

## Appendix 1: Methodological details

We use a standard protocol for preparing rapid evidence profiles (REP) to ensure that our approach to identifying research evidence is as systematic and transparent as possible in the time we were given to prepare the profile.

# Examining the effectiveness of public health interventions to address wildfire smoke, combined heat-smoke events and pollutants

28 July 2023

### Identifying research evidence

For this REP, we searched Health Systems Evidence, Social Systems Evidence, Health Evidence, PubMed, and Scopus for:

- 1) evidence syntheses
- 2) protocols for evidence syntheses that are underway
- 3) single studies.

We searched [Health Systems Evidence](#) using an open search for (wildfire OR forest fire OR bushfire OR fire) AND (smoke OR heat OR pollutant OR pollution). In [Social Systems Evidence](#), we used the filter for “fires” under “programs and services” and “environmental-threats management.” In [Health Evidence](#), we ran an open search using (wildfire OR forest fire OR bushfire OR fire) AND (smoke OR heat OR pollutant OR pollution). In [PubMed](#), we combined an open search for (wildfire OR forest fire OR bushfire OR fire) AND (smoke OR heat OR pollutant OR pollution) AND (mitigation OR prevention OR masks OR communication OR evacuation OR ventilation), combined with a date limitation of the past five years (2018 inclusive) and English-only texts. In Scopus, we ran an open search for (wildfire OR forest fire OR bushfire OR fire) AND (smoke OR heat OR pollutant OR pollution) AND (mitigation OR prevention OR masks OR communication OR evacuation OR ventilation), combined with a date limitation of the past five years (2018 inclusive) and English-only texts. Links provide access to the full search strategy. An exception was made to include a single study from 2015 given its application to the Canadian context.

Each source for these documents is assigned to one team member who conducts hand searches (when a source contains a smaller number of documents) or keyword searches to identify potentially relevant documents. A final inclusion assessment is performed both by the person who did the initial screening and the lead author of the rapid evidence profile, with disagreements resolved by consensus or with the input of a third reviewer on the team. The team uses a dedicated virtual channel to discuss and iteratively refine inclusion/exclusion criteria throughout the process, which provides a running list of considerations that all members can consult during the first stages of assessment.

During this process we include published, pre-print and grey literature. We do not exclude documents based on the language of a document. However, we are not able to extract key findings from documents that are written in languages other than Chinese, English, French or Spanish. We provide any documents that do not have content available in these languages in an appendix containing documents excluded at the final stages of reviewing. We excluded documents that did not directly address the research questions and the relevant organizing framework.

## **Assessing relevance and quality of evidence**

We assess the relevance of each included evidence document as being of high, moderate or low relevance to the question.

Two reviewers independently appraised the quality of the guidelines we identified as being highly relevant using AGREE II. We used three domains in the tool (stakeholder involvement, rigour of development and editorial independence) and classified guidelines as high quality if they were scored as 60% or higher across each of these domains.

Two reviewers independently appraise the methodological quality of evidence syntheses that are deemed to be highly relevant. Disagreements are resolved by consensus with a third reviewer if needed. AMSTAR rates overall methodological quality on a scale of 0 to 11, where 11/11 represents an evidence synthesis of the highest quality. High-quality evidence syntheses are those with scores of eight or higher out of a possible 11, medium-quality evidence syntheses are those with scores between four and seven, and low-quality evidence syntheses are those with scores less than four. It is important to note that the AMSTAR tool was developed to assess evidence syntheses focused on clinical interventions, so not all criteria apply to those pertaining to health-system arrangements or to economic and social responses. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, an evidence synthesis that scores 8/8 is generally of comparable quality to another scoring 11/11; both ratings are considered 'high scores.' A high score signals that readers of the evidence synthesis can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the evidence synthesis should be discarded, merely that less confidence can be placed in its findings and that the evidence synthesis needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1): S8.

## **Preparing the profile**

Each included document is hyperlinked to its original source to facilitate easy retrieval. For all included guidelines, evidence syntheses and single studies (when included), we prepare a small number of bullet points that provide a summary of the key findings, which are used to summarize key messages in the text. Protocols and titles/questions have their titles hyperlinked, given that findings are not yet available. For this profile, we only prepared bulleted summaries of key findings for documents deemed to be of high relevance. For those classified as medium or low relevance, we list the title with a link to the primary source for easy retrieval if needed. We then draft a summary that highlights the total number of different types of highly relevant documents identified (organized by document), as well as their key findings, date of last search (or date last updated or published), and methodological quality.

## **Identifying experiences from other countries and from Canadian provinces and territories**

For each rapid-evidence profile, we collectively decide on what countries to examine based on the question posed. For this profile, we focused on places that have had recent experience with wildfires. For this profile that included Canadian provinces and territories as well as Australia, France, Italy and the United States. For each country and each Canadian province or territory, we searched government websites for public health guidance.

