Webinars
Series of scientific webinars that provide a forum for discourse on scientific issues.
Live and On-Demand
Case Conferences
Journal Clubs
Grand Rounds
CE Available

Online Courses
Evidence-based online courses on a variety of children's environmental health topics.
Interactive and Self-Paced
CE Available

Resource Catalog
Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals
Topics included:
Air Quality, Pesticides, Natural Disasters, BPA, Mold, Lead, Mercury
Public Health Response to Wildfire Smoke

Julie Fox
Ambient Air Epidemiologist
Washington Department of Health
Wildfire Smoke Response Topics

- Basics of health impacts from wildfire smoke exposure
- Public health response & challenges
- Current workgroup activities to develop public health guidance
Audience Poll

Who is participating in this webinar?
Daily PM2.5 levels surge with wildfire smoke

August 20, 2018
## Particle Size

<table>
<thead>
<tr>
<th>Particle Type</th>
<th>Cut-Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM2.5</td>
<td>2.5 µm</td>
</tr>
<tr>
<td>PM10</td>
<td>10 µm</td>
</tr>
<tr>
<td>Respirable Fraction</td>
<td>4 µm</td>
</tr>
<tr>
<td>Total Dust</td>
<td>None, but generally &lt;100</td>
</tr>
</tbody>
</table>

Wildfire smoke particles are mostly smaller than 1 um in diameter.
Deposition of inhaled particles varies by particle size

Source: Oberdörster et al. Env Health Perspectives. 113 (7): 2005.
Deposition of inhaled particles varies by particle size

Source: Oberdörster et al. Env Health Perspectives. 113 (7): 2005.
Fewer people suffer the most severe impacts.

Figure Adapted from: Cascio et al. Sci Total Env. 624: 2018
Evidence of health impacts from wildfire smoke exposure

<table>
<thead>
<tr>
<th>Impact</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality</td>
<td>Strong</td>
</tr>
<tr>
<td>Increased hospitalizations</td>
<td>Strong</td>
</tr>
<tr>
<td>Worsening respiratory disease</td>
<td>Very Strong</td>
</tr>
<tr>
<td>• Asthma</td>
<td></td>
</tr>
<tr>
<td>• COPD</td>
<td></td>
</tr>
<tr>
<td>• Bronchitis</td>
<td></td>
</tr>
<tr>
<td>• Pneumonia</td>
<td></td>
</tr>
<tr>
<td>Worsening heart disease</td>
<td>Inconclusive but suggestive</td>
</tr>
<tr>
<td>Stroke</td>
<td>Growing evidence for PM2.5, little known for wildfire smoke</td>
</tr>
<tr>
<td>• Type II Diabetes</td>
<td></td>
</tr>
<tr>
<td>• Neurological and cognitive impairment</td>
<td></td>
</tr>
<tr>
<td>• Pre-term and low birthweight babies</td>
<td></td>
</tr>
<tr>
<td>• Others...</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Reid et al. Env Health Persp. 124 (9): 2016. Cascio et al. Sci Tot Env. 624: 2018
Minor to deadly responses

- Eye irritation
- Cough, wheeze
- Cardiovascular morbidities
- Respiratory morbidities
- Overall increased hospitalizations & deaths
Groups sensitive to smoke from fires

- People with Pre-Existing Diseases
  - Especially lung and heart diseases
- People with respiratory infections
- Children & Infants
- People 65 years and older
- Pregnant women & fetus

Growing evidence for other sensitive groups

**Large population sensitive to wildfire smoke**

<table>
<thead>
<tr>
<th>Sensitive Population</th>
<th>% of WA Population (2016 or 2017 data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt;18 years</td>
<td>24%</td>
</tr>
<tr>
<td>People 65+ years</td>
<td>15%</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease, Emphysema &amp; bronchitis</td>
<td>6%</td>
</tr>
<tr>
<td>Asthma</td>
<td>10%</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>12%*</td>
</tr>
</tbody>
</table>

* Percent in whole US population, not specific to WA

Wildfire smoke response guidance

ESF 8: Public Health, Medical and Mortuary Services

Appendix 5: Air Quality Response

Attach 1: Wildfire Response—Severe Smoke Episodes
DOH communication & outreach

- Work with partners
- Create materials
- Share resources
Have you addressed wildfire smoke and health impacts for your work?
Steps to protect health from smoke

