

Wildfire Smoke

LOCAL PUBLIC
HEALTH OFFICERS

Guidance for
Canceling Outdoor
Events or Activities
and Closing Schools

April 2022



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CURRENT AIR QUALITY & FORECASTS

Current outdoor PM_{2.5} levels from agency monitors are available as Air Quality Index (AQI) Values that are updated hourly on the [Washington Smoke Blog](#) and [EPA's AirNow App](#). Forecasts are also increasingly available during wildfire season on the WA Smoke Blog and Washington State Department of Ecology's [Smoke Forecast website](#). Low-cost PM_{2.5} sensors can provide helpful information outdoors where there is not a nearby agency monitor and indoors, where there are no agency monitors, though these are less accurate than agency monitors and uncorrected sensor measurements should not be directly compared to PM_{2.5} action levels. Publicly reported PM_{2.5} outdoor sensor measurements with an applied smoke correction factor are also available on the WA Smoke Blog.

Introduction

The Washington State Departments of Health and Ecology have been asked about when to cancel outdoor events and activities or close schools due to wildfire smoke impacts on public health. Decisions about closures, relocations, or evacuations are made at the local level in Washington. This document provides guidance for local health officers about air concentrations of smoke, measured as fine particulate matter (PM_{2.5}), considered a health threat.

Recommended particulate matter action levels for closures and cancellations

When outdoor forecasted 24-hour or NowCast PM_{2.5} concentrations:

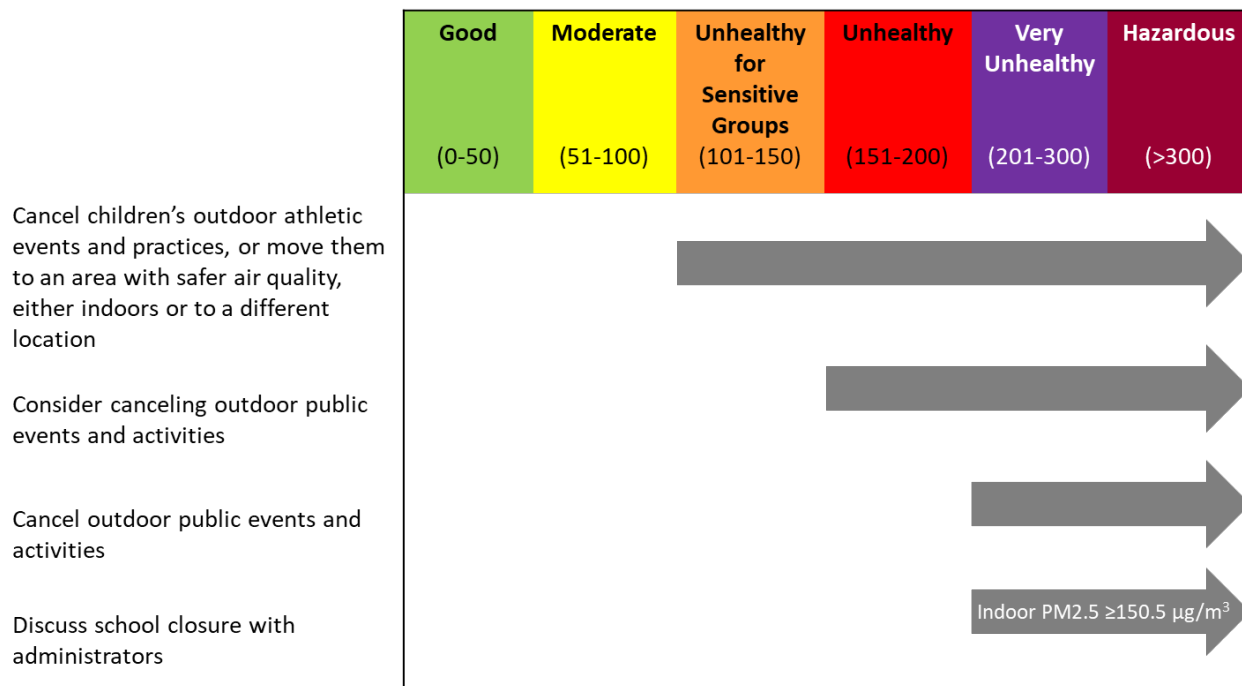
- Equal or exceed 35.5 µg/m³ (AQI value 101, “Unhealthy for Sensitive Groups” category or worse) cancel children’s outdoor athletic events and practices or move them to an area with safer air quality, either indoors or to a different location.
- Equal or exceed 55.5 µg/m³ (AQI value 151, “Unhealthy” category or worse) consider canceling outdoor public events and activities.
- Equal or exceed 150.5 µg/m³ (AQI value 201, “Very Unhealthy” category or worse) cancel outdoor public events and activities.

When school is in session and indoor PM_{2.5} concentrations:

- Equal or exceed 150.5 µg/m³ (indoor equivalent to AQI value 201 and “Very Unhealthy” category or worse) discuss school closure with administrators.

PM_{2.5} concentrations are reported across six health hazard levels in the AQI. The PM_{2.5} action levels described here are each at a cut-point of a hazard level. The AQI is designed for outdoor pollutants, though the school closure action level is based on an indoor PM_{2.5} concentration with an equivalent AQI value in the absence of established hazard levels for the general public designed for indoor use.

Figure 1. AQI thresholds for recommended closures and cancellations



Factors to consider for outdoor event and activity cancellations and school closures

In addition to the PM_{2.5} action levels, consider other factors and issues specific to your area when deciding about closures and cancellations to protect health and welfare.

Outdoor Events and Activities

- What is the forecast for how long wildfire smoke levels will remain high?
- Are smoke conditions getting worse, getting better, or staying about the same?
- Is there an option to relocate to an area with cleaner air?
- If children or others requiring care are involved, will adults be available as caretakers?
- Will there be impacts on economic or job security by cancelling the activity or event?
- Are there other weather factors to consider, like excessive heat or humidity, that would further increase risk of outdoor exposure?
- Is the visibility safe for driving?

Schools

- What is the forecast for how long wildfire smoke levels will remain high?
- Have all options to improve indoor air quality been attempted?
- Are students and staff who are sensitive to smoke allowed to stay home if it is safer?
- Is it safe to walk or bike to school?
- Is the visibility safe for driving?
- Are there other weather factors to consider, like excessive heat or humidity, that would further increase health risks?
- Where will children be relocated if schools are closed? Is the air quality better there?
- If children or others requiring care are involved, will adults be available as caretakers?
- Will there be impacts to economic or job security for parents missing work to attend to children?
- While moving to another location, will people be more exposed outdoors than if they had just stayed indoors?
- Are there other safety concerns about relocating people?