## Appendix 2: Key findings from evidence syntheses and sorted by relevance

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched and jurisdiction of authors	Availability of GRADE profile	Equity considerations
<ul style="list-style-type: none"> <li>• Type of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Risk communication                   <ul style="list-style-type: none"> <li>▪ Assess risk using Air Quality Health Index (AQHI)</li> </ul> </li> </ul> </li> <li>• Settings               <ul style="list-style-type: none"> <li>○ Community settings</li> </ul> </li> <li>• Populations               <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> <li>○ Individuals with pre-existing conditions (e.g., respiratory or cardiac conditions)</li> <li>○ Older adults</li> </ul> </li> </ul>	<p><a href="#">The timing, content, consistency and delivery channel impact the effectiveness of health protection messaging before and during wildfire events</a> (1)</p> <ul style="list-style-type: none"> <li>• Quantitative studies have found that during smoke events, short health alert messages with non-technical content are more likely to be recalled and complied with; however, qualitative studies have found that people tend to want more detailed information on smoke emission and their health impacts</li> <li>• There is a need to target health protection messaging for populations at highest risk from smoke exposure as well as those who cannot adhere to general advice (for example, homeless persons and those who work outdoors)</li> <li>• Lack of consistency and trust in the source of health protection messaging has been identified as a key issue</li> <li>• Television, online and smartphone-based communication channels are preferred sources of information, but older populations may prefer radio and television as the means of message delivery</li> <li>• Messaging that begins early and occurs frequently is recommended for susceptible populations</li> <li>• An important theme that emerged in the literature is the need for health protection messaging to begin prior to wildfire season to give people and organizations the time to prepare and procure resources</li> </ul>	High	Non-living	4/9  Australia	2020	Not available	<ul style="list-style-type: none"> <li>• Occupation</li> <li>• Socio-economic status</li> </ul>
<ul style="list-style-type: none"> <li>• Types of exposure               <ul style="list-style-type: none"> <li>○ Combined wildfire smoke and heat</li> </ul> </li> <li>• Duration of exposure               <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Masks                   <ul style="list-style-type: none"> <li>▪ N95</li> <li>▪ Other</li> </ul> </li> </ul> </li> <li>• Setting               <ul style="list-style-type: none"> <li>○ Community settings</li> </ul> </li> </ul>	<p><a href="#">Evidence on intervention and mitigations measures to reduce negative health outcomes is limited</a> (2)</p> <ul style="list-style-type: none"> <li>• This review reported that health risks and mitigation strategies to reduce the negative exposure to wildland fire was limited</li> <li>• Five studies included in the review focused on mitigation strategies while the remaining included literature examined negative health outcomes due to occupation exposure</li> <li>• Two of the five studies examining mitigation measures found that the use of specific filters and N95 masks may be associated with fewer respiratory symptoms than mask usage alone</li> </ul>	High	Not living	8/10  Canada	2020	Not available	<ul style="list-style-type: none"> <li>• Place of residence</li> <li>• Occupation</li> </ul>

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched and jurisdiction of authors	Availability of GRADE profile	Equity considerations
<ul style="list-style-type: none"> <li>▪ Parks and recreational sites</li> <li>• Populations               <ul style="list-style-type: none"> <li>○ Occupations directly affected by wildfires</li> </ul> </li> <li>• Outcomes               <ul style="list-style-type: none"> <li>○ Respiratory conditions</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Additional research identifying the feasibility and effectiveness of personal protective equipment (e.g., filtered masks or respirations) on long-term dermal and respiratory health outcomes of wildland fire fighters are needed</li> </ul>						
<ul style="list-style-type: none"> <li>• Type of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Duration of exposure               <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Settings               <ul style="list-style-type: none"> <li>○ Community settings</li> </ul> </li> <li>• Populations               <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Risk communication                   <ul style="list-style-type: none"> <li>▪ Protect indoor air quality</li> <li>▪ Identify what is needed for evacuation preparation</li> </ul> </li> <li>○ Masks                   <ul style="list-style-type: none"> <li>▪ N95</li> </ul> </li> <li>○ Enhanced HVAC</li> <li>○ Evacuation</li> </ul> </li> <li>• Outcomes               <ul style="list-style-type: none"> <li>○ Physical health                   <ul style="list-style-type: none"> <li>▪ Respiratory conditions</li> </ul> </li> <li>○ Mental health outcomes</li> <li>○ Personal and community isolation</li> </ul> </li> </ul>	<p><a href="#">Clear communication can promote the use of mitigation interventions to manage the physical and mental health effects of persons affected by wildfire smoke</a> (3)</p> <ul style="list-style-type: none"> <li>• The purpose of this review was to explore the utility of communication as a mitigation intervention for smoke-related emergencies</li> <li>• This review concluded that clear, concise and specific communication through social media or news platforms are important to disseminate information regarding mitigation interventions for the physical and mental health effects of wildfires</li> <li>• Examples of mitigation interventions included risk communication, communal support, evacuation and protective equipment</li> <li>• Additionally, this review stated that information of mitigation interventions should be adapted to the needs of persons with diverse communication abilities or cultural differences</li> </ul>	High	Not living	7/10  Australia	2020	Not available	<ul style="list-style-type: none"> <li>• Place of residence</li> <li>• Race/ethnicity/culture / language</li> <li>• Occupation</li> </ul>
<ul style="list-style-type: none"> <li>• Types of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants                   <ul style="list-style-type: none"> <li>▪ PM2.5</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Educational and physical mitigation interventions should be enforced from personal to organizational levels to reduce negative effects of wildfire exposure in older adults</a> (4)</p>	Medium	Not living	5/10  United States	2021	Not available	<ul style="list-style-type: none"> <li>• Place of residence</li> </ul>

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched and jurisdiction of authors	Availability of GRADE profile	Equity considerations
<ul style="list-style-type: none"> <li>• Duration of exposure               <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Risk communication                   <ul style="list-style-type: none"> <li>▪ Protect indoor air quality</li> <li>▪ Identify what is needed for evacuation preparation</li> </ul> </li> <li>○ Masks</li> <li>○ Evacuation</li> </ul> </li> <li>• Settings               <ul style="list-style-type: none"> <li>○ Community settings</li> <li>○ Healthcare settings                   <ul style="list-style-type: none"> <li>▪ Hospitals</li> <li>▪ Long-term care homes</li> </ul> </li> </ul> </li> <li>• Populations               <ul style="list-style-type: none"> <li>○ Older adults</li> </ul> </li> <li>• Outcomes               <ul style="list-style-type: none"> <li>○ Mental health outcomes                   <ul style="list-style-type: none"> <li>▪ Personal and community isolation</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• The purpose of this scoping review was to explore the health outcomes of wildfire exposure in older adults</li> <li>• The review concluded that older adults have fewer resources to manage the health effects of wildfire exposure</li> <li>• Mitigation interventions from all system levels (individual, communal and organizational) are needed to mitigate the effects of wildfire exposure in older adults</li> <li>• Examples of mitigation interventions included educational interventions for risk communication and protective equipment for respiratory concerns</li> <li>• Additionally, educational interventions delivered by Indigenous Elders may be beneficial at the communal level</li> </ul>						<ul style="list-style-type: none"> <li>• Race/ethnicity/culture/language</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure               <ul style="list-style-type: none"> <li>○ Pollutants</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Risk communication                   <ul style="list-style-type: none"> <li>▪ Determine when to reschedule outdoor activities</li> </ul> </li> <li>○ Masks                   <ul style="list-style-type: none"> <li>▪ N95</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Guidelines for mitigating the effects of air pollution during sports and exercise recommend reducing exposure and protecting against negative health effects</a> (5)</p> <ul style="list-style-type: none"> <li>• Athletes should reduce their overall exposure to air pollution and distance themselves from sources of air pollution</li> <li>• Air pollution monitoring and forecasting tools can be used to time physical activity during low pollution periods and determine when appropriate activities should be moved indoors               <ul style="list-style-type: none"> <li>○ When moving activities indoors, indoor air quality should be considered and improved through ventilation and filtration</li> </ul> </li> <li>• Athletes can consider using a properly fitted N95-type mask outside of training and competition</li> <li>• Asthma medications have not been found to be effective at mitigating the effects of air pollution exposure in those without asthma</li> </ul>	Low	Non-living	4/10 Canada	2022	Not available	<ul style="list-style-type: none"> <li>• Not applicable</li> </ul>

