

WA CHILDREN AND YOUTH ACTIVITIES GUIDE FOR AIR QUALITY

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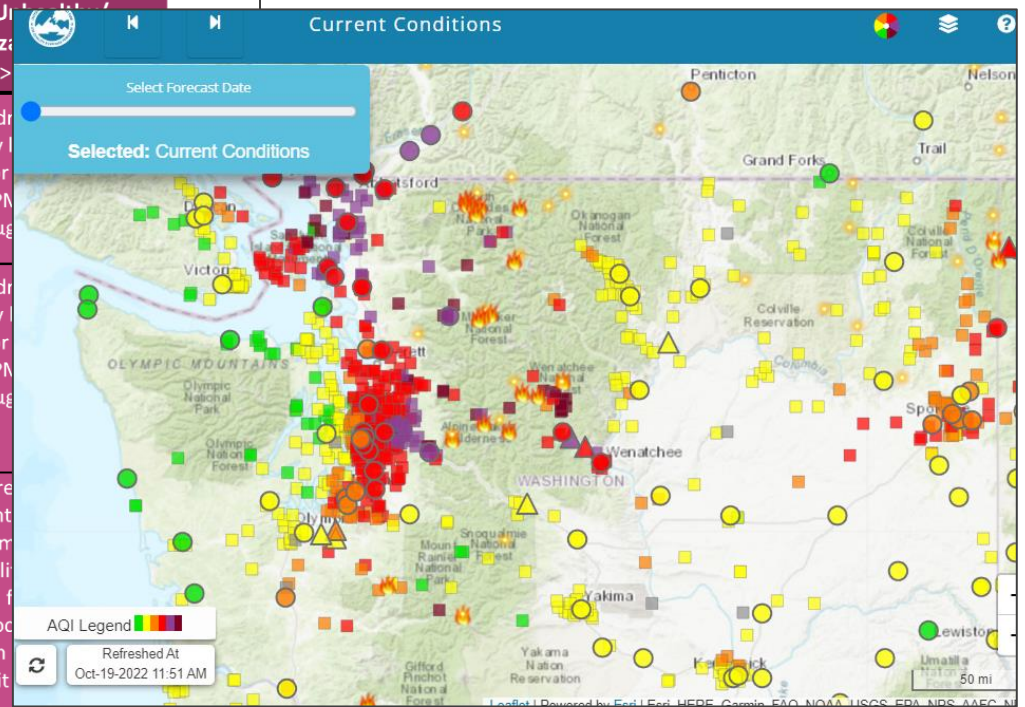
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Washington Air Quality Guide for School & Child Care Activities

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 enwiwa.ecology.wa.gov | | | | | |
| | Good (0-50) | Moderate (51-100) | Unhealthy for Sensitive Groups (101-150) | Unhealthy (151-200) | Very Unhealthy (201-300) |
| 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/m ³ (see following page). | Keep all children indoors. Keep activity levels light unless indoor PM2.5 levels are below 35.5 µg/m ³ . | Keep all children indoors. Keep activity levels light unless indoor PM2.5 levels are below 35.5 µg/m ³ . |
| 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/m ³ . 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/m ³ . | Keep all children indoors. Keep activity levels light unless indoor PM2.5 levels are below 35.5 µg/m ³ . |
| 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 or to a different location. Consider time spent in poor air quality during transit before relocating. |



Air quality on Wednesday,
October 19, 2022 at
11:51 AM

*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.

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2023 Engagement Process

1. Operational Engagement
 - Listening Sessions w/ school and child care partners, including WIAA (February-April)
2. Technical Engagement
 - Meeting with experts to discuss research & scientific evidence
3. Incorporate feedback into first draft
4. Internal review & discussion
5. Send draft to external partners for written input & review
6. Incorporate external feedback w/ more internal review and discussion
7. Process to publication (comms review, graphic design, leadership approval)

Technical Engagement

Impacts of PM2.5 Exposures in Children

- Findings with most evidence
 - Exacerbation of asthma
 - Asthma development
 - Respiratory infections
 - Reduced lung function development
- Growing evidence
 - IQ loss or declines in academic performance
 - Neurodevelopmental disorders
 - Pediatric cancers
 - Increased risks for adult chronic diseases
- Potential for lifelong consequences²

