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# BMJ Paediatrics Open

## Educating families about the impacts of wildfire smoke on children's health: Opportunities for healthcare professionals

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3 **Viewpoint: *Educating families about the impacts of wildfire smoke on children’s health:***  
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5 ***Opportunities for healthcare professionals***  
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8 A dramatic wildfire smoke season has emerged in the first half of 2023. In March, smoke from  
9 early wildfires in Spain blanketed communities along the Mediterranean. In June, smoke covered parts of  
10 Scotland following fires in the Highlands, and the Canadian wildfires caused weeks of hazardous air  
11 conditions in cities across North America from Seattle to Toronto and New York. The chance of adverse  
12 health events from wildfire smoke exposure has increased even in populations previously considered less  
13 vulnerable.  
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22 As trusted messengers, healthcare professionals are well-positioned to advise parents about  
23 potential health consequences of wildfire smoke. Historically, paediatricians have not discussed climate  
24 change hazards like wildfire smoke during office visits.<sup>1</sup> This absence of counselling may partially reflect  
25 paediatricians’ self-perceived lack of knowledge including about effective strategies to communicate  
26 climate-health harms. However, wildfire smoke is a growing global health hazard for children, and parents  
27 are increasingly turning to paediatricians for advice.<sup>1,2</sup>  
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35 Children often spend more time outdoors than adults, breathe faster, and take in more air relative  
36 to their body weight; their lungs are also still developing and maturing. Their nasal passages filter relatively  
37 less air pollution, allowing a higher proportion of particulate matter to penetrate deeper into their lungs.<sup>2</sup>  
38 This is problematic because particulate matter from wildfire smoke is more toxic than pollution from other  
39 sources (e.g., traffic).<sup>3</sup> Prolonged wildfire smoke events can last weeks to months and spread across large  
40 geographic areas. Health consequences vary by developmental stage. Exposure in utero has been associated  
41 with pre-term birth and decreased birth weight, which can have lifelong implications for respiratory and  
42 cardiovascular health.<sup>2</sup> Younger children experience higher rates of ER respiratory visits and visits for  
43 respiratory infections during wildfire events than older children.<sup>2,3</sup> Simultaneously, many parents are not  
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3 aware of the health risks that wildfire smoke poses, do not know how to protect their children, or may not  
4  
5 take the risks seriously.<sup>4</sup>  
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8 We believe that foundational principles in behavioural science can empower health professionals  
9  
10 with tools to increase parents' understanding of wildfire smoke risks and their motivation to seek resources  
11  
12 and take actions to protect their children's health. We recommend three strategies for communicating with  
13  
14 families about the impacts of wildfire smoke on children's health.  
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### 17 *Strategy 1. Use visuals and stories to motivate use of Air Quality Indexes*

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20 Visuals capture and direct attention and, thus, can be a powerful communication tool to promote  
21  
22 the adoption of protective actions.<sup>5</sup> Air Quality Indexes (AQIs) provide information using simple color-  
23  
24 coded visual graphics about local levels of air pollutants. Healthcare professionals can point parents towards  
25  
26 these visuals, available on government websites and through weather apps on many smartphones.<sup>1</sup> For  
27  
28 example, when the concentration of PM<sub>2.5</sub> exceeds 35µg/m<sup>3</sup> (i.e., US AQI >100, UK DAQI >4, EU AQI  
29  
30 = Poor), air is unhealthy for sensitive groups like children; healthcare professionals could recommend the  
31  
32 protective actions under Strategies 2 and 3. Importantly, children with asthma or other respiratory or cardiac  
33  
34 conditions as well as infants may be extremely sensitive to air pollution and require protective actions at  
35  
36 lower AQI levels. Health management plans for children need to be personalized, reflect lower risk  
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38 thresholds, and include guidance for parents to watch for symptoms like coughing, fatigue, or shortness of  
39  
40 breath whenever wildfire smoke is present.  