## Appendix: 3 Key findings from primary studies and sorted by relevance

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Study characteristics	Equity considerations
<ul style="list-style-type: none"> <li>• Type of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants</li> </ul> </li> <li>• Duration of exposure               <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Risk communication                   <ul style="list-style-type: none"> <li>▪ Assess risk using Air Quality Health Index (AQHI)</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">There is a need to utilize diverse communication platforms, particularly radio, to effectively disseminate wildfire smoke information in BC, with specific attention to reaching vulnerable populations, such as non-English speakers, migrant farm workers, and those with lower educational attainment, by simplifying message content and leveraging social media, local media outlets and community representatives.</a> (6)</p> <ul style="list-style-type: none"> <li>• Respondents suggested that wildfire smoke advisories could be improved through tailored messaging, designated air quality reports by news outlets, and more frequent messaging before and during wildfire season</li> <li>• Respondents identified the need to increase the reach of messaging by making messages simpler and easy to understand and translating them into languages spoken by Indigenous and immigrant communities in BC</li> </ul>	High	<p><i>Publication date:</i> 2022</p> <p><i>Jurisdiction studied:</i> British Columbia, Canada</p> <p><i>Methods used:</i> Online survey</p>	<ul style="list-style-type: none"> <li>• Race/ethnicity/culture/language</li> <li>• Education</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Masks                   <ul style="list-style-type: none"> <li>▪ N95</li> <li>▪ Other</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Surgical and cloth masks provide good protection against wildfire ash, but poor protection against wildfire smoke.</a> (7)</p> <ul style="list-style-type: none"> <li>• Variations in head size, mask fit and design features are likely to reduce predicted efficiencies in practice</li> <li>• In the case of wildfire smoke, masks may offer greater protection than predicted if their health effects depend more on inhaled particle mass than count</li> </ul>	High	<p><i>Publication date:</i> 2022</p> <p><i>Jurisdiction studied:</i> N/A (modelling study)</p> <p><i>Methods used:</i> Modelling study</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<ul style="list-style-type: none"> <li>• T Type of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Cleaner air spaces</li> </ul> </li> </ul>	<p><a href="#">High-efficiency particulate air filters can be used to transform indoor community spaces such as libraries into public cleaner air spaces, including reducing PM2.5 concentrations by up to 70% compared to outside</a> (8)</p>	High	<p><i>Publication date:</i> 2021</p> <p><i>Jurisdiction studied:</i> Australia</p> <p><i>Methods used:</i> Observational study</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure               <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants                   <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Mitigation interventions               <ul style="list-style-type: none"> <li>○ Cleaner air spaces</li> </ul> </li> </ul>	<p><a href="#">Key recommendations for improving home ventilation include increasing the minimum air filter efficiency requirement to minimum efficiency reporting values (MERV) 11 or MERV 13 during wildfire seasons, considering double-filter ventilation configurations in areas with high outdoor PM2.5 exposure, implementing near 100% recirculation during severe outdoor PM2.5 peaks, and emphasizing continuous monitoring of indoor air quality and ventilation variables in mechanical ventilation systems for wildfire-resiliency retrofits</a> (9)</p>	High	<p><i>Publication date:</i> 2022</p> <p><i>Jurisdiction:</i> British Columbia, Canada</p> <p><i>Methods:</i> Modelling study</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>

	<ul style="list-style-type: none"> <li>• More studies are necessary to validate the recommendations and assess their practical application to current residential ventilation systems</li> <li>• Portable air cleaners were found to decrease indoor PM2.5 levels, but a cost-benefit analysis implies that their application is not justified</li> </ul>			
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Cleaner air spaces</li> </ul> </li> </ul>	<p><a href="#">A comparison of indoor and outdoor particulate matter data during a forest fire in Alaska in 2015 demonstrated that closed and non-ventilated buildings can be effective in reducing exposure to particulate matter, but that lower efficiency filters often used in residential and public buildings do not control the infiltration of smaller smoke particles during wildfire events.</a> (9)</p> <ul style="list-style-type: none"> <li>• Particle counts in the air infiltrating indoors is largely impacted by forest fire smoke that greatly exceeds indoor particulate counts during non-fire periods</li> <li>• Other active filtration methods such as high-efficiency particulate air filters should be investigated as alternative strategies to prevent exposure to smaller particles during wildfire episodes</li> </ul>	High	<p><i>Publication date:</i> 2021</p> <p><i>Jurisdiction:</i> Alaska, United States</p> <p><i>Methods:</i> Observational study</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Cleaner air spaces <ul style="list-style-type: none"> <li>▪ Public cleaner air spaces</li> </ul> </li> </ul> </li> <li>• Settings <ul style="list-style-type: none"> <li>○ Community centres</li> </ul> </li> </ul>	<p><a href="#">Evidence suggests that the usage of high-efficiency particulate air (HEPA) portable air cleaners and increasing the amount of time they are turned on, can result in a significant reduction in the indoor total optical particle number concentration compared to outdoors at homeless shelters.</a> (10)</p> <ul style="list-style-type: none"> <li>• Keeping HEPA portable air cleaners running all the time, regardless of what fan speed they are on, can significantly reduce indoor particle levels</li> <li>• However, the main challenge of operating portable air cleaners in homeless shelters in Washington, according to shelter staff, was to keep them on and running</li> </ul>	High	<p><i>Publication date:</i> May 2023</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Observational study</p>	<ul style="list-style-type: none"> <li>• Place of residence</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> <li>▪ Other chemicals</li> </ul> </li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication <ul style="list-style-type: none"> <li>▪ Protect indoor air quality</li> </ul> </li> <li>○ Cleaner air spaces <ul style="list-style-type: none"> <li>▪ Private cleaner air spaces</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Paper filter windows using Hanji paper (a traditional Korean paper that is made from the bark of a mulberry tree) have proven to significantly reduce the amount of outdoor particles entering the indoor environment and to act as a filter medium, especially during severe outdoor air pollution events such as wildfires.</a> (11)</p> <ul style="list-style-type: none"> <li>• PM2.5 particle reductions of 57 to 77% were observed by simply replacing glass windows with Hanji paper windows, and the indoor CO2 concentration stayed below 900ppm with the Hanji windows compared to the CO2 concentration reaching 1440ppm with glass windows</li> <li>• These trends indicate that paper filter windows can help to improve indoor air quality by reducing the concentration of pollutants in the indoor environment</li> </ul>	High	<p><i>Publication date:</i> June 2023</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Experimental study</p>	<ul style="list-style-type: none"> <li>• None</li> </ul>