US asthma prevalence¹

- Children (<18 yrs): 5.8%
- Adults: 8.4%

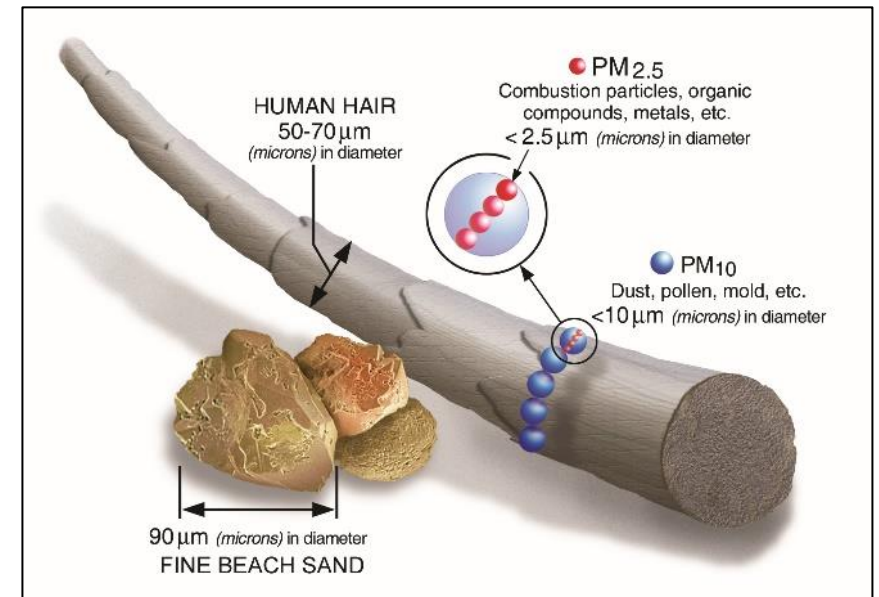


Image: US EPA.

Differences Between Children & Adults

- Inhalation rates of children higher than adults
- Respiratory system still developing until ~21 years
- Evidence of < nasal breathing in children → increase particles inhaled deeper

| Age Group | Inhalation Rate* Compared to Adults (21 to <61) |
|---------------|-------------------------------------------------------|
| Birth to <1 | 4.9 |
| 1 to <2 | 5.3 |
| 2 to <3 | 4.2 |
| 3 to <6 | 3.1 |
| 6 to <11 | 1.9 |
| 11 to <16 | 1.2 |
| 16 to <21 | 1.0 |
| Avg 21 to <61 | 1.0 |

*Inhalation rate measured as m³/kg/day

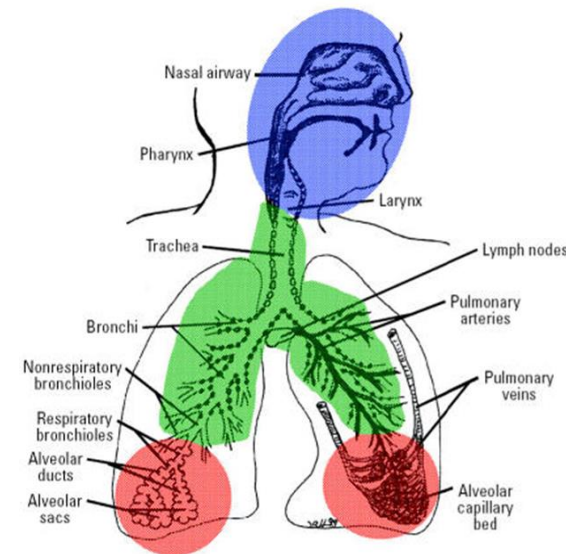


Image: Oberdörster et al. Env Health Perspectives. 113 (7): 2005.

Physical Activity Increases Breathing Rate

Children 1 to <16:

| Compared to Sedentary: | Inhalation Increases: |
|-------------------------------|------------------------------|
| Light Intensity | ~2.5X |
| Moderate Intensity | ~4.5X |
| High Intensity | ~8.5X |

- Similar trend for all age groups, including adults
- **Increased Breathing Rate → Increased inhalation of PM2.5**

Source: US EPA. Exposure Factor Handbook, Chpt 6: Inhalation Rates. Table 6-2. Sept 2011.