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44 If an AQI is unfamiliar and distant from parents' experiences, stories can help clinicians establish  
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46 rapport and bridge the gap between the tool and children's health, making actions more tangible, real, and  
47  
48 personally relevant. Use of personal stories in patient interactions can increase the relevance of health  
49  
50 messages and promote self-efficacy.<sup>5</sup> Whenever possible, clinicians should draw from their own or others'  
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52 local experiences about how AQI values inform decision-making. For instance, a paediatrician could offer,  
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3 "During the wildfires, I noticed my kids would cough a lot after I called them inside for dinner. Now, I  
4 always check the daily AQI to decide whether an indoor activity might be safer that day!"  
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8 *Strategy 2. Emphasize near-term health benefits of reduced exposure to wildfire smoke*  
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11 The most effective way to eliminate harmful exposures to smoke is to relocate to areas with better  
12 air quality. As this option may be impractical, especially during long-term smoke episodes, healthcare  
13 professionals can recommend more feasible alternatives. On unhealthy air quality days, outdoor events can  
14 be rescheduled or relocated to locations with better air quality; time spent outside and physical exertion can  
15 be reduced.  
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22 Masking is another option, but medical and cloth masks provide limited protection from smoke  
23 exposure. Clinicians should guide parents to use well-fitted N95 respirators for older children when they  
24 are outside; their use in young children has not been approved in the US and elsewhere. However, children  
25 over 2 who can communicate their comfort level will be better-protected with a well-fitted N95 respirator  
26 than a medical mask. Clinicians can review with parents the age, developmental status, and healthcare needs  
27 of each child to inform a plan. Healthcare professionals should emphasize that taking action benefits  
28 children's health, reducing respiratory symptoms like cough, wheeze, and asthma symptoms requiring ER  
29 care.<sup>2</sup> Concrete risks and protective actions can help engage families, increase parents' perceptions of  
30 wildfire smoke harms, and motivate action here and now.<sup>5</sup>  
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42 *Strategy 3. Identify and reduce patient barriers to accessing clean indoor air spaces*  
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45 Ensuring adequate indoor air quality is also imperative during wildfire smoke events. For example,  
46 data from many US schools—where children spend most of their time apart from home—suggest they have  
47 poor ventilation, which negatively affects children's health.<sup>2</sup> The use of standard HVAC systems can reduce  
48 exposure by 70-80% using a MERV13 filter or better, and even filtration with stand-alone devices like  
49 portable air purifiers can offer significant benefits—especially those using high efficiency particulate air  
50 (HEPA) filters.<sup>2</sup> Thus, healthcare professionals also need to recommend clean indoor air spaces in homes,  
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3 community spaces, and schools to reduce the health impacts of wildfire smoke among children. Although  
4 ventilation systems can be cost-prohibitive for many families, programs that increase access to clean air  
5 spaces should be explored. For example, some US states have begun to offer free air purifiers to households  
6 in smoke-prone communities. Healthcare professionals can have greater impact and promote behaviour  
7 uptake by becoming familiar with available programs and providing actionable plans for families to access  
8 them.<sup>5</sup>  
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16 Achieving reductions in children's exposure to wildfire smoke will also hinge on the development  
17 of policies that protect children. The COVID-19 pandemic sparked many conversations about how to  
18 improve indoor air quality. The medical community should seize that momentum to advocate for policies  
19 and measures that make indoor spaces safer during wildfire smoke events and beyond, for example, through  
20 the establishment of indoor air quality guidelines and standards. Some states in the US and Australia have  
21 executed rules or recommendations instructing employers to take actions to protect workers from wildfire  
22 smoke in response to specific AQI levels. What if children were guaranteed similar protections? At a  
23 minimum, establishing consistent policies around adjustments to outdoor school activities (e.g.,  
24 rescheduling sports competitions) in response to high wildfire smoke levels would give children equal  
25 protections in schools across jurisdictions. Any development of guidelines aimed to mitigate children's  
26 risks to health from wildfire smoke will require substantial input and expertise from and partnership  
27 amongst healthcare professionals, public health officials, and community service providers.  
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42 Helping parents and policy makers understand the importance of indoor and outdoor air quality—  
43 including how to monitor and act on it—is essential to protecting our children's health today and into the  
44 future.  
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50 Canada.  
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53 personal relationships that could have appeared to influence this work.  