Steps to reduce smoke exposures

- Reduce outdoor time and activities.
- Stay indoors and keep indoor air as clean as possible.
- Keep windows closed and only allow entry of outside air through filtration.
- Restrict use of outside doors; double door entries can help keep smoke out.
- Wildfires often occur on hot days, and many schools and other indoor facilities do not have air conditioning. Pay attention to the heat and take steps to cool buildings.
- For more information:
 - [Improving Ventilation and Indoor Air Quality during Wildfire Smoke Events \(PDF\)](#)
 - [DOH Smoke from Fires](#)

Measuring wildfire smoke levels

The concentration of PM_{2.5} – particles less than 2.5 micrometers in diameter – is the most useful measurement of smoke levels to protect health. The Department of Ecology (Ecology) and local clean air agencies routinely monitor these levels outdoors. PM_{2.5} concentrations are grouped into health hazard levels within the U.S. Environmental Protection Agency's (EPA) Air Quality Index (AQI) six categories (Figure 1). Health precautions in each category are based on current conditions weighted to “24 hour-like” average concentrations. AQI values are from hourly monitored concentrations using EPA's NowCast algorithm.

NowCast particulate matter (PM_{2.5}) concentrations use averages of between 3 and 12 hours that can be compared to 24-hour standards and health indexes. The U.S. Environmental Protection Agency's (EPA) NowCast algorithm is designed to respond when air quality conditions are rapidly changing, which is common during wildfire smoke events. NowCast

concentrations use longer averaging times when air quality is stable, and shorter averaging times when conditions are changing quickly. NowCast concentrations, unlike hourly data, are suitable for comparison with federal standards and the AQI.

Outdoor measurements, trends and forecasts

Three key pieces of information about smoke conditions are available on public agency websites and apps: the current PM_{2.5} AQI, current PM_{2.5} trends (whether smoke conditions are getting worse, getting better, or staying the same), and smoke forecasts. Whenever possible, decision-making around canceling outdoor events and activities, closing facilities or relocating people should consider all three pieces of information. However, forecasts are not available in all areas, and the level of uncertainty increases as the forecast time extends. Forecasts more than two days in the future should be used with caution, as they have greater uncertainty.

The Washington Smoke Blog is the recommended public agency website for accessing information on current conditions, trends, and forecasts, as it provides all three in a single map. On a smartphone, EPA's AirNow is the recommended app, though its forecasts are limited to only some parts of Washington. Users who do not see forecast information in their area on the AirNow app can also refer to Ecology's smoke forecast, which covers additional (though not all) areas. Instructions for all three resources are provided below.

Outdoor Air Sensors

The recommended maps show agency monitoring sites as circles and publicly-reporting PM_{2.5} low-cost sensors as smaller squares. Low-cost PM_{2.5} sensors are small devices available commercially. They are generally less accurate than agency monitors, and since many are operated by members of the public, their performance, siting, and maintenance are unknown. Though EPA conducts some limited quality control screening on sensor data and applies a correction factor to account for known sensor bias, sensor data has greater uncertainty and is generally lower quality than agency monitoring data.

Where available, nearby agency monitors are the best data source. However, agency monitors may also represent different smoke conditions if they are at a different elevation or in a different type of environment. In places far from agency monitors, nearby air sensors are likely better data sources than distant agency monitors. However, sensor data should be interpreted with caution, especially when one sensor shows very different values than other nearby sensors. Considering values from multiple nearby sensors can help offset the greater uncertainty of sensor measurements.

Recommended Website: Washington Smoke Blog

To see the current PM_{2.5} AQI and trend using the [Washington Smoke Blog](#) map:

- Click the agency monitor or sensor closest to the area of interest.

- A pop-up will appear that indicates the PM_{2.5} AQI value, trend, and link to recommended health actions.

Additional features shown on the map include: fire icons for large fire incidents, small glowing points for satellite fire detections, and gray polygons for smoke plume locations.

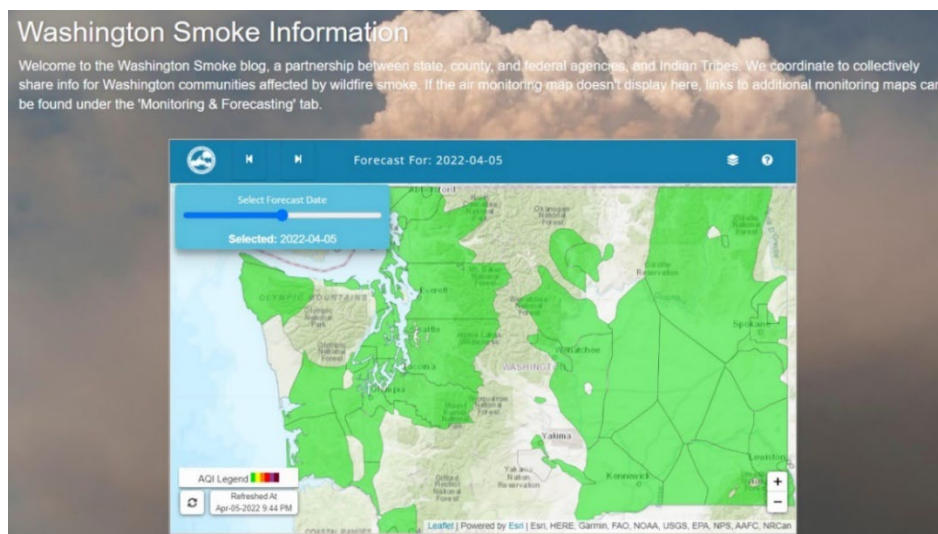
Figure 2. Washington Smoke Blog map pop-up



To see the smoke forecast:

- Close any visible pop-ups on the map.
- Under “Select Forecast Date” in the top left corner of the map, use the slider to advance the date to the desired forecast date.
- The shaded polygons on the map indicate the 24-hour PM_{2.5} AQI category forecasted for the selected date.

Figure 3. [Washington Smoke Blog](#) forecast display



The Washington Smoke Blog also contains text and graphical discussions of statewide, regional, or local air quality forecasts when wildfire smoke events are in progress. The [Monitoring and Forecasting](#) tab on the blog contains more information on several available higher-resolution smoke simulations.

Recommended Smartphone App: EPA's AirNow

The landing page of EPA's AirNow app shows the current AQI and the daily forecast for some areas. Sometimes the current AQI is based on ground-level ozone or PM₁₀ conditions instead of PM_{2.5}. Click "Details" below the AQI dial to see the AQI value for PM_{2.5}.