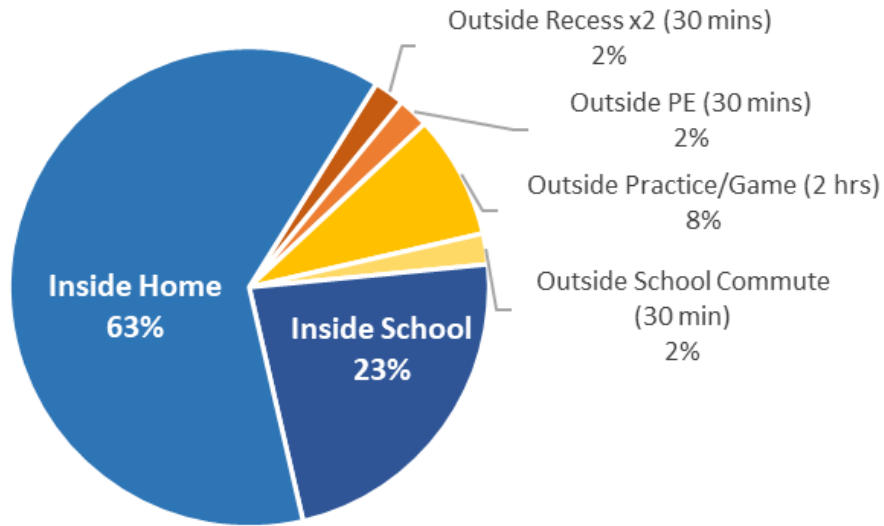
Physical Activity Levels

| Sedentary | Light Activities | Moderate Activities | Vigorous Activities |
|---------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| No activity | Little physical effort that doesn't make you breathe harder than normal | Moderate physical effort that makes you breathe somewhat harder than normal | Hard physical effort that makes you breathe much harder than normal |
| Examples: Sleeping, napping | Examples: Playing board games, throwing and catching while standing, block stacking | Examples: Yoga, shooting basketballs, dance instruction, ping pong | Examples: Running, jogging, basketball, football, soccer, swimming, cheerleading, jumping rope |

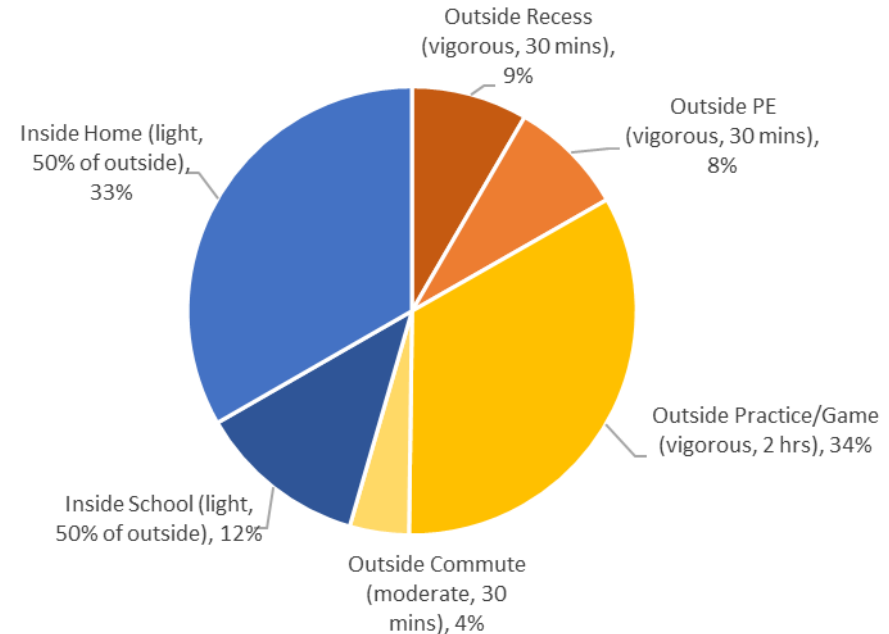
Source: Children's Health & Wildfire Smoke Exposure Workshop, Workshop Recommendations. Jan 24, 2022.
CDC Examples of Intensity Levels: https://www.cdc.gov/nccdphp/dnpa/physical/pdf/pa_intensity_table_2_1.pdf

Where are children exposed to PM2.5?

Example: Time Indoors & Outdoors



Example: Exposures with Activities, Outside "Unhealthy for Sensitive Groups"



Depends on many factors: level of outdoor PM2.5, age, activity intensity level, amount of time indoors/outdoors and infiltration indoors.