1. Stay informed about air quality
   - Check the air quality hazard level

2. Limit exposure
   - Avoid strenuous outdoor activity
   - Limit time outdoors
   - Stay indoors

3. Keep indoor air clean
   - Keep windows and doors closed
   - Don’t contribute to poor air quality
   - Set AC on recirculate
   - Use an air cleaner with a HEPA filter

4. Pay attention to symptoms
   - Seek medical help if needed
Washington Air Quality Advisory (WAQA) vs. EPA’s Air Quality Index (AQI)

WAQA designed to be more health protective
Washington Air Quality Advisory:

- Good
  - Air pollution is so low so there is little health risk.
  - It’s a great day for everyone to enjoy the outdoors!

- Moderate
  - People with health conditions should limit spending any time outdoors & avoid strenuous outdoor activities.
  - They may begin to have worsened symptoms.

- Unhealthy for sensitive groups
  - All of the above &:
  - All sensitive groups should limit spending any time outdoors. People with health conditions may have worsened symptoms. Healthy people may start to have symptoms.

- Unhealthy for everyone
  - Everyone, especially sensitive groups, should limit time spent outdoors, avoid strenuous activities outdoors, & choose light indoor activities.

- Very unhealthy for everyone
  - Everyone should stay indoors, avoid all strenuous activity, close windows & doors if it’s not too hot, set your AC to recirculate, & use a HEPA air filter if possible.

- Hazardous for everyone
  - All of the above &:
  - People with heart or lung disease, or those who have had a stroke, should consult their healthcare provider about leaving the area & wearing a properly fitted respiratory mask if they must go outdoors. Follow burn bans and evacuation orders.

- Know the symptoms:
  - Watery or dry eyes
  - Coughing/wheezeing
  - Throat & sinus irritation
  - Phlegm
  - Shortness of breath
  - Headaches
  - Irregular heartbeat
  - Chest pain

If you are experiencing serious symptoms, seek immediate medical attention.

For more health information & how to choose the proper respiratory mask, visit doh.wa.gov/smokefromfire.
# Air Pollution and School Activities Guide

**Air Quality Conditions**

First, check local air conditions at [https://fortress.wa.gov/ecy/enviwa/](https://fortress.wa.gov/ecy/enviwa/) and then use this chart.

<table>
<thead>
<tr>
<th>Good</th>
<th>Moderate</th>
<th>Unhealthy for Sensitive Groups</th>
<th>Unhealthy</th>
<th>Very Unhealthy/Hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recess (15 minutes)</td>
<td>No restrictions.</td>
<td>Allow students with asthma, respiratory infection, lung or heart disease to stay indoors.</td>
<td>Keep students with asthma, respiratory infection, and lung or heart disease indoors.</td>
<td>Keep all students indoors and keep activity levels light.</td>
</tr>
<tr>
<td>P.E. (1 hour)</td>
<td>No restrictions.</td>
<td>Monitor students with asthma, respiratory infection, lung or heart disease. Increase rest periods or substitutions for these students as needed.</td>
<td>Keep students with asthma, respiratory infection, lung or heart disease, and diabetes indoors. Limit these students to moderate activities. For others, limit to light outdoor activities. Allow any student to stay indoors if they don't want to go outside.</td>
<td>Conduct P.E. indoors. Limit students to light indoor activities.</td>
</tr>
<tr>
<td>Athletic Events and Practices (Vigorous activity 2-3 hours)</td>
<td>No restrictions.</td>
<td>Monitor students with asthma, respiratory infection, lung or heart disease. Increase rest periods and substitutions for these students as needed.</td>
<td>Students with asthma, respiratory infection, lung and heart disease, or conditions like diabetes shouldn't play outdoors. Consider moving events indoors. If events are not cancelled, increase rest periods and substitutions to allow for lower breathing rates.</td>
<td>Cancel events. Or move events to an area with “Good” air quality — if this can be done without too much time spent in transit through areas with poor air quality.</td>
</tr>
</tbody>
</table>