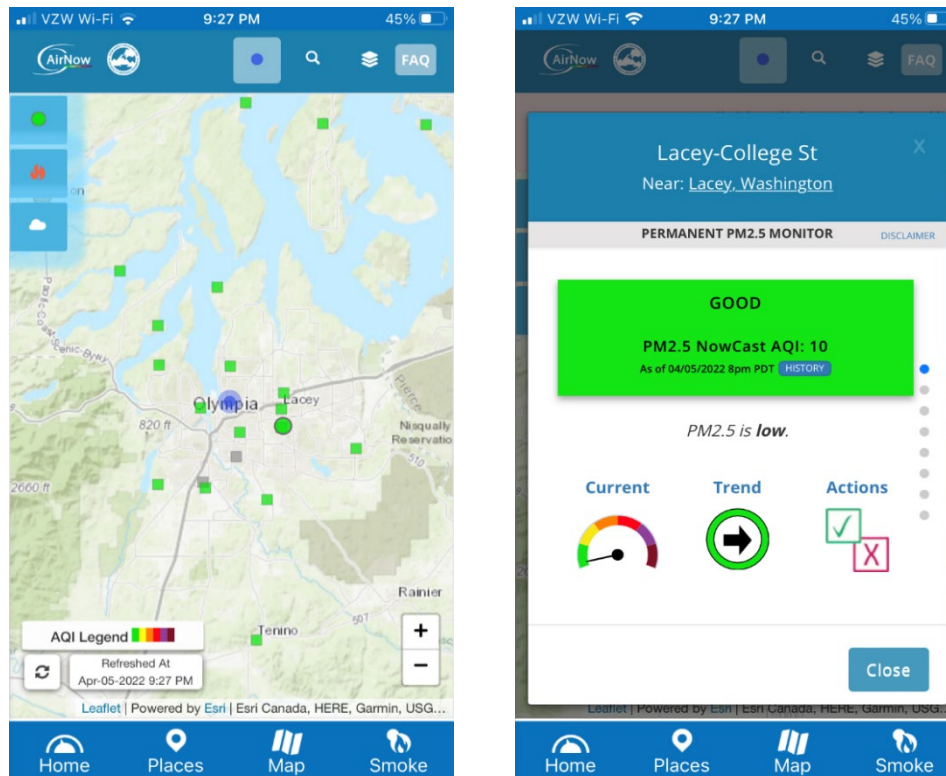
Figure 4. EPA's AirNow App home screen



For more detailed monitoring data, click the "Smoke" button in the bottom right corner of the app. This map shows the same display of agency monitors and air sensors visible on the Washington Smoke Blog map.

- Click the agency monitor or sensor closest to the area of interest.
- A pop-up will appear that indicates the PM_{2.5} AQI value, trend, and link to recommended health actions.

Figure 5. Accessing AQI values on EPA's AirNow App



Alternative Smartphone Forecast: Ecology Smoke Forecast Webpage

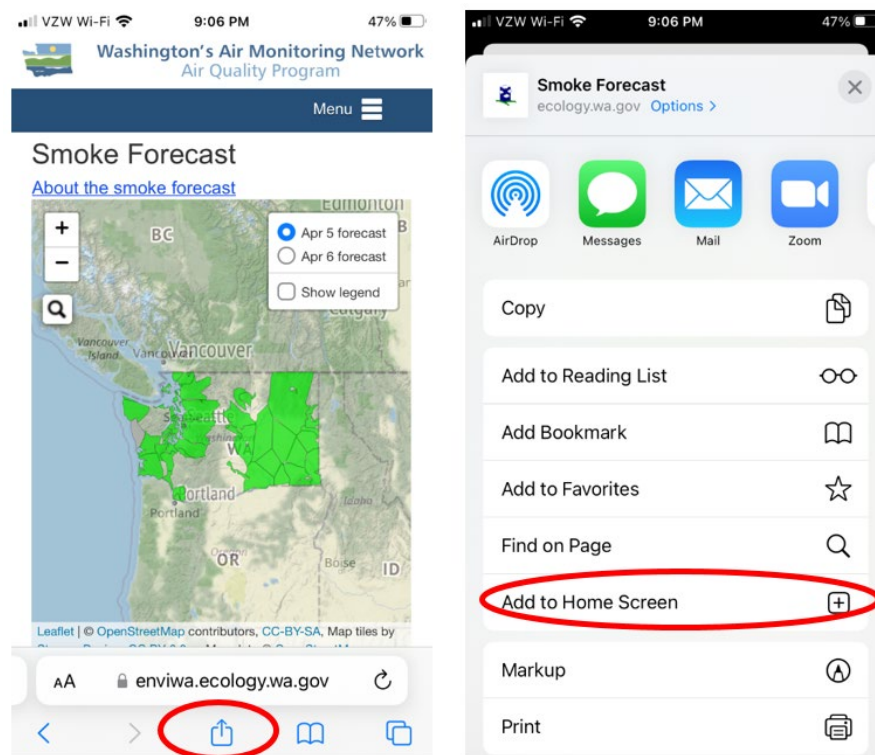
EPA's AirNow App does not provide forecasts in all areas of Washington. Ecology's smoke forecast webpage covers additional (though not all) areas. While Ecology's smoke forecast is not available in an app, a link to it can be saved as a home screen icon on a smartphone for easy app-like access.

To save the Ecology Smoke Forecast page as a home screen icon:

On an iPhone:

1. Open Safari and navigate to <https://enviwa.ecology.wa.gov/home/text/421#Forecast>
2. Click the "share button" (square with an arrow pointing up) and select "Add to Home Screen"
3. Select "Add". The smoke forecast page shortcut icon is now saved on the home screen.

Figure 6. Accessing Ecology's smoke forecast via smart phone



On an Android phone:

1. Open Chrome and navigate to <https://enviwa.ecology.wa.gov/home/text/421#Forecast>
2. Tap the menu icon (3 dots in the top right) and select "Add to home screen". The smoke forecast page shortcut icon is now saved on the home screen.

Other websites and apps

Current PM_{2.5} AQI values, trends and smoke forecasts are also available from other public agency websites and apps. The information from these resources and instructions for viewing the PM_{2.5} AQI are summarized in Table 1 below.