<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Duration of exposure <ul style="list-style-type: none"> <li>○ Short term</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Private cleaner air shelters</li> </ul> </li> </ul>	<p><a href="#">Do-it-yourself (DIY) air cleaners represent a cost-effective alternative to commercial air cleaners and show comparable performance at improving indoor air quality during wildfire smoke events</a> (12)</p> <ul style="list-style-type: none"> <li>• DIY air cleaners constructed with a box fan and furnace filter(s) are a feasible intervention for improving indoor air quality during smoke events for low-income communities to whom commercial air cleaners are a cost barrier</li> <li>• DIY air cleaners are shown to reduce indoor smoke concentrations and provide cleaner air delivery rates (CADR) comparable to commercially available air cleaners</li> <li>• The low material costs of DIY air cleaners may enable wide distribution by air quality agencies or community groups and organizations</li> <li>• Additional research is needed to ascertain the impact of filter lifespan and replacement frequency on the cost-effectiveness of DIY air cleaners</li> </ul>	High	<p><i>Publication date:</i> 15 November 2022</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Controlled experiment (climate-controlled chambre environment)</p>	<ul style="list-style-type: none"> <li>• Socio-economic status</li> </ul>
<ul style="list-style-type: none"> <li>• Types of exposure <ul style="list-style-type: none"> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> <li>▪ Other chemicals</li> </ul> </li> </ul> </li> <li>• Duration of exposure <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Masks <ul style="list-style-type: none"> <li>▪ N95</li> <li>▪ Other</li> </ul> </li> </ul> </li> <li>• Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> </ul> </li> <li>• Outcomes <ul style="list-style-type: none"> <li>○ Physical health conditions</li> </ul> </li> <li>• Respiratory conditions</li> </ul>	<p><a href="#">Masks usage may reduce the risk of respiratory health conditions caused by wildfire pollutant exposure</a> (13)</p> <ul style="list-style-type: none"> <li>• The purpose of this study was to describe a framework demonstrating the health benefits of mask usage during wildfire exposure</li> <li>• This study found that mask usage protected against negative effects of pollutants, with an N95 mask providing the most protection</li> </ul>	High	<p><i>Publication date:</i> 18 August 2021</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Case study</p>	<ul style="list-style-type: none"> <li>• Place of residence</li> </ul>
<ul style="list-style-type: none"> <li>• Types of exposure <ul style="list-style-type: none"> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> <li>▪ Other chemicals</li> </ul> </li> </ul> </li> <li>• Duration of exposure <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation intervention <ul style="list-style-type: none"> <li>○ Risk communication <ul style="list-style-type: none"> <li>○ Assess risk using AQHI</li> </ul> </li> <li>○ Masks <ul style="list-style-type: none"> <li>▪ N95</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Mobile health apps aimed at reducing risk of wildfire exposure have strong feasibility and accessibility in youth with asthma, given detailed reports of air quality</a> (14)</p> <ul style="list-style-type: none"> <li>• The purpose of this randomized control trial was to assess the feasibility and acceptability of mobile health apps aimed to reduce the risk of wildfire exposure in youth with asthma</li> <li>• This study found that risk communication providing clear reports of air quality (e.g., AQHI and daily spirometry) and health reminders are helpful in reducing exposure to wildfire</li> <li>• Access to other forms of interventions (e.g., masks and protected air quality) are varied</li> </ul>	High	<p><i>Publication date:</i> 11 October 2021</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Randomized control trial</p>	<ul style="list-style-type: none"> <li>• Place of residence</li> <li>• Race/ethnicity/culture/language</li> <li>• Gender/sex</li> </ul>