Even short durations of high intensity activity outdoors during poor air quality can significantly elevate daily exposure for children.

Operational Engagement

Who did we engage with?

- LHJ school group
- School Nurses
- Washington State Department of Children, Youth, & Families
- Washington Interscholastic Activities Association
- Association of Washington School Principals
- Risk management Groups
- Wildfire Smoke Impacts Advisory Group

Key Themes from Listening Sessions

- Be specific & clear: reduce gaps & vagueness
- Make more generalizable to children's activities beyond school
- Tension around recommendation to move or cancel games & practices at "Unhealthy for Sensitive Groups" (orange)
- Keep 2-pager format as quick information for making decisions
- Include more information about monitoring, forecasts and using low-cost sensors

Feedback & Ways Addressed in Proposed Draft

Clear & easy, gaps in the exposure duration are challenging

- Closed the gap in time between recommendations
- Combined the top two rows to address up to an hour
- Combined the unhealthy with very unhealthy/hazardous column

Adaptable for additional activities and the term “children” is unclear

- Shifted focusing in rows on activity duration (rather than activity, like PE)
- Added row for activities >4 hrs to get at all-day/overnight camp and others longer activities
- Included “youth” every time we indicate “children”
- Add more fall sports & relevant examples to list of activities (including child care and younger kids)

2-pager for immediate decisions & sharing, but more detail still helpful

- Kept 2-pager, added more detailed below in appendix
- Wanted additional information on low-cost sensors – created an appendix

Disagreement about level for canceling/moving games & practices

- There’s a lot on the line when canceling events (mental & social impacts)
- Now a 1-4 hour category (instead of just 1 hr from combination above)
- Maintained in “Unhealthy for Sensitive Groups” but left flexibility for local decision making

Washington Children and Youth Activities Guide for Air Quality



The following public health recommendations are to protect children and youth (18 years and younger) from fine particle air pollution (PM2.5). Apply this guide to school, child care, athletic practices and games, before and after school programs, camps, field trips, and other outdoor programming and activities.

Check current and forecast air quality at AirNow.gov or during wildfire smoke at wasmoke.blogspot.com
(See Appendix A)

Outside Air Quality Index (AQI): PM2.5

| Activity Duration | Good (0-50 AQI) | Moderate (51-100 AQI) | Unhealthy for Sensitive Groups (101-150 AQI) | Unhealthy, Very Unhealthy, or Hazardous (≥151 AQI) |
|---------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 mins to 1 hour (e.g., recess, PE, classes typically held outside) | No restrictions. | Allow children and youth with health conditions to opt out or stay indoors. Limit intensity of activities for these children and youth if needed. | Limit to moderate intensity activities outside. For children and youth with health conditions, further limit intensity or move to an area with safer air quality if needed. | Cancel outdoor activity or move to an area with safer air quality, either indoors with filtered air or to a different location. Limit to light intensity activities indoors if indoor PM2.5 levels are elevated. |
| 1-4 hours (e.g., athletic events and practices) | No restrictions. | Allow children and youth with health conditions to opt out or stay indoors. Limit intensity of activities for these children & youth if needed. | Limit to light intensity activities or to a 1-hour total duration with moderate intensity activities. If intensity level and time cannot be modified, consider canceling outdoor activity or move to an area with safer air quality, either indoors or to a different location. For children & youth with health conditions, further limit time or intensity if needed. | Cancel outdoor activity or move to an area with safer air quality, either indoors with filtered air or to a different location. Limit to light intensity activities indoors if indoor PM2.5 levels are elevated. |
| > 4 hours (e.g., outdoor school or programming, day camp, overnight camp) | No restrictions. | Move children and youth with health conditions to an area with safer air quality, either indoors or to a different location if needed. Allow children and youth without health conditions to opt out or stay indoors and limit intensity of activities. | Limit to light intensity activities and under 4-hr total duration. If intensity level and time cannot be modified, cancel outdoor activity, or move it to an area with safer air quality, either indoors or to a different location. For children and youth with health conditions, further limit time or intensity if needed. | Cancel outdoor activity or move to an area with safer air quality, either indoors with filtered air or to a different location. Limit to light intensity activities indoors if indoor PM2.5 levels are elevated. |

ADDITIONAL CONSIDERATIONS

Close windows and doors when activities are moved indoors. Pay attention to heat.