Source: WA Dept of Health; [www.doh.wa.gov/Portals/1/Documents/Pubs/334-332.pdf](http://www.doh.wa.gov/Portals/1/Documents/Pubs/334-332.pdf)
Stay informed: air quality updates

- Wildfire smoke location and concentrations shift
- Check smoke hazard levels **frequently**
- Updated information on websites, local news, radio

1. WA Smoke Info Blog
2. Regional Clean Air Agency
3. EPA Smoke Sense App

**Washington Smoke Information**

Visit these resources to stay informed about air quality and smoke conditions in your area:
- [wasmoke.blogspot.com](http://wasmoke.blogspot.com)
- Regional Clean Air Agency
- EPA Smoke Sense App
Ash Falls in Seattle ... Some Clearing in Southeast Washington

There were several reports of ash in the greater Seattle area yesterday, probably from the Cougar Creek and/or Crescent Mountain fires. This can be disconcerting, but keep in mind that the amount of ash we are seeing in the Seattle area isn't a major health concern. The very fine particles that you can't see (PM2.5) are what can cause respiratory and other health problems in these conditions because they get deep into the lungs. Western Washington will continue to experience Unhealthy to Very Unhealthy air quality today. Strong westerly winds are predicted for Wednesday afternoon into Thursday. Those winds should push most of this lingering smoke out of Western Washington on Thursday. The coastal region could see some relief on Wednesday evening. Keep in mind, though, that there is a large area of smoke off the coast that will likely blow back over us on Wednesday.

Don't Tough It Out!

Daycares, camps and school sports practices should be held indoors when the air quality is poor.

When the smoke levels are unhealthy, it is recommended that outdoor activities be restricted for everyone, especially those in sensitive groups who could have a wide range of health effects. Sensitive groups include those with health conditions, infants, children, pregnant women and people over 65.

<table>
<thead>
<tr>
<th>Station</th>
<th>Yesterday hourly</th>
<th>Sat 8/25 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonasket</td>
<td>No hourly data</td>
<td>Lingerling smoke in the morning, clearing in the afternoon</td>
</tr>
<tr>
<td>Wuthrop</td>
<td></td>
<td>Some lingering smoke in the morning, clearing in the afternoon</td>
</tr>
<tr>
<td>Twisp</td>
<td></td>
<td>Air quality much improved over recent days, some smoke remains due to proximity to Crescent fire.</td>
</tr>
<tr>
<td>Omak</td>
<td></td>
<td>Lingerling smoke in the morning, clearing in the afternoon today</td>
</tr>
<tr>
<td>Nespelem</td>
<td></td>
<td>Lingerling smoke in the morning, winds should increase and clear the air in the afternoon.</td>
</tr>
<tr>
<td>Chelan</td>
<td></td>
<td>Smoke at times, clearing at times, best in the afternoon.</td>
</tr>
<tr>
<td>Entiat</td>
<td></td>
<td>Smoke at times in the morning, clearing in the afternoon.</td>
</tr>
<tr>
<td>Leavenworth</td>
<td></td>
<td>Light smoke at times today mostly clearing by later in the day.</td>
</tr>
<tr>
<td>Wenatchee</td>
<td></td>
<td>Some smoke lingering today, clearing in the afternoon.</td>
</tr>
<tr>
<td>Ellensburg</td>
<td></td>
<td>Light smoke accumulations lingering, improving in the afternoon.</td>
</tr>
<tr>
<td>Yakima</td>
<td></td>
<td>Smoke from Hume fire at times. Clearing in the afternoon.</td>
</tr>
<tr>
<td>Moses Lake</td>
<td></td>
<td>Light smoke at times in the morning clearing from smoke in the afternoon.</td>
</tr>
<tr>
<td>Cle Elum</td>
<td></td>
<td>Light smoke in the morning, clearing in the afternoon.</td>
</tr>
</tbody>
</table>

Issued 2018-08-26 09:30 PDT by Janice Peterson 206-484-4353, jlpetersen@fs.fed.us
Avoid smoky air:
Reduce time outdoors & physical activity