<ul style="list-style-type: none"> <li>• Populations <ul style="list-style-type: none"> <li>○ Individuals with pre-existing conditions</li> </ul> </li> <li>• Outcomes <ul style="list-style-type: none"> <li>○ Physical health outcomes</li> </ul> </li> <li>• Effects on pre-existing conditions</li> </ul>				
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Duration <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation intervention <ul style="list-style-type: none"> <li>○ Risk communication</li> <li>○ Protect indoor air quality</li> </ul> </li> <li>• Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> </ul> </li> </ul>	<p><a href="#">Portable air cleaners with high-efficiency particulate air filters can reduce indoor PM2.5 levels during wildfire exposure</a> (15)</p> <ul style="list-style-type: none"> <li>• The purpose of this study was to assess the impact of portable air cleaners (PAC) with HEPA filters on indoor PM2.5 levels</li> <li>• Using data from an ongoing wildfire episode, this study concluded that PACs with HEPA filters were more effective at reducing indoor PM2.5 levels than staying indoors alone during repeated short-term wildfire exposure</li> </ul>	High	<p><i>Publication date:</i> 15 June 2021</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Cross-sectional</p>	<ul style="list-style-type: none"> <li>• Place of residence</li> </ul>
<ul style="list-style-type: none"> <li>• Types of exposure <ul style="list-style-type: none"> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Duration of exposure <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication</li> <li>○ Protect indoor air quality</li> </ul> </li> <li>• Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> </ul> </li> </ul>	<p><a href="#">A PM2.5 filtration tool can improve indoor air quality during repeated short-term wildfire exposure</a> (16)</p> <ul style="list-style-type: none"> <li>• The purpose of this study was to assess the impact of mitigation interventions to improve indoor air quality in residential, commercial and school buildings during repeated short-term wildfire exposure</li> <li>• This study concluded that the use of filtration improved indoor air quality and reduced PM2.5, particularly in residential areas with low air exchange</li> </ul>	High	<p><i>Publication date:</i> 12 May 2021</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Cross-sectional</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Cleaner air spaces <ul style="list-style-type: none"> <li>▪ Private cleaner air shelters</li> </ul> </li> <li>○ Enhanced HVAC</li> </ul> </li> <li>• Settings</li> </ul>	<p><a href="#">Portable air cleaners have the ability to reduce PM2.5 concentration levels in office settings during the wildfire season</a> (17)</p> <ul style="list-style-type: none"> <li>• The main objective of this study was to examine the effectiveness of portable air cleaners in reducing PM2.5 concentration in office settings</li> <li>• The findings from this study revealed that portable air cleaners were able to reduce the concentration levels of particulate matter by 73% during working hours and 92% during non-working hours</li> <li>• The authors note that elevated particulate matter concentration during the wildfire season should be of noteworthy concern to staff in office settings during this time</li> </ul>	High	<p><i>Publication date:</i> 2020</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Cross-sectional study</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Heat</li> <li>○ Wildfire smoke</li> </ul> </li> </ul>	<p><a href="#">Evacuations due to wildfire led to significant post-traumatic stress symptoms including insomnia, which was reported for 62.5% of survey respondents</a> (18)</p>	High	<p><i>Publication date:</i> 2019</p> <p><i>Jurisdiction:</i> Canada</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>

<ul style="list-style-type: none"> <li>○ Pollutants</li> <li>● Mitigation interventions</li> <li>○ Evacuation</li> </ul>			<p><i>Methods:</i> Cross-sectional study</p>	
<ul style="list-style-type: none"> <li>● Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>● Mitigation interventions <ul style="list-style-type: none"> <li>○ Evacuation</li> </ul> </li> <li>● Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> <li>○ Pregnant women</li> </ul> </li> <li>● Outcomes <ul style="list-style-type: none"> <li>○ Mental health outcomes <ul style="list-style-type: none"> <li>▪ Anxiety</li> <li>▪ Depression</li> <li>▪ Post-traumatic stress disorder</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Wildfire evacuees experience various negative biopsychosocial consequences, including emotional/mental health disorders (anxiety, depression, PTSD), cognitive impairments (memory lapses, poor concentration), and physical conditions (sleep problems, respiratory problems)</a> (19)</p> <ul style="list-style-type: none"> <li>● The findings also emphasize that communities impacted by wildfires need sustained and long-term services and support</li> </ul>	High	<p><i>Publication date:</i> 2021</p> <p><i>Jurisdiction:</i> Canada</p> <p><i>Methods:</i> Online questionnaire and interviews</p>	<ul style="list-style-type: none"> <li>● Place of residence</li> <li>● Gender/sex</li> </ul>
<ul style="list-style-type: none"> <li>● Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>● Mitigation interventions <ul style="list-style-type: none"> <li>○ Evacuation</li> </ul> </li> <li>● Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> <li>○ Pregnant women</li> </ul> </li> </ul>	<p><a href="#">The experiences of pregnant women during a wildfire evacuation revolved around themes of stress, resilience, social support, roles and the significance of “home”</a> (20)</p> <ul style="list-style-type: none"> <li>● The findings highlighted diverse stress responses among pregnant women during the evacuation, challenges in fulfilling parenting roles, and the reliance on social support from family and the community to cope with the traumatic event</li> <li>● Women reported in the qualitative study experiencing pregnancy complications related to high stress from the evacuations, including intrauterine growth restriction, C-section and pre-term births</li> </ul>	High	<p><i>Publication date:</i> 2022</p> <p><i>Jurisdiction:</i> Canada</p> <p><i>Methods:</i> Qualitative thematic analysis</p>	<ul style="list-style-type: none"> <li>● Place of residence</li> <li>● Gender/sex</li> </ul>
<ul style="list-style-type: none"> <li>● Type of exposure <ul style="list-style-type: none"> <li>○ Heat</li> <li>○ Wildfire smoke</li> <li>○ Pollutants</li> </ul> </li> <li>● Mitigation interventions <ul style="list-style-type: none"> <li>○ Evacuation</li> </ul> </li> <li>● Approaches to mitigate unintended consequences from public health interventions</li> </ul>	<p><a href="#">Significant mental health challenges were reported following evacuation, but enhancing available mental health supports and service use may help over the long-term</a> (21)</p> <ul style="list-style-type: none"> <li>● Evacuees from the Fort McMurray fires reported significant mental health challenges following evacuation</li> <li>● Enhancing mental health services following evacuations may be helpful in the long run, however it should be noted that Caucasian populations were more likely than those from ethnic minorities to use and receive available services</li> <li>● Common barriers for not accessing services included a preference for self-management and not knowing how or where to get information</li> </ul>	High	<p><i>Publication date:</i> 2021</p> <p><i>Jurisdiction:</i> Canada</p> <p><i>Methods:</i> Cross-sectional study</p>	<ul style="list-style-type: none"> <li>● Race/ethnicity/culture/language</li> </ul>
<ul style="list-style-type: none"> <li>● Type of exposure <ul style="list-style-type: none"> <li>○ Heat</li> <li>○ Wildfire smoke</li> <li>○ Pollutants</li> </ul> </li> </ul>	<p><a href="#">Evacuation during the Fort McMurray wildfires was associated with a reduction in breastfeeding and an increase in the use of infant formula</a> (22)</p>	High	<p><i>Publication date:</i> 2018</p> <p><i>Jurisdiction:</i> Canada</p>	<ul style="list-style-type: none"> <li>● Features of relationship</li> </ul>