Indoor air filtration can reduce elevated levels of indoor PM2.5. See Appendix C. To measure indoor PM2.5 levels, see Appendix B.

Consider time spent in transit in activity duration.

All children and youth 18 and younger are considered a sensitive group. Health conditions include but are not limited to asthma and other lung disease, heart disease, diabetes, and respiratory infection (e.g., RSV and pneumonia).

| | |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sources of PM2.5 | The primary sources of PM2.5 are typically wildfire smoke during warmer months and smoke from home heating during colder months, though this varies by location. Other sources include vehicle exhaust, industrial emissions, and prescribed burning. |
| Children's Health & Increased Risk | Children and youth are more sensitive to health effects from breathing in PM2.5 because they breathe in more air than adults for their body weight. This increases their total dose of air pollution. The respiratory system also develops until about age 21. Children and youth with health conditions (including asthma and other lung diseases, heart disease, and diabetes) have a higher risk of emergency department visits and hospitalizations compared to children without health conditions. Children and youth may also be at risk for declines in academic performance, neurodevelopmental problems, and chronic conditions in adulthood. Children with asthma should follow their Asthma Action Plan . |
| Symptoms | Symptoms of PM2.5 exposure include burning eyes, coughing, throat and nose irritation, fatigue, headache, wheezing, and shortness of breath. Monitor symptoms. If symptoms become serious, seek medical attention. Symptoms can continue or appear in the week following exposure to PM2.5. |
| Physical Activity | CDC recommends children and youth 6-17 years old exercise an hour or more every day as an important part of health. WAC 110-300-0360(2)(c) requires minimum outdoor activity/active play in child care programs with an exception for extreme weather. Safe outdoor play when PM2.5 levels are high, especially for days or weeks, requires precautions. People breathe deeper and take more air into their lungs when exercising, thus taking in more air pollution. Children and youth's breathing rates increase over 2 times during light intensity physical activity, over 4 times during moderate intensity activity, and over 8 times during high intensity activity compared to being at rest. Intensity level is related to the exertion and varies individually, but as examples: <ul style="list-style-type: none"> » Light Intensity Activities: playing board games, playing catch, and stacking blocks » Moderate Intensity Activities: climbing on playground, dodgeball, four-square, golf, gymnastics, hopscotch, lightly riding a tricycle/bicycle, marching band, moderate or brisk walking, shooting basketballs, softball/baseball, table tennis, volleyball, weight training, and yoga » Vigorous Intensity Activities: aerobic dance, basketball, cheer, competitive swimming, football, jogging, jumping jacks, jump rope, karate, race walking, running, soccer, swimming, tennis, and vigorous bicycling For a more detailed list see CDC's guidance, "General Physical Activities Defined by Level of Intensity." |
| Reducing Exposures | As PM2.5 pollution increases, each action is increasingly important to protect health: limit duration and intensity of outside physical activity (e.g., increase rest periods), stay indoors when possible and keep indoor air clean. Consider a child's total exposure throughout the day and night, including time spent at school, home, and in transit. Walking, biking, or riding in a bus with windows opened is time outdoors. Some children may not have cleaner air at home. |
| Masks & Respirators | A NIOSH approved N95 or other particulate respirator can be an option when you have no other way to avoid wildfire smoke. NIOSH approved respirators do not come in suitable sizes for very young children and have not been tested for broad use in children. Effective use requires proper selection, size and fit. See Western States PEHSU guidance on respirator use by children. More NIOSH information here. |
| Air Quality Monitoring & Low-Cost Sensors | Outdoor Air Monitoring: Use air pollution forecasts and government agency monitors on AirNow.gov for non-wildfire smoke pollution. Use the Washington Smoke Blog for wildfire smoke. The Smoke Blog includes low-cost sensors and has the most relevant forecasts for Washington wildfire smoke. See Appendix A. Indoor Air Monitoring: Indoor low-cost sensors can be used for indoor activities. Do not compare uncorrected sensor data to the AQI. Compare sensor data in locations throughout the facility and indoors vs outdoors. See Appendix B. |
| Indoor Air Quality | During high levels of PM2.5 or extended durations of poor air quality, taking steps to improve indoor air quality is extra important because PM2.5 will seep into buildings. If you're not sure whether indoor PM2.5 levels are lower than outside, assume levels are similar and increase steps to reduce exposure. Indoor air filtration (HVAC systems with enhanced filtration or HEPA portable air cleaners) can reduce indoor levels of PM2.5. Do not use air cleaners that produce ozone or have additive technology, such as ionization and plasma. See Appendix C. |
| Adult Staff & Volunteers | Adult staff and volunteers can be impacted by air pollution, see WA Air Quality Guide for Particle Pollution . For policies on outdoor workers during wildfire smoke, see WA L&I's Wildfire Smoke Workplace Safety & Health webpage . |
| School Closures | Consider school and facility closures if you cannot maintain indoor PM2.5 below 150.5 µg/m3 (AQI value of 201). See Summary Wildfire Smoke Guidance for Closing Schools , which includes factors to consider. |
| Resources | Websites: WA DOH's Air Quality and Health or Smoke from Fires and Health , EPA's Air Quality Flag Program . For technical assistance: airquality@doh.wa.gov . |