Table 1. Summary of websites and apps providing monitoring data and forecasts

Resource	Instructions for viewing PM _{2.5} AQI	Provides forecast?	Provides trend information?	Includes low-cost air sensor data?
Washington Smoke Blog Webpage	<ul style="list-style-type: none"> PM_{2.5} AQI is shown by default 	Yes, in most locations. Use “Select Forecast Date” slider.	Yes, see “Trend” link on each site’s popup.	Yes
Ecology’s Air Monitoring Network Webpage	<ul style="list-style-type: none"> Select “PM_{2.5}” button at the top of the page 	Yes, in most locations. See “Smoke Forecast” tab.	No	No
EPA Fire and Smoke Map Webpage	<ul style="list-style-type: none"> PM_{2.5} AQI is shown by default 	No	Yes, see “Trend” link on each site’s popup.	Yes
EPA AirNow Webpage	<ul style="list-style-type: none"> Default view shows combined ozone/PM_{2.5} AQI. Scroll down to “Current Air Quality” to see AQI for PM_{2.5} only. Click “Monitors Near Me” and check “Monitors” > “PM_{2.5}” in the top left to see the map of monitoring sites. 	Yes, only in some locations.	No	No
EPA AirNow App	<ul style="list-style-type: none"> Default view shows combined ozone/PM_{2.5} AQI. Click “Details” under AQI dial to see AQI for PM_{2.5} only. 	Yes, only in some locations.	Only on “Smoke” map, click “Smoke” in the bottom right	Yes, click “Smoke” in the bottom right
Ecology AirQualityWA App: (Apple iOS & Google/Android)	<ul style="list-style-type: none"> Click “Index General” in bottom left and select “PM_{2.5}” 	No, but forecast webpage can be saved as a home screen shortcut.	No	No
EPA SmokeSense App	<ul style="list-style-type: none"> See AQI value next to “Particle” under AQI dial 	Yes, only in some locations and only one day ahead. See “AQI Tomorrow” dial.	Yes, click “Fire & Smoke Near Me Map”	Yes, click “Fire & Smoke Near Me Map”

A number of private companies also provide AQI values and forecasts through websites and apps, including popular weather apps. While some pull this information from EPA, others use proprietary methods that are not always accurate or transparent, and some use AQI cut-points

incorrectly. The public agency websites and apps listed above are recommended over private or third-party websites and apps to ensure that users have the most accurate information on smoke conditions and forecasts.

Indoor PM_{2.5} Measurement in Schools

Low-cost PM_{2.5} sensors can provide helpful information about indoor air quality in making decisions about school closures and school activities. While sensor measurements are less accurate than those from agency monitors, there are no agency monitors indoors, and correction factors can sometimes be used to increase accuracy. If using a correction factor is not possible, do not directly compare uncorrected sensor data to AQI cut-points or PM_{2.5} action levels. Instead, use sensor data to check how different parts of the school compare to each other and how indoor PM_{2.5} levels compare to outdoor levels. When comparing indoors to outdoors, ensure both measures are uncorrected or using the same correction factors. Uncorrected sensor data can still indicate whether indoor concentrations are lower or higher than outdoor concentrations and whether some indoor spaces are cleaner than others.

Two strategies are helpful in evaluating indoor PM_{2.5} levels in schools during periods of wildfire smoke.

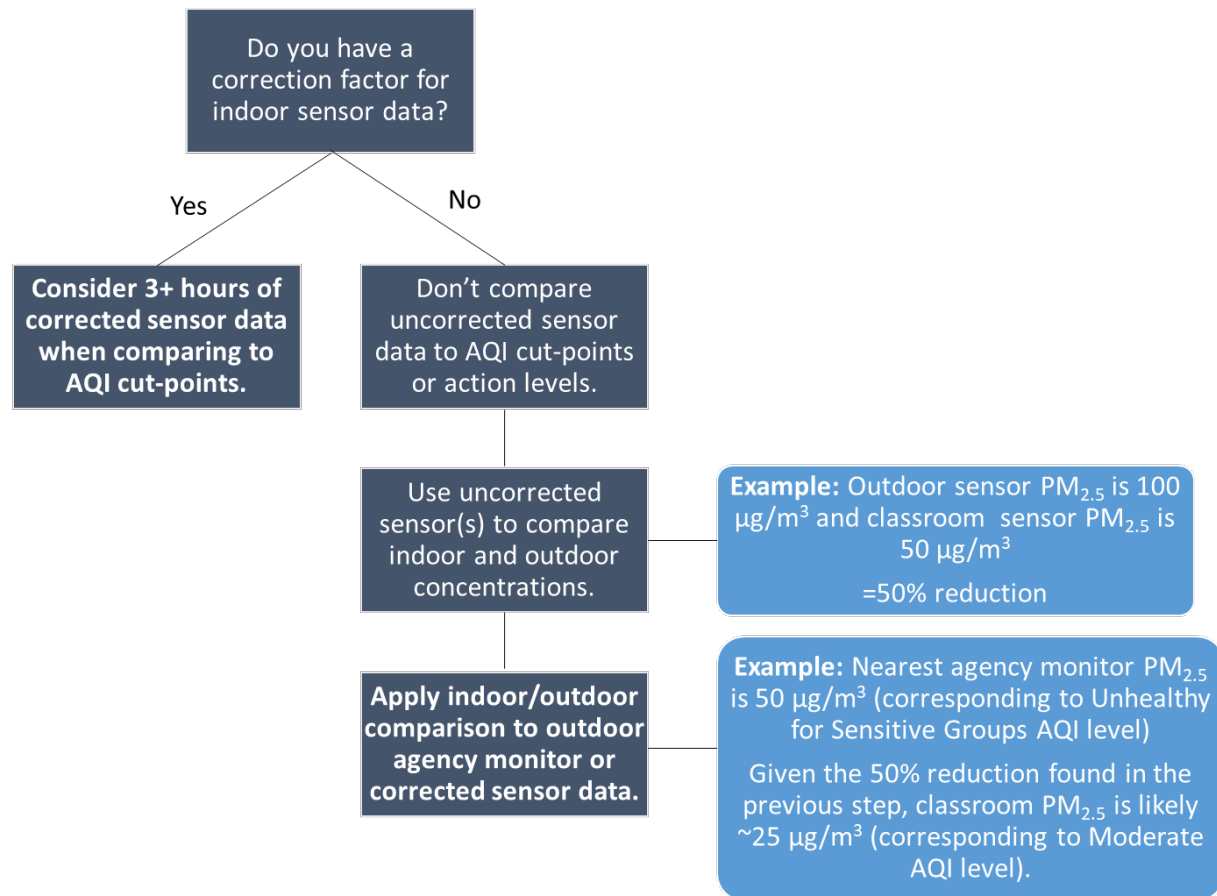
1. Assess variation in indoor air quality, ventilation, and filtration throughout the building(s) of the school:
 - Conduct a walk-around of the building(s) and outdoors using a portable sensor when outside PM_{2.5} levels reach “Unhealthy for Sensitive Groups”. Do this during times when the building is in use and ventilation is in normal operating conditions.
 - Select rooms where indoor air quality and ventilation, as well as children’s activity levels are expected to vary. Include rooms used by children that are expected to have worse ventilation or indoor air quality (like no air filtration), rooms where physical activity is usually more vigorous (like the gym), rooms where external doors are opened frequently, and any external buildings (like portables).
 - In each room and outdoors, let the sensor measurements stabilize, then estimate average measurements over 5-10 minutes.
 - Complete the walk-around while outside PM_{2.5} levels are stable, most likely best achieved by completing within a few hours.
 - Determine the relative difference across the building(s) compared to outside PM_{2.5} levels. For example, if the gym’s indoor PM_{2.5} level is 75 µg/m³ and the outdoor PM_{2.5} is 100 µg/m³, then there is a 25% reduction of outdoor air pollution in the gym. If a regular classroom’s indoor PM_{2.5} level is 50 µg/m³ and the outdoor PM_{2.5} is 100 µg/m³, then there is a 50% reduction of outdoor air pollution in the classroom. This suggests that the classroom would have cleaner air than the gym.