<ul style="list-style-type: none"> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Evacuation</li> </ul> </li> <li>• Approaches to mitigate unintended consequences from public health interventions</li> </ul>	<ul style="list-style-type: none"> <li>• The mixed-methods study found that caregivers experienced significant stress during and after the evacuation that may have contributed to challenges feeding, including challenges breastfeed while moving, perceptions of reduced milk supply and concerns around privacy while breastfeeding</li> <li>• Additional stressors included displacement, warding off unhealthy food for older children and managing family reunification</li> </ul>		<p><i>Methods:</i> Mixed-methods study</p>	
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation intervention <ul style="list-style-type: none"> <li>○ Evacuation</li> </ul> </li> <li>• Settings <ul style="list-style-type: none"> <li>○ Community settings</li> </ul> </li> </ul>	<p><a href="#">Evacuations due to wildfire smoke alone should be carefully considered as there is considerable potential for them to be ineffective due to shifting weather patterns or inaccurate measurements</a> (23)</p>	High	<p><i>Publication date:</i> 2015</p> <p><i>Jurisdiction studied:</i> Canada</p> <p><i>Methods:</i> Time series analysis</p>	<ul style="list-style-type: none"> <li>• None identified</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Combined</li> <li>○ Pollutants <ul style="list-style-type: none"> <li>▪ Particulate matter</li> </ul> </li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication <ul style="list-style-type: none"> <li>▪ Protect indoor air quality (e.g., keep windows and doors closed)</li> </ul> </li> <li>○ Enhanced HVAC</li> </ul> </li> <li>• Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> <li>○ Occupations directly affected by wildfires</li> </ul> </li> </ul>	<p><a href="#">Evidence suggests that air quality in low-income homes can be affected by wildfire plumes, having a close proximity to roadways, and individual residential behaviour</a> (24)</p> <ul style="list-style-type: none"> <li>• The primary aim of this study was to examine the impact of air pollution from wildfires on the indoor air quality in low-income homes</li> <li>• The findings from this study revealed that the indoor PM2.5 concentration levels elevated 4.6-fold due to wildfire plumes</li> <li>• Black carbon, carbon monoxide, and nitrogen dioxide concentrations were all increased in homes located close to roadways, and four homes even had an 18% increase in indoor-to-outdoor ratio of PM2.5 concentration levels</li> <li>• It is worth noting that when windows were left open for over 12 hours in a day, black carbon concentration levels were increased 2.4-fold as compared to those with their windows closed during this time</li> </ul>	Medium	<p><i>Publication date:</i> 2019</p> <p><i>Jurisdiction:</i> Denver, Colorado, United States</p> <p><i>Methods:</i> Home visits; cross-sectional study</p>	<ul style="list-style-type: none"> <li>• Socioeconomic status</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> <li>○ Pollutants</li> </ul> </li> <li>• Duration of exposure <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication</li> </ul> </li> <li>• Populations <ul style="list-style-type: none"> <li>○ Children</li> </ul> </li> <li>• Outcomes <ul style="list-style-type: none"> <li>○ Physical health outcomes <ul style="list-style-type: none"> <li>▪ Respiratory conditions</li> </ul> </li> <li>○ Mental health outcomes</li> <li>○ Anxiety</li> </ul> </li> </ul>	<p><a href="#">Communication strategies to support children affected by chronic bushfire smoke exposure should emphasize the role of parents and caregivers as information conduits, the use of air quality apps as a common information source, the need for child-friendly communication methods, addressing language barriers for culturally diverse communities, and the importance of actionable behaviors to protect children's health</a> (25)</p> <ul style="list-style-type: none"> <li>• Some caregivers reported their children felt ongoing worry that the smoke will return, and some reported worsening asthma during bushfires</li> <li>• Communication strategies specifically designed for children containing actionable behaviours to proactively protect their health and the health of others are needed to supplement broader communication efforts</li> </ul>	Medium	<p><i>Publication date:</i> 2022</p> <p><i>Jurisdiction:</i> Australia</p> <p><i>Methods:</i> Interviews</p>	<ul style="list-style-type: none"> <li>• Race/ethnicity/culture/ language</li> <li>• Personal characteristics associated with discrimination (age)</li> </ul>

