging activities, which significantly lessen chances of recovery of burned ecosystems.

Hazard reduction burning

It is claimed that hazard reduction burning is the most important measure in reducing bushfire risk. However, Rural Fire Service Chief of NSW, Shane Fitzsimmons has stated that hazard reduction burns have a place but are "not the panacea". (29) He is backed by his counterparts in Queensland and Victoria who have pointed to the limitations of hazard reduction burning that include a shortening window of opportunity and unsuitability of some areas.

Although Doctors for the Environment has no expertise in on-ground fire risk reduction measures, it is clear that scientific knowledge must be respected and applied in dealing with fuel reduction burns. Indigenous practises may be appropriate in reducing risk imposed by climate change and co-exist with practises that protect ecosystems and biodiversity that are essential for human health.

Hazard reduction burning should not increase the health burden of smoke pollution which can travel long distances and pool in airsheds under certain meteorological conditions. (30) If hazard reduction burning takes place, it needs to be done in consultation with, and warnings for the health of vulnerable groups such as schools, childcare centres, sports grounds, and retirement housing.

Recommendation: Scientific assessment of hazard reduction burning and indigenous fire practices as an adjunct to mitigation of climate change.

Recommendation: Recognition that hazard reduction burning may itself create health problems, particularly in relation to bushfire smoke, and risk management of such problems must be figured into burns.

Recommendation: Close collaboration between health, environment and fire management agencies during hazard reduction burns

Health and well-being of firefighters

Human resources during the recent bushfires were stretched to the limit. Firefighters reported extremes of fatigue and were exposed to extreme danger. Tragically, six firefighters lost their lives, including three firefighters from the US. Health risks include physical impacts of trauma and burns, respiratory health, exposure to chemicals and contaminants, and longer-term impacts on mental health.

Doctors for the Environment strongly supports more research into the health of firefighters. Australian Institute of Occupational Hygienists called on the COAG Health Council for a long-term study into the health and well-being of firefighters, pointing out that many had been exposed for months to “smoke, heat, noise, and toxic substances, yet there were few, if any, measures in place to monitor the exposure”. (31) While P2 mask provide some protection from particulates they are difficult to work with and maintain in the correct position. They also do not protect against volatile toxic gases. Contaminants from household chemicals, firefighting foam and asbestos exposure are revealed as risks both during the bushfires and in the subsequent clean up phase. (32,33) The ash left behind when buildings are burnt are is a particular hazard, as it can contain elevated levels of lead, copper, chromium, arsenic, and asbestos. (34,35)

While there is clear evidence of the adverse impacts of short-term exposure to bushfire smoke, (36,37) there is need for more research on health impacts of long-term, sometimes months of exposure to particulate matter, products of combustion and chemicals. At our current state of knowledge, we do not know the health impacts of long-term exposure, but they are likely to be serious. (38)

Many of the firefighters were themselves victims of the bushfires and lost homes, stock and property. The mental health and well-being of firefighters must be a high priority in any review of this disaster. There is heavy reliance on volunteer firefighters who work for some months, losing time at work and time with their families, and at least one study has highlighted significant mental health impacts. (39) With longer and more intense fire seasons expected that situation may not be tenable in the future.

Recommendation: Funding for research on the health risks to firefighters exposed to repeated short term and long-term exposure to bushfire smoke, ash and other pollutants, and follow-up of the physical and mental health of firefighters for at least a five-year time frame.

Recommendation: Better understanding of the health risks to our firefighters to guide best-practice health advice during and in the aftermath of fires.

Heatwaves

The heat waves generally associated with high bushfire risk are also associated with higher rates of non-fire related mortality, cardiac arrest, and emergency hospital admissions. (40, 41) Both heat and air pollution exert health effects, and the total may be larger than the sum of individual effects. (42)

Heat and humidity can trigger asthma and increase airway resistance. High temperatures and sunlight can increase ground level ozone which also has negative impacts on respiratory function. (43)

Recommendation: That health departments recognise the importance of heatwaves in the prelude of, and during, the fire season and strengthen health systems to better deal with heatwaves.

Water and food security

Heavy rainfall in areas affected by bushfires can lead to flooding, erosion of soils and contaminated runoff. Forested catchments are the best protection for water catchments, so catchments should not be logged if part of the forest cover is burnt.

Bushfires can cause the release of chemicals such as phosphorus and nitrogen. Rains can wash chemicals into water supplies and stimulate the growth of blue-green algae, which can cause illness. Organic sediments in water can increase bacterial growth and deplete oxygen levels in the water and make water unsafe for humans and animals. (44) Protective actions include the protection of drinking water catchments after fires, avoiding the logging of burnt areas, and the establishment of water quality monitoring programs. (45)

Recommendation: Strengthen procedures to protect and monitor drinking water catchments from contaminated runoff after bushfires.

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

Direct health impacts of bushfires

The direct impact of bushfires can be devastating with loss of life, livelihoods, homes and communities. People at the fire front are exposed to danger from radiant heat and can suffer dehydration, heat stress, smoke inhalation, burns (including respiratory burns), cardiac and respiratory problems, physical trauma and death. Immediate and longer-term impacts on mental health are significant. (46, 47) Preventing harm to populations during large and intense fires is a significant challenge as was seen in the 2019-20 fires.