- Prioritize steps to reduce exposure in the rooms with highest PM_{2.5} levels or relocate children away from these rooms to cleaner air spaces if necessary.
- If possible, repeat the walk-around throughout the poor air quality or smoke event. Also repeat the walk-around as needed if outside PM_{2.5} levels increase or operating conditions change that would impact ventilation or indoor air quality. For example, if portable air cleaners are added, if windows cannot be kept closed, or if there are major changes in how the rooms are being used.

2. Track indoor air quality during wildfire smoke events:

- Place a stationary sensor in a room that is representative of the indoor air quality of the building(s) that has typical building use, and/or in a space with high physical activity levels or where students would go for indoor recess (like the gym). Avoid the cafeteria, where there are often sources of indoor PM_{2.5} from cooking.
- When outdoor PM_{2.5} levels reach “Unhealthy for Sensitive Groups”:
 - For school activities including games or practices, check the trend of indoor PM_{2.5} concentrations over time (i.e. whether smoke conditions are getting worse, getting better, or staying the same).
 - For decisions about school closures, check the one-hour averages of indoor PM_{2.5} concentrations over a period of 3 hours or more, and consider the forecast of outside PM_{2.5} for the day.
- Compare indoor stationary sensor measurements to outdoor stationary sensor measurements (ensure that either both are uncorrected or they have the same correction factor). Then apply this comparison to the nearest agency monitor. For example, if the indoor stationary sensor measurements are half of the outdoor stationary sensor measurements, assume that the indoor PM_{2.5} concentrations are half of what the agency monitor is reporting. If there is no outdoor stationary sensor, refer to the assessment from the walk-around (above) to determine the relative difference between the room with the indoor stationary sensor and outdoors (Figure 7). If there is no nearby agency monitor, consider installing a publicly reporting outdoor stationary sensor that could show up on [the EPA Fire and Smoke Map](#) with a correction factor applied.
- Refer to the assessment from the walk-around (above) to determine relative estimates of the PM_{2.5} levels in other rooms throughout the building(s) compared to the room with the indoor stationary sensor.
- Prioritize efforts on reducing PM_{2.5} levels in the rooms with highest levels or relocate children away from these rooms to cleaner air spaces if necessary.

Figure 7. Decision tree for comparison of sensor measurements to determine indoor PM_{2.5} concentrations



Check the performance evaluations developed by [South Coast AQMD](#) when selecting low-cost PM_{2.5} sensors. A Field R² value near 1 and a relatively low Field MAE indicate a better-performing sensor, though even data from better-performing sensors may still need a correction factor applied to correct bias. Note that EPA's Fire and Smoke Map displays publicly-reporting outdoor sensors (such as Purple Air) with a correction factor applied. The Fire and Smoke Map does not show indoor sensors. If you are comparing indoor and outdoor measurements from sensors such as Purple Air, make sure you are comparing uncorrected indoor data to uncorrected outdoor data, or that the two are using the same correction factor. If you're not sure whether indoor PM_{2.5} levels are lower than outside, assume levels are similar and take precautionary steps to reduce exposures. For technical assistance with indoor sensor measurements, contact: airquality@doh.wa.gov.

Other sources of PM_{2.5} air pollution in Washington

Major sources of PM_{2.5} in Washington are wildfire, dust from tilling and harvesting, agricultural and silvicultural burning, and residential wood burning. Industrial and mobile sources also emit

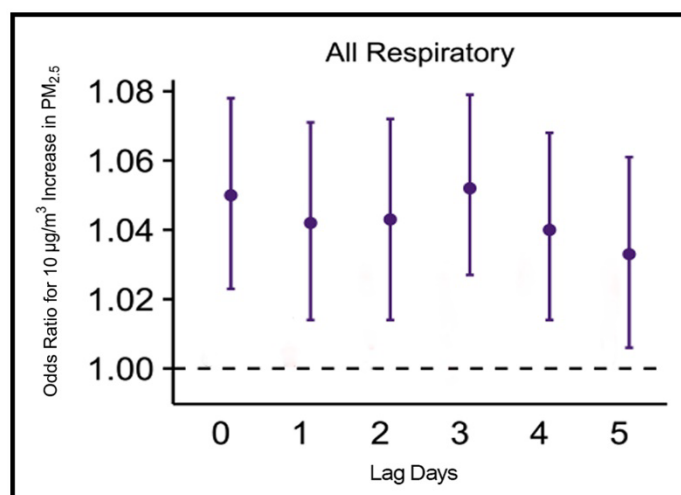
PM_{2.5}, though in smaller amounts than these other sources. While there is concern about PM_{2.5} from each of these sources of pollution, the chemical compositions can differ, and this can affect toxicity. There are also different seasonal patterns. For example, residential wood burning generally occurs over several months and contributes to routinely high PM_{2.5} concentrations, particularly during cold and stagnant weather. In contrast, wildfire smoke tends to last for a few weeks and the PM_{2.5} concentrations can have very high daily peaks. Some of the highest acute exposures to air pollution in Washington are from wildfire smoke.

Health Concern of Smoke Exposures

Exposure to wildfire smoke, like all smoke, can cause health problems. Minor symptoms include burning eyes, runny nose, coughing and headaches. More life-threatening effects include asthma attacks, COPD flare-ups, abnormal heart rhythms, heart attacks, and strokes. Several epidemiologic studies focusing on health impacts of wildfire smoke have been published recently, with just a few specific to Washington.