<ul style="list-style-type: none"> <li>• Types of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Duration of exposure <ul style="list-style-type: none"> <li>○ Repeated short term</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication</li> <li>○ Protect indoor air quality</li> <li>○ Masks</li> </ul> </li> <li>• Populations <ul style="list-style-type: none"> <li>○ People living in areas directly affected by wildfires</li> </ul> </li> <li>• Outcomes <ul style="list-style-type: none"> <li>○ Physical health outcomes</li> <li>○ Mental health outcomes <ul style="list-style-type: none"> <li>▪ Anxiety</li> <li>▪ Depression</li> <li>▪ Personal and community isolation</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Clear, detailed and timely dissemination of mitigation interventions are needed to reduce physical and mental health outcomes caused by repeated short-term wildfire exposure</a> (26)</p> <ul style="list-style-type: none"> <li>• The purpose of this qualitative study was to understand the impact of wildfire exposure on overall well-being and behaviour changes in persons with lived experiences</li> <li>• Risk communication through social media and news sources were found to be useful in mitigating physical and mental outcomes caused by repeated short-term wildfire exposure</li> <li>• Participants identified pitfalls in knowledge dissemination including a lack of information and inconsistent recommendations</li> <li>• Timely, clear and detailed information on air quality, health risks and mitigation interventions, disseminated by a trustworthy and central source, is needed</li> </ul>	Medium	<p><i>Publication date:</i> 2020</p> <p><i>Jurisdiction:</i> Australia</p> <p><i>Methods:</i> Qualitative</p>	<ul style="list-style-type: none"> <li>• Place of residence</li> <li>• Gender/sex</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication <ul style="list-style-type: none"> <li>▪ Determine when to reschedule outdoor activities</li> <li>▪ Protect indoor air quality (e.g., keep windows and doors closed)</li> </ul> </li> <li>○ Masks <ul style="list-style-type: none"> <li>▪ N95</li> </ul> </li> </ul> </li> </ul>	<p><a href="#">Exposure to wildfire smoke can be reduced using mitigating strategies such as preparing health systems for smoke events, staying indoors, and using air filters and masks</a> (27)</p> <ul style="list-style-type: none"> <li>• The findings stress the need for more research to address structural barriers and individual variations in order to develop effective public-health interventions</li> <li>• In particular, there is a need for prospective cohorts with individual-level data to better understand the biological impacts of wildfire smoke exposure</li> </ul>	Medium	<p><i>Publication date:</i> 2022</p> <p><i>Jurisdiction:</i> N/A</p> <p><i>Methods:</i> Not specified</p>	<ul style="list-style-type: none"> <li>• Race/ethnicity/culture/language</li> <li>• Socio-economic status</li> </ul>
<ul style="list-style-type: none"> <li>• Type of exposure <ul style="list-style-type: none"> <li>○ Wildfire smoke</li> </ul> </li> <li>• Mitigation interventions <ul style="list-style-type: none"> <li>○ Risk communication <ul style="list-style-type: none"> <li>▪ Determine when to reschedule outdoor activities</li> </ul> </li> </ul> </li> <li>• Protect indoor air quality (e.g., keep windows and doors closed)</li> </ul>	<p><a href="#">Interventions that target indoor air quality improvement and reduce outdoor activities during smoke exposure show promising results in effectively mitigating the health impacts of wildfires and associated pollutants</a> (28)</p> <ul style="list-style-type: none"> <li>• Wildland firefighters' exposure to smoke during their work tasks, such as mop-up, holding, fireline construction and firing, highlights the need for effective administrative controls to reduce particulate matter and chemical exposure</li> <li>• No detailed discussion is provided of what such administrative controls would entail</li> </ul>	Medium	<p><i>Publication date:</i> 2020</p> <p><i>Jurisdiction:</i> United States</p> <p><i>Methods:</i> Not specified</p>	<ul style="list-style-type: none"> <li>• Occupation</li> </ul>

## Appendix 4: Detailed jurisdictional scan about mitigating the health and social effects of exposure to wildfires

Jurisdiction	Guidance document	Identified interventions
Canada – British Columbia	<p><a href="#">Guidance for BC public health decision makers during wildfire smoke events</a> (2014) based on Evidence review: <a href="#">Exposure measures for wildfire smoke surveillance</a></p> <p><a href="#">BC health and smoke exposure (HASE) coordination committee guideline</a> (2023)</p> <p><a href="#">Wildfire preparedness guide</a> (2023)</p>	<ul style="list-style-type: none"> <li>• Communications advising people to: <ul style="list-style-type: none"> <li>○ stay indoors</li> <li>○ reduce outdoor physical activity</li> <li>○ wear an N95 respirator</li> <li>○ activate asthma/COPD action plans</li> <li>○ use a cleaner air space</li> </ul> </li> <li>• Cancelling outdoor events</li> <li>• Providing community cleaner air spaces</li> <li>• Augmenting air filtration in institutions (including hospitals, nursing homes, long-term care facilities, day cares, schools and other institutions)</li> <li>• Evacuating</li> </ul>
Canada – Alberta	<p><a href="#">Simplified wildfire smoke guide</a> (2017)</p>	<ul style="list-style-type: none"> <li>• Reduce exposure by closing windows and air vents and setting air conditioning to recirculate</li> <li>• Reduce outdoor activities and take breaks indoors in cleaner air</li> <li>• Reduce emissions by taking transit or telecommuting and refraining from the use of outdoor fires or barbecues</li> <li>• Monitor health by checking the Air Quality Health Index (AQHI) and public health advisories</li> <li>• Monitor symptoms including cough, throat irritation, discomfort and others</li> <li>• Consider the use of an N95 mask</li> </ul>
Canada – Saskatchewan	No evidence-based guidelines identified	
Canada – Manitoba	<p><a href="#">Smoke exposure from wildland fires: Interim guidelines for protecting community health and wellbeing</a> (2012)</p>	<ul style="list-style-type: none"> <li>• Assess risk of smoke conditions considering air quality, health effects of smoke (through emergency room monitoring), weather forecast and expected duration</li> <li>• Refer to public health recommendations based on air quality category, which may include: <ul style="list-style-type: none"> <li>○ Rescheduling activities and limiting time outdoors</li> <li>○ Cancelling public events</li> <li>○ Using cleaner air spaces</li> <li>○ Evacuating</li> </ul> </li> <li>• If necessary, prioritize evacuees by highest risk, which include those experiencing symptoms and those with respiratory conditions, followed by vulnerable populations including elderly, people who have difficulty walking, newborns and children, pregnant women, and people requiring special or supportive care</li> </ul>
Canada – Ontario	No evidence-based guidelines identified	

