

# Bushfires and planned burns

## Tips for your patients in managing smoke

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The frequency and intensity of bushfires are likely to increase with climate change. The health effects of smoke are mainly due to elevated concentrations of particulate matter generated by fire. Bushfire smoke exposure exacerbates many chronic diseases, especially asthma and chronic obstructive pulmonary disease.

### Key points

- **Smoky episodes from bushfires and planned burns are common and increasing in frequency.**
- **Patients with chronic respiratory conditions are one of the most important groups at increased risk of adverse impacts from smoke exposure.**
- **Public smoke advisories often come too late to benefit higher-risk individuals; therefore, advice from GPs is crucial to support patients in managing their health.**
- **The three main tips for patients who are sensitive to smoke are:**
  - find local, near real-time, air quality information, including smoke forecasts if available
  - have a plan for reducing personal exposure to smoke.
  - have a plan for preventing and managing clinical deterioration.

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Australian vegetation is notoriously flammable and, as in many other parts of the world, climate change is likely to increase the frequency and intensity of bushfires and the consequent impacts of smoke.<sup>1,2</sup> The imperative to manipulate forest fuel loads to manage fire hazard is increasing. Planned burning ('prescribed' or 'hazard reduction' burning) is the dominant strategy for fuel-load reduction but is another source of smoke.<sup>3</sup> The term 'back-burning' refers to emergency burning initiated during bushfires to control the fires or protect vulnerable locations. Back-burning is a crucial strategy but can contribute to the severe air pollution associated with bushfires.

With increasingly frequent bushfires and planned burns and the capacity of smoke to travel long distances and affect populations, managing their exposure to smoke should be a core skill for Australians. This is especially the case for those who are at increased risk, or who care for others at increased risk, of adverse health outcomes precipitated by reduced air quality. People with chronic respiratory conditions, especially asthma and chronic obstructive pulmonary disease, are particularly at risk.

### Smoke exposure and lung health

The health impacts of smoke are mostly driven by the concentration of suspended particulate matter (PM) generated by combustion. The effects of aerosolised particles, especially those smaller than 2.5 microns in diameter (PM<sub>2.5</sub>), have been intensively investigated. PM<sub>2.5</sub> adversely affects respiratory, cardiovascular and metabolic functions by promoting inflammation and coagulation, increasing oxidative stress and impairing microvascular and autonomic functions.<sup>4,5</sup> The effects on the respiratory system are especially important in the context of bushfire smoke. Elevated concentrations of smoke-related PM<sub>2.5</sub> are associated with: increased intensity and frequency of symptoms; greater use of asthma rescue medication; and increased healthcare attendances, respiratory hospital emergency department presentations, admissions and respiratory mortality.<sup>6</sup>



### Air quality information sources vary by state

- Environment Protection Agencies (or equivalent) in each jurisdiction: maintain air quality monitoring networks and provide real-time information online; the spatial coverage varies between regions. Public health agencies: provide general public health information and air quality warnings (these can sometimes be too late to enable preventive action).
- Fire services and land management agencies: provide information on bushfires and planned burns through their websites, social media pages and via automated notifications.
- The University of Tasmania provides AirRater ([www.airrater.org](http://www.airrater.org)): an air quality surveillance and health-tracking app available in Tasmania and, from September 2017, the ACT.

There is mounting evidence that  $PM_{2.5}$  from bushfires (and wood heaters) has greater respiratory toxicity than equivalent concentrations of  $PM_{2.5}$  from background urban sources. This is not surprising because the composition of smoke emitted by bushfires is different from that of industry and traffic emissions. Smoke mixtures include hundreds of toxic copollutants, many of which are respiratory irritants.<sup>7</sup> Experimental studies comparing equivalent concentrations of smoke-derived and background  $PM_{2.5}$  show much greater lung inflammation with exposure to bushfire smoke.<sup>8,9</sup> Epidemiological studies directly comparing  $PM_{2.5}$  from bushfire smoke and background urban  $PM_{2.5}$  have also shown larger effects on respiratory outcomes, such as hospital admissions and mortality, for smoke-specific  $PM$ , than for background  $PM$ .<sup>10-12</sup> There is considerable individual variation, but asthma outcomes at a community level are so strongly affected by air quality that daily counts of salbutamol sales and asthma-related visits to doctors are tracked by the British Columbia Asthma Monitoring System in Canada. This is to identify and manage smoke effects across the province where air quality monitoring networks are incomplete.<sup>13</sup>

### Timely information

Patients with asthma or other chronic lung diseases usually know if they are sensitive to smoke. Timely information is essential, as advance warnings make managing the effects of smoke on health considerably easier. Public health warnings and smoke alerts from public health or fire agencies are usually only issued after severe smoke has been present for some time because Australian air quality standards are based on a 24-hour average concentration of  $PM_{2.5}$ , which does not readily capture the rapid fluctuations associated with episodic bushfire smoke. The ability to access timely information is crucial for high-risk patients, who often experience deterioration in their clinical state with modest changes in air quality well before 24-hour national air quality standards are exceeded.<sup>14</sup>

Good information about geographic areas affected by smoke might allow activities to be rescheduled so people can avoid smoky places or choose to visit unaffected areas.