A 2012 study of Washington wildfire smoke impacts found that for a 10 µg/m³ increase in PM_{2.5} from wildfire smoke there is a 5% increased risk in same-day respiratory hospitalizations (odds ratio 1.052, 95% confidence interval 1.025-1.080) (Figure 8) [1]. The study found that, when focusing on specific respiratory impacts, there is an 8% increased risk for same-day asthma-related admissions for a 10 µg/m³ increase in PM_{2.5} from wildfire smoke (odds ratio 1.076, 95% confidence interval 1.019-1.136) [1].

Figure 8. Hospital or urgent care admissions--wildfire smoke



Emergency department or urgent care admissions associated with wildfire smoke exposures for a 10 µg/m³ increase in PM_{2.5} from wildfire smoke in Washington in 2012. Includes lag analysis (0-5 days).

Figure adapted from Gan et al. 2017; results limited to GWR estimation of smoke [1]

The Department of Health (Health) collaborated with several local health jurisdictions in central Washington to examine emergency department and outpatient clinic visits during 2012

wildfires. Health found that average daily patient visits were 28% higher for cardiovascular disease and 18% higher for respiratory disease during wildfires, compared to the two-week period before wildfires [2]. The increased daily patient visits were most pronounced for respiratory disease in children [2].

A University of Washington study in collaboration with the Departments of Ecology and Health investigated mortality and wildfire smoke in Washington from 2006-2017 [3]. The risk of dying from all non-traumatic deaths (i.e. not including accidents) was found to increase 2% the day after wildfire smoke compared to days without wildfire smoke. The increase remained two days after the smoke but was no longer statistically significant. As a sub-analysis, the risk of dying on the day of wildfire smoke was generally higher when focusing on respiratory causes of death.

Sensitive populations have increased risk for experiencing adverse health effects when smoke levels are elevated. Sensitive populations include people with heart and lung diseases, people with respiratory infections, people with diabetes, people 18 and younger or older than 65, pregnant people, outdoor workers, people of color, tribal and indigenous people, and people with low-income. For wildfire smoke and other air pollution exposures, a smaller portion of the population will suffer from the most severe health impacts, such as death and hospitalizations, and a larger portion of the population will suffer subclinical effects. The most severe impacts first occur in sensitive populations. However, as wildfire smoke exposures increase, more of the public will start to experience these severe impacts (Figure 9).

Figure 9. Range of health effects from wildfire smoke exposure

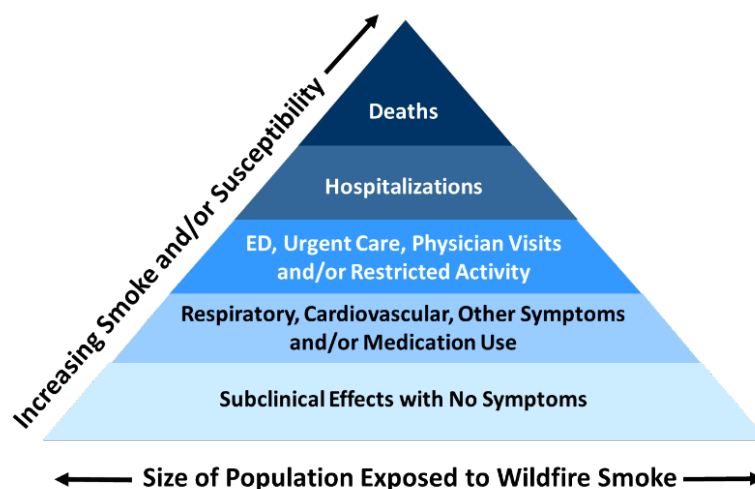


Figure adapted from Cascio 2018 [4]

Most epidemiologic research of wildfire smoke focuses on acute health effects that occur within a week of elevated 24-hour PM_{2.5} exposures. There is minimal research about long-term health effects of wildfire smoke exposure [5]. There is some evidence that most

people recover from exposures to wildfire smoke within weeks. Studies of wildland firefighters found that forced expiratory capacity in one-second (FEV1) declines over a firefighting season and returns to baseline within months [5]. In general, particle clearance from lungs of healthy people is nearly complete after several weeks. Clearance takes longer in people with progressive lung diseases [6, 7]. The amount of time it takes for particles to clear the body is relatively long compared to most wildfire smoke episodes in the Pacific Northwest. Most people will likely recover a few weeks after inhalation of wildfire smoke. However, there may be some residual physical damage.

There is a much larger body of published research about PM_{2.5} exposures from other sources of air pollution beyond wildfire smoke, and outside of Washington. Meta-analyses combining the results of several studies demonstrate that short-term increases in PM_{2.5} from a wide range of sources are associated with higher rates of deaths and hospitalizations [8, 9]. Many of these deaths and hospitalizations are due to cardiovascular and respiratory effects. Increased cardiovascular hospitalizations include congestive heart failure and ischemic heart disease [10]. Underlying respiratory diseases that are worsened include asthma, chronic obstructive pulmonary disease (COPD) and pneumonia [10]. In adults and children, research indicates that elevated exposures to PM_{2.5} leads to poor lung function [11, 12]. Exposure to PM_{2.5} in children may not only worsen asthma, but may lead to development of asthma [13]. While worsening heart and lung effects from PM exposure have been studied the most, there is increasing evidence that PM_{2.5} may also lead to several other effects, such as strokes [14], development of type 2 diabetes [15, 16], neurological and cognitive impairment [17, 18], and poor birth outcomes like pre-term delivery or babies born with low birth weight [19, 20]. While there is less research about these impacts specific to wildfire smoke PM_{2.5} exposures, the pattern of impacts appears similar to that of PM_{2.5} from other sources.

Summary Guidance

- [Summary Wildfire Smoke Guidance for Closing Schools](#)
- [Summary Wildfire Smoke Guidance for Canceling Outdoor Events or Activities](#)

Air Quality and Public Health Guidance Resources

Figure 10. [Washington Guide for Public Health Actions for Wildfire Smoke](#)

Washington Guide for Public Health Actions for Wildfire Smoke

This guide is designed for air quality, public health, and other officials making local decisions.