Jurisdiction	Guidance document	Identified interventions
Canada – Quebec	No evidence-based guidelines identified	
Canada – Nova Scotia	No evidence-based guidelines identified	
Canada – Prince Edward Island	No evidence-based guidelines identified	
Canada – Newfoundland and Labrador	<a href="#">Forest fire smoke and air quality: Public health guidelines</a> (2015)	<ul style="list-style-type: none"> <li>• Health warning messages and precaution measures based on e-smog bulletins, AQHI and guidelines from other jurisdictions, namely California</li> <li>• Additional public health recommendations include: <ul style="list-style-type: none"> <li>○ Stay indoors and move to the coolest room in the house</li> <li>○ Avoid physical activity</li> <li>○ Keep the body cool and hydrated by taking cool showers and baths, wearing light clothing and drinking regularly</li> <li>○ Keep indoor air clean by closing windows and turning off ventilation systems that bring outdoor air into the home</li> <li>○ Use community facilities as cleaner air spaces</li> <li>○ Consider the use of personal protective equipment including N95 masks if advised by a healthcare provider</li> </ul> </li> </ul>
Canada – Nunavut	No evidence-based guidelines identified	
Canada – Yukon	<a href="#">Yukon wildfire smoke response guideline</a> (2020)	<ul style="list-style-type: none"> <li>• Stay indoors and close windows and doors</li> <li>• Purify indoor air using MERV filters with a rating of 13 or higher and portable air cleaners</li> <li>• Seek cleaner air spaces provided in the community</li> <li>• Reduce other sources of pollution such as smoking, woodburning or frying or broiling meat</li> <li>• Use humidifiers to reduce levels of pollutants in the home through condensation (however, be wary of the potential for mould spores)</li> <li>• Reduce, reschedule or modify outdoor activities and avoid smoky periods</li> <li>• Monitor smoke-related illness</li> <li>• Evacuate when particular contextual factors have been considered and other interventions have been ineffective</li> </ul>
Canada – Northwest Territories	<a href="#">Smoke exposure from wildfire: Guidelines for protecting community health and wellbeing</a> (2016)	<ul style="list-style-type: none"> <li>• Assess smoke conditions by considering air quality, using the AQHI, special air quality statements issued by Environment Canada and landmark visibility index</li> <li>• Consider the duration of smoke and weather forecast</li> <li>• Provide recommendations for heavy smoke, which may include: <ul style="list-style-type: none"> <li>○ Rescheduling activities and limiting time outdoors</li> <li>○ Cancelling public events</li> <li>○ Using cleaner air spaces</li> </ul> </li> </ul>

Jurisdiction	Guidance document	Identified interventions
Australia	<a href="#">Standard for smoke, air quality and community health</a> (2022)	<ul style="list-style-type: none"> <li>• Informing the community of the level of impact on air quality and the potential health risks associated with exposure to fine particles</li> <li>• Ongoing provision of advice and cautionary actions people can take to protect their health, which could include: <ul style="list-style-type: none"> <li>○ Airing out the home when outside air quality has improved</li> <li>○ Use of portable indoor air cleaners that have a high efficiency particulate air filter</li> <li>○ Use of face masks</li> <li>○ Spending time in public buildings with air conditioning</li> <li>○ Creating cleaner air spaces</li> <li>○ Adapting physical activity</li> </ul> </li> <li>• Advising for specific settings where stronger health protection measures may be warranted</li> <li>• Balancing the need for sensitive groups to leave the smoke-affected area against the potential risks associated with moving highly vulnerable people</li> </ul>
France	No evidence-based guidelines identified	
Italy	No evidence-based guidelines identified	
United States	<a href="#">Wildfire smoke: A guide for public health officials</a> (2019)  <a href="#">2021 changes to Wildfire smoke: A guide for public health officials</a> (2021)  <a href="#">Wildfire guide post-publication updates</a> (ongoing)	<ul style="list-style-type: none"> <li>• Wearing N95 or P100 particulate respirator that fits close to the face to reduce exposure to wildfire smoke and ash</li> <li>• Staying indoors, especially in indoor environments that have filtered air and climate control to provide relief from smoke and heat</li> <li>• Using high-efficiency heating, ventilation, and air-conditioning (HVAC) filters (rated MERV 13 or higher) to reduce particle concentrations indoors</li> <li>• Provide regular communications about air quality during smoke events, such as the <a href="#">Air Quality Index</a> (AQI; available on <a href="#">AirNow</a>), the <a href="#">Fire &amp; Smoke Map</a>, school-focused guidance that addresses <a href="#">outdoor activities</a>, and a visual alert system through the <a href="#">Air Quality Flag Program</a></li> <li>• State and local public health agencies should consider running pre-season PSAs or social media or news announcements to advise the public on how to prepare for the fire season</li> <li>• During smoke periods, advisories based on air quality levels should address the needs of at-risk life stages and populations, such as people with lung or heart disease, pregnant women, children, older adults and people of lower socio-economic status</li> <li>• Advisories should include preparing for the wildfire season, such as through stocking up on non-perishable groceries that do not require cooking, and people with chronic diseases should check with healthcare providers about precautions ahead of smoke events and have an adequate supply of medication available, including a written asthma action plan for asthmatics</li> </ul>

## Appendix 5: Documents excluded at the final stages of reviewing (including guidelines with no clear grounding in evidence)

Document type	Hyperlinked title
Evidence syntheses	<a href="#">What does it mean to psychologically prepare for a disaster? A systematic review</a>
	<a href="#">Wildfire smoke exposure during pregnancy: A review of potential mechanisms of placental toxicity, impact on obstetric outcomes, and strategies to reduce exposure</a>
Single studies	<a href="#">Evaluating an Air Quality Health Index amendment for communities impacted by residential woodsmoke in British Columbia, Canada</a>
	<a href="#">Climate change and pregnancy: Risks, mitigation, adaptation and resilience</a>
	<a href="#">Adaptation resources and responses to wildfire smoke and other forms of air pollutions in low-income urban settings: A mixed methods study</a>
	<a href="#">Outdoor and indoor fine particular matter at skilled nursing facilities in the western United States during wildfire and non-wildfire seasons</a>
	<a href="#">Public health agency responses and opportunities to protect against health impacts of climate change among US populations with multiple vulnerabilities</a>
	<a href="#">Long-term trends in PM2.5 mass and particle number concentrations in urban air: The impacts of mitigation measures and extreme events due to changing climates</a>
Guidelines	<a href="#">Guidelines for health staff in northern Saskatchewan communities preparation for forest fires and the assessment of health effects from forest fire smoke (Canada – Saskatchewan)</a>
	<a href="#">Health impacts of particles from forest fires (Canada – Quebec)</a>
	<a href="#">Bushfires and health (Australia)</a>
	<a href="#">Guidelines on land-based wildfire prevention (European Union)</a>
	<a href="#">Protecting building occupants from smoke during wildfire and prescribed burn events (United States)</a>
	<a href="#">Air quality and outdoor activity guidance for schools (United States)</a>

Waddell K, DeMaio P, Alam S, Ali A, Bain T, Bhuiya A, Chen K, Sharma K, Wilson MG. Rapid evidence profile #53: Examining the effectiveness of public health interventions to address wildfire smoke, combined heat-smoke events and pollutants. Hamilton: McMaster Health Forum. 28 July 2023.

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