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4 ***Opportunities for healthcare professionals***  
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3 ***Educating families about the impacts of wildfire smoke on children’s health: Opportunities***  
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6 ***for healthcare professionals***  
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8 A dramatic wildfire smoke season emerged in 2023. Chilean wildfire smoke blanketed  
9 communities across Chile and Argentina in February. In June, smoke covered parts of Scotland following  
10 fires in the Highlands while Canadian wildfires caused hazardous air conditions throughout North America.  
11 By August, damage from wildfires had broken multiple global records, devastating communities in Hawaii,  
12 the Canary Islands, and the Mediterranean. The chance of adverse health events from wildfire smoke  
13 exposure increased even in populations previously considered less vulnerable.  
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22 As trusted messengers, healthcare professionals are well-positioned to advise parents about  
23 potential health consequences of wildfire smoke. Historically, paediatricians have not discussed such  
24 climate-related hazards during office visits.[1] This absence of counselling may partially reflect  
25 paediatricians’ self-perceived lack of knowledge about how to effectively communicate their harms.  
26 However, wildfire smoke is a growing global health hazard for children, and parents are increasingly  
27 turning to paediatricians for advice.[1,2]  
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35 Children often spend more time outdoors than adults, breathe faster, and take in more air relative  
36 to their body weight; their lungs are also still developing and maturing. Their nasal passages filter relatively  
37 less air pollution, allowing more particulate matter (PM) to penetrate deeper into their lungs.[2] This is  
38 problematic because wildfire-smoke PM is more toxic than pollution from other sources (e.g., traffic).[3]  
39 Indeed, scientists continue to uncover the full extent of wildfire-smoke toxicity. Besides PM, smoke often  
40 contains myriad harmful substances, such as methane, carbon monoxide, nitrogen oxides, trace metals, and  
41 carcinogens.[4]  
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50 Prolonged wildfire-smoke events can last weeks-to-months and spread widely. Health  
51 consequences vary by developmental stage. Exposure in-utero has been associated with pre-term birth and  
52 decreased birth weight, with potential lifelong health implications.[2] Younger children experience more  
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3 emergency-room respiratory visits and respiratory-infection visits during wildfire events than older  
4 children.[2,3] Simultaneously, many parents are unaware of wildfire-smoke health risks, do not know how  
5 to protect their children, or do not take the risks seriously.[5]  
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10 We believe that foundational principles in behavioural science can empower health professionals  
11 with tools to increase parents' understanding of wildfire-smoke risks and their motivation to seek resources  
12 and take actions to protect their children's health. We recommend three strategies for communicating with  
13 families about the impacts of wildfire smoke on children's health.  
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### 19 *Strategy 1—Use visuals and stories to motivate use of Air Quality Indices*

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22 Visuals capture and direct attention and can be a powerful communication tool to promote the  
23 adoption of protective actions.[6] Air Quality Indices (AQIs) provide information using simple colour-  
24 coded visual graphics about local air-pollutant levels. Healthcare professionals can point parents towards  
25 these visuals, available on government websites and through many smartphone apps.[1] Low-cost air  
26 sensors like PurpleAir are available and accurate in measuring PM. Thus, their data can serve as useful  
27 tools to guide decision-making regarding children's smoke exposures.[2] For example, when the  
28 concentration of PM<sub>2.5</sub> exceeds 35µg/m<sup>3</sup> (i.e., US AQI>100, UK DAQI>4, EU AQI=Poor), air is  
29 considered unhealthy for sensitive groups like children; healthcare professionals could recommend the  
30 protective actions under Strategies 2-3. Importantly, infants and children with asthma, other respiratory  
31 conditions, or cardiac conditions may be extremely sensitive to air pollution and require protective actions  
32 at lower AQI. Health-management plans for children need to be personalized, reflect lower risk thresholds,  
33 and include guidance for parents to watch for symptoms like coughing, fatigue, or shortness of breath  
34 whenever smoke is present.  
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50 If AQIs are unfamiliar and distant from parents' experiences, stories can help clinicians establish  
51 rapport and connect with children's health, making actions more tangible, real, and personally relevant. Use  
52 of personal stories in patient interactions can increase the relevance of health messages and promote self-  
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3 efficacy.[6] Whenever possible, clinicians should draw from their own or others' local experiences about  
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5 AQI values informing decision-making. For instance, a paediatrician could offer, "During the wildfires, I  
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7 noticed my kids coughing after playing outside. Now, I check the AQI to decide whether an indoor activity  
8  
9 might be safer that day!"