Air Quality Index	Recommended Public Health Actions Check current and forecast air quality at enviwa.ecology.wa.gov
Good (0-50)	<p>Prior to wildfire season:</p> <ul style="list-style-type: none"> Coordinate a local plan for public health actions and distribute preparedness information to the public. Identify indoor spaces where individuals will seek cleaner air during wildfire smoke events and develop plans to protect indoor air quality, including filtration. <ul style="list-style-type: none"> Indoor spaces used by sensitive groups, such as schools, child care facilities, and long-term care facilities. Community cleaner air settings, such as libraries. Temporary cleaner air shelters. <p>During wildfire season:</p> <ul style="list-style-type: none"> Monitor wildfires, smoke forecasts, and air quality at WA Smoke Blog. If forecasts predict smoke in your area, review the Washington Wildfire Response document for Severe Smoke Episodes and the Wildfire Smoke Guide for Public Health Officials.
Moderate (51-100)	<p>Above recommendations, plus:</p> <ul style="list-style-type: none"> Distribute health information to the public, including steps to take with health advisory categories Washington Air Quality Guide for Particle Pollution. <ul style="list-style-type: none"> Refer to the WA Smoke Blog for information about wildfires, smoke forecasts, and air quality. Identify and focus outreach efforts for sensitive groups. Coordinate with public health partners to follow recommended public health actions. Recommend following the Washington Air Quality Guide for School and Child Care Activities. For outdoor workers, start following WA Department of Labor and Industries' requirements.
Unhealthy for Sensitive Groups (101-150)	<p>Above recommendations, plus:</p> <ul style="list-style-type: none"> Recommend sensitive groups take steps to reduce exposure (limit time outside, avoid strenuous outdoor activity, and follow tips for cleaner indoor air). Recommend sensitive groups spend time in a cleaner air setting in the community, such as a library, if they cannot maintain cleaner air at home. Cancel children's outdoor athletic events and practices or move them to an area with safe air quality, either indoors or at a different outside location: Washington Air Quality Guide for School Activities. For an extended duration of smoke, consider opening a cleaner air shelter for sensitive groups.
Unhealthy (151-200)	<p>Above recommendations, plus:</p> <ul style="list-style-type: none"> Recommend everyone take steps to reduce exposure (limit time outside, avoid strenuous outdoor activity, and follow tips for cleaner indoor air). Recommend everyone spend time in an identified cleaner air setting in the community, such as a library, if they cannot maintain cleaner air in their residence. Consider canceling outdoor public events and activities: Wildfire Smoke Guidance for Canceling Outdoor Events or Activities and Closing Schools. For an extended duration of smoke, consider opening a cleaner air shelter for the public.
Very Unhealthy (201-300)	<p>Above recommendations, plus:</p> <ul style="list-style-type: none"> Strongly recommend everyone take steps to reduce exposure (stay inside and filter indoor air to keep it cleaner; go elsewhere for cleaner air if needed and possible). Cancel outdoor public events and activities: Wildfire Smoke Guidance for Canceling Outdoor Events or Activities and Closing Schools. If school is in session, discuss school closure with administrators if indoor air cannot be kept lower than PM_{2.5} 150.5 µg/m³ (AQI value of 201): Wildfire Smoke Guidance for Canceling Outdoor Events or Activities and Closing Schools. Distribute NIOSH-approved particulate respirators, such as N95 masks, as available, for limited use outside. Include training material for proper fit and use. For an extended duration of smoke, consider recommending that sensitive groups voluntarily relocate to an unimpacted area.
Hazardous (>300)	<p>Above recommendations, plus:</p> <ul style="list-style-type: none"> For an extended duration of smoke, consider recommending that everyone voluntarily relocate to an unimpacted area.

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Figure 11. [Washington Air Quality Guide for Particle Pollution](#)

Washington Air Quality Guide for Particle Pollution

Check current and forecast conditions at enviwa.ecology.wa.gov

Vehicle exhaust, woodstove emissions, industrial emissions, wildfire smoke, windblown dust, and other sources contain fine particles with diameters 2.5 micrometers or smaller (PM_{2.5}) that can be dangerous to your health.

The Air Quality Index (AQI) reports the level of air quality and health concern across six categories:

Air Quality Index	What Should I Do?	Know the symptoms! Burning eyes Coughing Throat and nose irritation Headaches Fatigue Wheezing and shortness of breath Irregular heartbeat Chest pain  If your symptoms become serious, seek medical attention. High exposure to PM_{2.5} can lead to hospitalizations and increase the risk of death.
Good 0–50	 It's a great day to be active outside and a good time to make a plan if worse air quality is in the forecast.	
Moderate 51–100	 Some people are especially sensitive to lower levels of particle pollution and should reduce exposure. For example, limit time outside and avoid strenuous outdoor activity. All sensitive groups should watch for symptoms.	
Unhealthy for Sensitive Groups 101–150	 Sensitive groups should take steps to reduce exposure. Limit time outside, avoid strenuous outdoor activity, and follow tips for cleaner indoor air. Everyone should watch for symptoms as a sign to reduce exposure.	
Unhealthy 151–200	 Everyone should reduce exposure. Limit time outside, avoid strenuous outdoor activity, and follow tips for cleaner indoor air.	
Very Unhealthy 201–300	 Everyone should reduce exposure. Stay inside and filter indoor air to keep it cleaner. Go elsewhere for cleaner air, if needed.	
Hazardous >300	 Everyone should reduce exposure. Stay inside and filter indoor air to keep it cleaner. Go elsewhere for cleaner air, if needed.	

See back page for steps to reduce exposure and a list of sensitive groups with increased risk.

For information on wildfire smoke and protecting health, go to doh.wa.gov/smokefromfires.

For information on wildfire smoke and outdoor worker safety, see [WA State Department of Labor and Industries requirements](#).

Steps to Reduce Exposure



Limit duration and intensity of outside physical activity.



Stay inside with cleaner indoor air:



Close windows and doors, unless it is too hot to maintain safe temperatures.



Don't add to indoor air pollution, such as cigarette smoking or burning candles.



Filter indoor air through an HVAC system, HEPA portable air cleaner, or DIY box fan filter.



Set air conditioning to recirculate.



If unable to maintain clean air at home, go elsewhere for cleaner air such as a friend's place, public space, or unimpacted area.



If you must be outside, wear a properly fitted, NIOSH-approved particulate respirator, such as an N95 mask.



Sensitive Groups with Increased Risk

- › People with health conditions
 - » Lung diseases, such as asthma and COPD
 - » Heart diseases
 - » Respiratory illnesses
 - » Diabetes
- › People 18 and younger or older than 65
- › Pregnant people
- › Outdoor workers
- › People of color
- › Tribal and indigenous people
- › People with low income



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For information on wildfire smoke and protecting health, go to doh.wa.gov/smokefromfires.

For information on wildfire smoke and outdoor worker safety, see [WA State Department of Labor and Industries requirements](#).

Figure 12. Washington Air Quality Guide for School & Child Care Activities

Washington Air Quality Guide for School & Child Care Activities

Vehicle exhaust, woodstove emissions, industrial emissions, wildfire smoke, windblown dust, and other sources contain fine particle pollution (PM2.5) that can seriously affect children's health. The following public health recommendations to protect children from PM2.5 are designed for school activities and can be applied to child care, before/after school programs, camp, and sports programs for children (18 years and younger) by considering the duration of outdoor activities.