Recommendation: Strengthen health services to prepare for short-term and long-term health impacts of bushfires on populations through liaison with local GPs, health clinics, the Department of Health, and communities.

Recommendation: Ensure health services are prepared with surge capacity for the increased demands during bushfires.

Bushfire smoke and air quality

Bushfires can have a disastrous impact on air quality and millions of Australians were affected by poor air quality over the summer. Bushfire smoke caused a major public health hazard in densely populated urban areas of Sydney, Melbourne and Canberra. On some days, air quality was worse than any other city in the world. In December 2019 the Air Quality Index (AQI) in the western suburbs of Sydney was 2552 - 22 times the hazardous rating - and in January 2020 the AQI in suburbs of Canberra was measured at 4650. (48)

An early study of the smoke-related health burden in Eastern Australia has shown over 400 excess deaths and thousands of excess hospital admissions with cardiovascular or respiratory illness over the period October – February. (49)

Bushfire smoke is a complex mixture of particulate matter (PM), toxic gases and chemicals, including carbon monoxide, sulphur dioxide, nitrogen dioxide, benzene, formaldehyde, cyanide gas, and polycyclic aromatic hydrocarbons (PACs), all of which are known to be detrimental to health. Bushfire smoke promotes inflammation of the respiratory tract causing coughing, mucous secretion, eye irritation and aggravation of lung conditions such as asthma, chronic bronchitis and chronic obstructive pulmonary disease (COPD).

Very small particles in bushfire smoke (PM_{2.5}) can be absorbed via the lungs into the bloodstream and can cause inflammation, coagulation and oxidative stress, affecting the heart, brain and other organs. (50,51,52) There is no safe level of PM_{2.5} pollution, which has health impacts even at very low concentrations. (53) WHO guidelines suggest maximum levels of PM_{2.5} of 10 µg/m³, which was regularly exceeded over the summer, with levels ten times that high recorded on some days. It has been suggested that PM_{2.5} from bushfire smoke may have different health effects to those from PM_{2.5} generated by urban environments (e.g. traffic emissions), and at least one study suggests that PM_{2.5} from bushfire smoke is associated with higher rates of asthma. (54) More research is required to focus on air pollutants from bushfires.

Recommendation: Recognition that air pollution from bushfires is a major public health hazard.

Recommendation: Funding for research into the short and long-term health impacts of bushfire smoke

Long-term health effects of bushfire smoke

Of particular concern is the effects of long-term exposure to pollutants from bushfire smoke. Longer-term exposure to PM_{2.5} has been linked to heart, lung and kidney disease, strokes, type 2 diabetes, sepsis, and urinary tract infections. It is also associated with low birth weight babies, miscarriage and stillbirth. In South Australia, over 1500 survivors of the 1983 fires showed a higher prevalence of high blood pressure, diabetes and mental illness one year after the event. (55)

Even healthy people could develop serious illnesses after exposure to dangerous levels of smoke for weeks on end, and the cumulative effect of repeated bushfire smoke injury and repair cycles on the lung is completely unknown. (56, 57) Because this level of exposure is unprecedented, there is no research or knowledge whether this will increase the amount of respiratory and other diseases in the community. It is likely that more people are likely to be affected over time. (58)

Scientific studies providing evidence for the negative health impacts of bushfire smoke

There is an overwhelming body of evidence describing many negative health impacts of bushfire smoke:

- increase in all-cause mortality rates during bushfires (59,60,61)
- a direct association between bushfire smoke exposure and exacerbations of asthma and chronic obstructive pulmonary disease (COPD) (62,63,64,65,66)
- increase in emergency department presentations and hospital admission rates (67,68,69,70,71,72)
- increase in out of hospital cardiac arrests (73,74)

- increase in ambulance callouts (75)
- increase in adverse birth outcomes (76,77)

Public health advice on days of high bushfire smoke pollution

Despite the clear evidence of health harms from bushfire smoke, there is inadequate research and incomplete advice on how people can best protect themselves on days of bushfire smoke. (78)

- Advice to staying indoors is a short-term measure but is clearly impractical over the many months of bushfire smoke, particularly for outdoor workers.
- Older “leaky” houses and buildings are often inadequately sealed and may not offer any protection from outdoor air pollution.
- Air-conditioners are only able to remove PM2.5 when fitted with specific high-efficiency (HEPA) filters and are only effective at doing so in sealed buildings.
- Paper and simple cloth facemasks are ineffective at filtering very small smoke particles or toxic gases.
- P2/N95 facemasks, usually used in occupational exposures may filter out small particulate matter but do not offer protection from toxic gases. They are often uncomfortable or inefficient (e.g. facial hair), need to be properly fitted and are impractical for children’s use.
- More research is needed into evaluating the effectiveness and drawbacks of commercially available face masks, particularly for their use in children.