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12 *Strategy 2—Emphasize near-term health benefits of reduced exposure to wildfire smoke*  
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15 The most effective way to eliminate harmful exposures to smoke is to relocate to areas with better  
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17 air. This option may be impractical, especially during long-term smoke episodes, but healthcare  
18  
19 professionals can recommend other alternatives. On unhealthy air-quality days, outdoor events can be  
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21 rescheduled or relocated to places with healthier air, and time spent outside and physical exertion reduced.  
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23 If traveling by car through smoky areas, windows should remain closed and air conditioning set to  
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25 recirculation with fresh-air intake closed.[7]  
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29 Masking is another option, but medical and cloth masks provide limited protection from smoke  
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31 exposure. Clinicians should guide parents to use well-fitted N95 respirators for older children when they  
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33 are outside; their use in young children has not been approved in the US and elsewhere.[7] However,  
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35 children over 2 who can communicate their comfort level will be better-protected with a well-fitted N95  
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37 respirator than other masks. Small adult-sized respirators can provide an 80% decrease in smoke exposure  
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39 among children if properly fit; parents can be trained on how to do so.[2] Clinicians can review with parents  
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41 the age, developmental status, and healthcare needs of children to inform a plan. Healthcare professionals  
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43 should emphasize that actions benefit children's health, reducing respiratory symptoms like cough and  
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45 wheeze.[2] Concrete risks and protective actions can engage families, increase parents' perceptions of  
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47 smoke harms, and motivate action.[6]  
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51 *Strategy 3—Identify and reduce patient barriers to accessing clean indoor air spaces*  
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54 Ensuring adequate indoor air quality is also imperative during wildfire-smoke events. For example,  
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56 data from many US schools—where children spend much time—suggest they have poor ventilation, which  
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3 negatively affects children's health.[2] The use of standard Heating, Ventilation, and Air Conditioning  
4 (HVAC) systems with a Minimum Efficiency Reporting Value (MERV)13 filter can reduce exposure by  
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6 70-80%; even filtration with stand-alone devices like portable air purifiers can offer significant  
7  
8 benefits—especially those using high efficiency particulate air (HEPA) filters.[2] Thus, healthcare  
9  
10 professionals need to recommend clean indoor air spaces in homes, community spaces, and schools to  
11  
12 reduce wildfire-smoke health impacts among children. Although HVAC systems can be cost-prohibitive  
13  
14 for many families, programs that increase access to clean air spaces should be explored. For example, some  
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16 US states have begun to offer free air purifiers to households in smoke-prone communities. Other effective  
17  
18 low-cost alternatives include box-fan-systems—a box fan with an attached HVAC furnace filter—though  
19  
20 their dependence on electricity may limit use in regions with less adequate infrastructure or frequent power  
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22 outages. Healthcare professionals can have greater impact and promote behaviour uptake by becoming  
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24 familiar with available programs and providing actionable plans for families to access them.[6]  
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30 Achieving reductions in children's exposure to wildfire smoke also will hinge on developing  
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32 policies that protect children. The COVID-19 pandemic sparked conversations about improving indoor air  
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34 quality. The medical community should seize that momentum and advocate for safe indoor-air policies, for  
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36 example, by establishing indoor-air-quality guidelines and standards. Some US and Australian states have  
37  
38 executed rules or recommendations to protect workers from wildfire smoke in response to AQI levels. What  
39  
40 if children were guaranteed similar protections? At a minimum, establishing consistent policies to adjust  
41  
42 outdoor school activities (e.g., rescheduling sports competitions) in response to high wildfire-smoke levels  
43  
44 would protect children equally across school districts. Guidelines aimed at mitigating children's health risks  
45  
46 from wildfire smoke will require input and expertise from and partnership amongst healthcare  
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48 professionals, public health officials, and community service providers. These points further highlight the  
49  
50 growing need for professional development and educational training across health professions on the impact  
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52 of wildfire smoke on paediatric healthcare.  
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3 Helping parents and policy makers understand the importance of indoor and outdoor air  
4 quality—including how to monitor and act on it—is essential to protecting our children’s health today and  
5 into the future.  
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