Each jurisdiction manages their own air quality monitoring, planned burning and bushfire responses. Most provide real-time air quality information online, through their Environment Protection Agency or equivalent service (Box). For example, [www.environment.nsw.gov.au/aqms/aqi.htm](http://www.environment.nsw.gov.au/aqms/aqi.htm) shows information about air quality in NSW and has a link for signing up to receive alerts. However, the spatial coverage of monitoring networks is highly variable across Australia and not all regions have access to this information. Fire services and other agencies that conduct planned burning usually post information about bushfires and planned burns on their websites and social media pages, sometimes including the projected smoke impacts. For example, Forest Fire Management Victoria ([www.ffm.vic.gov.au/bushfire-fuel-and-risk-management/planned-burns/planned-burning-notification-system](http://www.ffm.vic.gov.au/bushfire-fuel-and-risk-management/planned-burns/planned-burning-notification-system)) manages an automated planned burns notification system. Our team at the University of Tasmania have developed AirRater ([www.airrater.org](http://www.airrater.org)), an air quality surveillance and health-tracking system available in Tasmania and, from September, available in the ACT. It provides real-time, location-specific notifications of changes in air quality via a smartphone app and supports self-management for improved health outcomes.<sup>15</sup>

### Managing smoke

If  $PM_{2.5}$  is increasing, or likely to increase, there are several available strategies for minimising the effects of smoke. The most reliable and effective strategy, with good evidence for reducing indoor smoke and health impacts, is to use a portable air cleaner.<sup>16</sup> These devices are available from home electrical stores and cost \$200 to \$300. It is important to get the right device, as not all products marketed as air purifiers will reduce  $PM_{2.5}$ . There are two effective types: those with electrostatic precipitators and those with high-efficiency particulate air filters. Humidifiers, negative ion generators and odour absorbers do not reduce the concentration of  $PM_{2.5}$ .<sup>16</sup> An air cleaner provides a clean air space in a single room in the home without the need for the entire house to be sealed.

Sealing a house by closing doors and windows is standard general advice. This will slow the infiltration of PM<sub>2.5</sub>, but its effectiveness depends on the overall leakiness of the house. There is little to be gained unless the house is properly sealed before the outdoor smoke concentrations have risen substantially. Sealing a house can be a helpful strategy for managing brief episodes of smoke from planned burns but is less useful for prolonged episodes. It is important to open doors and windows to ventilate the house once the outdoor smoke has dispersed.

### Clinical management

Ideally, people with asthma or other chronic respiratory conditions will have a management plan, agreed on with their GP, that includes advice about when to start preventive medication and how to manage exacerbations. Advance notice of smoke events is especially important for people with asthma because it enables preventive medication to be used. Agencies responsible for the management of parks, state forests and crown land are increasingly forecasting smoke events and incorporating the information in communications and management strategies for planned burning programs. Planned burning is especially frequent during autumn, with many places near vegetated areas affected each year. If people living in such areas know that smoke is an asthma trigger for them, they could benefit from

preventive medication throughout the burn-off season. This would be an individual management decision.<sup>17</sup>

### Summary

Episodes of smoky conditions are common in Australia and are likely to have a greater impact on the respiratory system than other sources of particulate air pollution. Public health advisories based on 24-hour air quality standards are often too late to enable people with respiratory conditions sensitive to smoke to take preventive action. Early notification of changes in air quality, combined with personal strategies for managing smoke exposure and clinical management plans, can substantially reduce the effects of smoke on health and quality of life for people with respiratory conditions. The use of portable air cleaners is the only intervention for managing smoke that has clear evidence supporting its effectiveness. **RMT**

### References

A list of references is included in the website version of this article ([www.medicinetoday.com.au](http://www.medicinetoday.com.au)).

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COMPETING INTERESTS: Dr. Johnston is part of the team that developed the AirRater app and has no commercial conflict.

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