Outside Air Quality Index: PM2.5					
Check current and forecast air quality at enviwa.ecology.wa.gov					
	Good (0-50)	Moderate (51-100)	Unhealthy for Sensitive Groups (101-150)	Unhealthy (151-200)	Very Unhealthy/ Hazardous (>200)
Recess (15 minutes)	No restrictions.	Allow children with health conditions (see below*) to stay indoors.	Keep children with health conditions indoors. Keep activity levels light for these children unless indoor PM2.5 levels are below 35.5 µg/m³ (see following page).	Keep all children indoors. Keep activity levels light unless indoor PM2.5 levels are below 35.5 µg/m³.	Keep all children indoors. Keep activity levels light unless indoor air is filtered, and indoor PM2.5 levels are below 35.5 µg/m³.
P.E. (1 hour)	No restrictions.	Allow children with health conditions to stay indoors and monitor symptoms for those who participate. Increase rest periods for these children as needed.	Keep children with health conditions indoors. Keep activities light for these children unless indoor PM2.5 levels are below 35.5 µg/m³. For others, limit to light outdoor activities. Allow any children to stay indoors if they do not want to go	Keep all children indoors. Keep activity levels light unless indoor PM2.5 levels are below 35.5 µg/m³.	Keep all children indoors. Keep activity levels light unless indoor air is filtered, and indoor PM2.5 levels are below 35.5 µg/m³.
Athletic Events and Practices (Vigorous activity 2-3 hours)	No restrictions.	Allow children with health conditions to opt out and monitor symptoms for those who join. Increase rest periods for these children.	Cancel children's outdoor athletic events and practices or move them to an area with safer air quality, either indoors or to a different location.	Cancel children's outdoor athletic events and practices or move them to an area with safer air quality, either indoors or to a different location. Consider time spent in poor air quality during transit before relocating.	Cancel children's outdoor athletic events and practices or move them to an area with safer air quality, either indoors with filtered air or to a different location. Consider time spent in poor air quality during transit before relocating.

**Health conditions include asthma and other lung disease, respiratory infection, heart disease, and diabetes. See the following page for more details about children's health, improving indoor air quality, and steps to reduce exposure.*

To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.

Health	Children are more sensitive to health effects from breathing in PM2.5 because their lungs are still developing, and they breathe in more air than adults for their body weight. Children with health conditions, such as asthma, have an even higher risk of health effects, including asthma attacks. Adult staff and volunteers may also be sensitive to air pollution, see WA Air Quality Guide for Particle Pollution . Symptoms from PM2.5 exposure range from minor to severe and include burning eyes, coughing, throat and nose irritation, fatigue, headache, wheezing, and shortness of breath. For children with asthma, follow their Asthma Action Plans . If symptoms become serious, seek medical attention.
Reducing Exposures	As PM2.5 pollution increases, each step is increasingly important to protect health: limit duration and intensity of outside physical activity and stay indoors and keep indoor air clean. Consider a child's total exposures throughout the day such as during transportation and longer duration activities like overnight camp. When it is not possible to stay indoors with cleaner air, consider N95 or other particulate respirators as a last option for limited use outside. Effective use requires proper selection, size and fit. See Western States PEHSU guidance on respirator use by children.
Physical Activity	CDC recommends children exercise 60 minutes or more every day. Doing so safely when PM2.5 levels are high, especially for days or weeks, requires precautions, such as limiting activity levels. People breathe deeper and take more air into their lungs when exercising. <ul style="list-style-type: none"> • Light Activities: Playing board games, playing catch, and stacking blocks • Moderate Activities: Yoga, shooting basketballs, dance instruction, and table tennis • Vigorous Activities: Running, jogging, basketball, football, soccer, swimming, and jumping rope
Improving Indoor Air Quality	Outside PM2.5 gets indoors through windows, doors, small openings, and some ventilation systems. Buildings with well-maintained and enhanced filtration (i.e. MERV 13) in the ventilation system have improved indoor air quality. Supplementing with properly sized, CARB-Certified HEPA portable air cleaners or DIY box fan filters can reduce PM2.5 in single rooms. Extreme heat can overlap with wildfire season. Establish building cooling resources in advance to help avoid opening windows when wildfire smoke increases PM2.5 levels. If you're not sure whether indoor PM2.5 levels are lower than outside, assume levels are similar and increase steps to reduce exposure, including filtration methods. See Improving IAQ and Ventilation in Schools During Wildfire Smoke Events and ASHRAE Protecting Building Occupants from Smoke .
Indoor Air Monitoring	Outdoor PM2.5 levels from the nearest agency monitor are updated hourly and daily forecasts are often available. Low-cost sensors can be used to take PM2.5 measurements indoors to check indoor air quality and outside when there is not a nearby agency monitor. However, they are generally less accurate than agency monitors. Correction factors can sometimes be used to increase accuracy. If using a correction factor is not possible, do not directly compare uncorrected sensor data to AQI cut-points or action levels. Compare indoor sensor measurements to outdoor sensor measurements (ensure that either both are uncorrected or they have the same correction factor). Then apply this comparison to the nearest agency monitor. For example, if the indoor sensor measurements are half of the outdoor sensor measurements, assume that the indoor PM _{2.5} concentrations are half of what the agency monitor is reporting. Assess variation across the building(s) using a portable sensor when outside PM2.5 levels have reached "Unhealthy for Sensitive Groups". Include measurements in rooms used by children that are expected to have worse ventilation or indoor air quality (like no air filtration), rooms where physical activity is usually more vigorous (like the gym), rooms where external doors are opened frequently, and any external buildings (like portables). Repeat the portable sensor measurements in different conditions, such as changes in occupancy. A stationary indoor sensor can be used to track changes in indoor air quality over longer time periods. Prioritize steps to reduce exposure in the rooms with highest PM2.5 levels. See "Indoor PM2.5 Measurements in Schools", Wildfire Smoke Guidance for Canceling Events or Activities and Closing Schools , for more information. For technical assistance with indoor measurements, contact: airquality@doh.wa.gov .
School Closures	School and facility closures may be the best option if you cannot maintain indoor PM2.5 at lower levels after considering alternatives, such as improving indoor air filtration and relocating children. School closures are the decision of the school district, usually in consultation with the local health department. See Summary Wildfire Smoke Guidance for Closing Schools .
More Resources	Air Quality Flag Program , Air Quality and Health , Smoke from Fires and Health , WA L&I's Worker Health and Smoke

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