Recommendation: Facilitate greater public awareness, monitoring, and management of the hazards of bushfire smoke.

Recommendation: Identification of effective methods of mitigating health impacts from bushfire smoke and develop best-practice guidelines on how people can best protect themselves, both in the short-term, and over long-term exposures.

Shortcomings of current air quality assessment

- Reporting of air quality is not standardised across state and government departments, with some jurisdictions using AQI (which is a composite measurement based on multiple pollutants) and others using PM2.5 levels, which is confusing for the public.
- Hourly averages are more useful for planning daily activities than the 24-hour mean value that is often provided. (77)
- There are inadequate numbers of air quality monitoring stations.

Recommendation: Ensure public availability of easily understandable and consistent information on air quality during bushfires and hazard reduction burning, including smoke alerts, real time air quality data or hourly PM2.5 data (e.g. smartphone app).

Recommendation: Standardised air quality information and public health advice across different Australian jurisdictions. DEA recommends PM2.5 data rather than AQI.

Recommendation: More detailed health advice based on location-specific air quality data and forecasts, allowing planning of daily activities including outdoor exercise.

Recommendation: Increase the number of air quality monitoring stations at state and territory levels, both portable and fixed, and low-cost sensors that can be rapidly deployed in a bushfire emergency.

Vulnerability to health impacts of bushfire smoke

The health risks of bushfire smoke are greater for children, pregnant women, the elderly, those with chronic diseases such as diabetes and heart disease, and those with respiratory conditions such as asthma, chronic obstructive pulmonary disease and chronic bronchitis. People in socially disadvantaged groups are potentially at higher risk as they may have poorer housing, lower health literacy and less ability to take preventive measures. (78,79)

Children are especially vulnerable to smoke. Their organs are growing rapidly, they spend more time outdoors and they inhale disproportionately larger doses of pollutants than adults. Animal models of lung development suggest exposure in early life changes the development of children's lungs. (80) Little is known about the long-term effects of bushfire smoke on children, although it is known that impairment of lung development in children does not recover in adult life.

Exposure to air pollution in pregnancy has been linked to increased rates of preterm birth, decreased birth weight, hypertensive disorders of pregnancy and gestational diabetes. (80)

Bushfire smoke is harmful to active adults. A person exercising vigorously inhales three to five times more air than someone at rest, which means more smoke is inhaled and more particles are deposited in the lungs and absorbed by the bloodstream. (81)

Mental health and bushfires

The stress of experiencing a bushfire can affect people psychologically, socially and economically. As well as risks to human life, property may be lost, pets and livestock killed, communities fragmented, home environments destroyed, uncertainty created regarding loss of livelihood and disruption to education, and relationships may break down. In addition, grief and mourning are natural responses to the scale of the ecological loss we saw last summer.

Not surprisingly, there is a large body of evidence that bushfires are a major trigger for mental illness or underlying latent mental health issues. (82,83,84,85,86,87,88,89,90)

Within the general adult population there is evidence of increased rates of depression, anxiety, post-traumatic stress disorder (PTSD), alcohol and substance abuse, aggression and violence, suicide, elevated risk of child abuse, triggering of latent mental health issues, strained community relationships and reduced productivity. All produce major long-term effects on personal, family and community function.

The mental health impacts of bushfires are not distributed equally amongst groups within Australian society, and vulnerable groups are disproportionately affected by mental health impacts.

Children and youths are particularly vulnerable to PTSD as well as behavioural and emotional disorders. (91,92,93) The ongoing brain development of children and adolescents makes them more susceptible to emotional trauma, and their mental distress tends to last longer and can be much worse than the direct physical effects. Children are also vulnerable because they exist in a system where they have little power. There is clear evidence to suggest that children experience increased rates of anxiety-related disorders following acute extreme weather-related events. For example, children surveyed six months after the 2003 Canberra bushfires showed much higher rates of behavioural and emotional problems

compared to the baseline rate in Australia, with nearly half showing symptoms of PTSD. Moreover, such children suffer long-term learning difficulties, compared to their non- or less-bushfire exposed peers. (94,95)

Recommendation: That bushfires are recognised as a major trigger for mental health issues, particularly for those directly impacted by fires and for firefighters.

Recommendation: That resources are spent developing policies and actions to support adults, strengthen family systems and strengthen communities to improve resilience so they are better able to address the mental health impacts of bushfires.

Recommendation: Funding for mental health services must continue for at least a five-year framework to account for long-term mental health impacts.

Recommendation: Resources are spent supporting and educating mental health care professionals in preparing for and reacting to impacts of climate change.

Conclusion

Australia can be better prepared for bushfire emergencies in the future, but much more research is needed to fully evaluate the health impacts in order to give appropriate public health advice.

It is imperative to acknowledge that one of the underlying drivers of our worsening bushfire seasons is human-induced climate change. The Australian government acknowledges the need to reduce emissions, yet our emissions continue to rise, even as new coal and gas projects are being approved. There is a serious disconnect between policy and action.

Without action, global temperatures will continue to rise, and catastrophic bushfire conditions will become Australia's "new normal".

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