Appendix A: Outdoor Air Quality Monitoring for Decision Making During Wildfire Smoke Events

Wildfire smoke can fluctuate throughout the day, or it can linger and be stable. It makes it challenging to plan activities in advance. Forecasts and current measurements make decision making around canceling, modifying, delaying, or ending activities early. For long-term measurements throughout the day. When decisions need to be made several hours in advance, use forecasts for your area or in the area of interest. Forecasts are more accurate than current measurements at the time of the activity.

The Washington Smoke Blog (<https://wasmoke.blogspot.com>) is the best source of outdoor air quality information when making decisions about outdoor activities when there is wildfire smoke. Use a combination of forecasts and current measurements from agency monitors and/or outdoor low-cost air sensors, as described below. Your [regional clean air agency](#) may have additional information for your area.

For activities planned in advance, use forecasts for your area or in the area of interest. Forecasts are more accurate than current measurements at the time of the activity. Use forecasts for your area or in the area of interest. Forecasts are more accurate than current measurements at the time of the activity. Use forecasts for your area or in the area of interest. Forecasts are more accurate than current measurements at the time of the activity.



Appendix B: Indoor Air Quality Monitoring

A portable handheld sensor can show how indoor PM2.5 levels vary throughout a facility. A stationary indoor sensor can track changes in indoor air quality over longer periods. See [Wildfire Smoke Guidance for Canceling Events or Activities and Closing Schools](#) section "Indoor PM2.5 Measurement in Schools" for more information about using indoor sensor data for decisions that need to be made in advance. Use the information below for immediate decision-making.

If you don't have an indoor air sensor:

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. Using a low-cost sensor can give you a better idea of your indoor PM2.5 levels. If you're considering purchasing a low-cost PM2.5 sensor, check the performance evaluations developed by the [South Coast AQMD](#). A Field R-squared value near 1 and a relatively low Field MAE indicate a better-performing sensor.

Portable handheld sensor:

Portable handheld sensors are used to check indoor air quality. They are generally less expensive than stationary sensors. Several factors can be applied to reduce bias. Sensor measurements should be taken at a consistent time interval used for data averaging, and whether the sensor is calibrated. Data should be reported in $\mu\text{g}/\text{m}^3$ units. To the extent possible, only compare data from uncorrected sensor data to corrected sensor data or AQI (not longer-term averages). EPA provides a calculator to convert <https://www.airnow.gov/aqi/aqi-calculator>.

Appendix C: Improving Indoor Air Quality

During outside air pollution events, reducing additional air pollution as much as possible to reduce exposures is especially important. Limiting both outdoor activities, like vehicle idling, vehicle transit, and outdoor burning, as well as indoor activities, like vacuuming (without a HEPA filter) or burning candles, all help reduce exposure.

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 or higher) in the ventilation system have improved indoor air quality and should run the HVAC fan continuously. Supplementing with HEPA portable air cleaners or DIY box fan filters can reduce PM2.5 in single rooms. Use HEPA portable air cleaners that are [AHAM Verifide](#) to have a Clean Air Delivery Rate (CADR) indicating it is properly sized and [CARB-Certified](#) to generate little or no ozone. Do not use ozone generators, ionizers, UV or other additive technologies in air cleaners. See [Improving IAQ and Ventilation in Schools During Wildfire Smoke Events](#) and [ASHRAE Protecting Building Occupants from Smoke](#).

Unhealthy for Sensitive Groups at 1-4 hours

Unhealthy for Sensitive Groups

(101-150 AQI)

Limit to moderate intensity activities outside. For children and youth with health conditions, further limit intensity or move to an area with safer air quality if needed.

1-4 hours
(e.g., athletic events and practices)

Limit to light intensity activities or to a 1-hour total duration with moderate intensity activities. If intensity level and time cannot be modified, consider canceling outdoor activity or move to an area with safer air quality, either indoors or to a different location. For children & youth with health conditions, further limit time or intensity if needed.

We heard different interpretations of this section, including the following:

1. Limit to light intensity activities
2. Limit to a 1-hour total duration with moderate intensity activities
3. Move to an area with safer air quality, either indoors or a different location
4. If none of the above can happen, then cancel

FAQs: Washington Children and Youth Activities Guide for Air Quality



The [Washington Children and Youth Activities Guide for Air Quality](#) includes public health recommendations to provide best practices based on current research and expertise in air quality and pediatric health. It relies on the subject matter expertise of educational leaders and local public health to integrate our recommendations into the complexity of decision-making for children and youth activities. We designed this FAQ to help interpret the Washington Children and Youth Activities Guide for Air Quality; it is not meant to replace it.

1. To what children and youth activities does this guide apply?
2. What is the rationale for the recommendations in this guide?
3. What is different about children and youth compared to adults?
4. What does “consider canceling” mean in the Unhealthy for Sensitive Groups category for 1-4 hours of activity
5. What about indoor activities when outdoor PM2.5 levels are very high?



Q: What does “consider canceling” mean in the Unhealthy for Sensitive Groups category for 1-4 hours of activity?

The activity duration of 1-4 hours often encompasses athletic games, practices, and events. For 1-4 hour activities at the Unhealthy for Sensitive Groups level, the recommendation is to “consider canceling outdoor activity or move to an area with safer air quality”. At the Unhealthy for Sensitive Groups level, there are several factors to weigh when considering to cancel, including but not limited to:

- Can the decision be made at the time of the event, or does the decision need to be made well in advance?
- Are smoke conditions getting worse, getting better, or staying about the same?
- Can the event be postponed or rescheduled?
- Is the AQI closer to 101, or closer to 150?
- Is there an option to relocate to an area with cleaner air, either indoors or another outdoor location?
- Have steps been taken to reduce overall activity, duration, and intensity?
- How much or to what extent can individuals’ duration of vigorous intensity be reduced? Can breaks and substitutions be increased?
- Are there extenuating circumstances in determining whether an athletic practice or competition can be held? (E.g., required for eligibility, league competitions, post-season/state competition)
- Where will children and youth spend their time if activities are canceled? Is the air quality better there?
- While moving to another location, will children and youth be more exposed during transit than if they had remained indoors?
- Are there other options for safe physical activity when conditions are smoky?

Smoke from Fires Toolkit

[https://doh.wa.gov/
community-and-
environment/air-
quality/smoke-
fires/smoke-
wildfires-toolkit](https://doh.wa.gov/community-and-environment/air-quality/smoke-fires/smoke-wildfires-toolkit)

Health Resources

Washington Air Quality Guide for Particle Pollution: [English](#) / [Spanish](#) / [Arabic](#) / [Chinese Simplified](#) / [Chinese Traditional](#) / [Korean](#) / [Punjabi](#) / [Russian](#) / [Somali](#) / [Tagalog](#) / [Ukrainian](#) / [Vietnamese](#)

Washington Children and Youth Activities Guide for Air Quality: [English](#) / [Spanish](#) / [Somali](#) / [Russian](#)

- Youth Activities Guide FAQs: [English](#) / [Spanish](#) / [Somali](#) / [Russian](#)

Washington Guide for Public Health Actions for Wildfire Smoke: [English](#)

Wildfire Smoke Guidance for Canceling Outdoor Events or Activities and Closing Schools: [English](#)

- Summary Wildfire Smoke Guidance for Cancelling Outdoor Public Events or Activities: [English](#)
- Summary Wildfire Smoke Guidance for Closing Schools: [English](#)

DOH Recommendations for Wildfire Smoke and COVID-19: [English](#)

Washington State CEMP ESF 8 Attachment 1 to Appendix 5 - Wildfire Response - Severe Smoke Episodes: [English](#)

Wildfire Smoke: A Guide for Public Health Officials: [English](#)

Questions?

- Email feedback to airquality@doh.wa.gov

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