<table>
<thead>
<tr>
<th>Enjoy the outdoors</th>
</tr>
</thead>
<tbody>
<tr>
<td>People with health conditions limit time outdoors and strenuous outdoor activity</td>
</tr>
<tr>
<td>All sensitive groups limit time outdoors strenuous outdoor activity</td>
</tr>
<tr>
<td>Everyone limit time outdoors and strenuous outdoor activity, choose light indoor activity</td>
</tr>
<tr>
<td>Everyone stay indoors and avoid all strenuous activity</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
### Avoid smoky air:
Reduce time outdoors & physical activity

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<th>Everyone stay indoors and avoid all strenuous activity</th>
<th>Everyone stay indoors and avoid all strenuous activity</th>
</tr>
</thead>
</table>

**VS.**

<table>
<thead>
<tr>
<th>Washington State in 2016*</th>
<th>Adults</th>
<th>10th Graders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met national recommendations for aerobic activity</td>
<td>58%**</td>
<td>24%</td>
</tr>
</tbody>
</table>


** 2015 data
Keep indoor air clean: windows and doors closed vs. heat stroke

- Wildfire season is generally June through September
- Most people in Washington do not have air conditioners
  - Rely on open windows at night for cooling
- When smoke persists:
  - Outdoor smoke levels $\rightarrow$ Indoor smoke levels

When does the risk of heat stroke outweigh the risk of wildfire smoke inhalation?

- “Be mindful of the heat”
- “Use your judgement”
- “Consider leaving the area or going somewhere else with AC”
Q7: Should I use a face mask when there is outdoor smoke?
Particle Filter Face Mask Resources

Wildfire Smoke and Face Masks

Wildfire smoke can irritate your eyes, nose, throat, and lungs. It can make you cough and wheeze, and can make it hard to breathe. If you have asthma or another lung disease, or heart disease, inhaling wildfire smoke can be especially harmful. If you cannot leave the smoky area, good ways to protect your lungs from wildfire smoke include staying indoors and reducing physical activity. Wearing a special mask called a "particulate respirator" can also help protect your lungs from wildfire smoke. These masks should be used mostly by people who have to go outdoors.

Will a face mask protect me from wildfire smoke?

Respirator masks labeled N95 or N100 provide some protection — they filter out fine particles but not batseyce gases (such as carbon monoxide, formaldehyde, and acrylonitrile). This type of mask can be found at many hardware and home improvement stores. Your local health agency may also have these masks.

- Choose an N95 or N100 mask that has two straps that go around your head.
- Don’t use a one-strap type dust mask as a surgical mask that leaves around your ears — these don’t protect against the fine particles in smoke.
- Choose a mask that fits your nose and under your chin. It should sit rightly to your face. These masks don’t come in sizes that fit young children.
- Don’t use bandannas or towels (wet or dry) or tissues held over the mouth and nose. These may help dust but they won’t protect your lungs from wildfire smoke.
- Anyone with long term heart disease or who is chronically ill should check with their health care provider before using any mask. Using respirator masks can make it harder to breathe, which may cause existing medical conditions worse. The work effort to breathe through a respirator mask can make it uncomfortable to use for long. These masks should be used mostly by people who have to go outdoors.

Respirator masks should not be used by young children — they don’t seal well enough to provide protection. They also don’t seal well on people who are bald.

How do I use my respirator mask?

- Place the mask over your nose and under your chin, with one strap placed below the ears and one strap above. Adjust the mask so that it sits comfortably through the face.
- Pinch the metal part of the mask tightly over the top of your nose.
- The mask fits best on clean, shaved skin.
- Throat with breathing after a short period. If it gets damaged, or if the inside gets dirty, use a new mask each day if you can.
- It’s better to breathe through a mask, or nose opening, if you don’t want to use a mask if you feel dizzy, nauseated, or out of shortness of breath.
- For more information, search for "wildfire smoke" on [www.doh.wa.gov](http://www.doh.wa.gov).

Smoke From Fires: N95 Respirator Masks

Untwist the straps, position the N95 low on your nose.

Watch this video on how to use a face mask.

Source: WA Dept of Health [www.doh.wa.gov/smokefromfires](http://www.doh.wa.gov/smokefromfires)
General public use of particle face masks: complicated messaging

- NIOSH-Approved Respirator Masks
  - N95, N100 or P100 commonly sold
  - N, P, R with 95% efficiency or greater are all appropriate
- 2 straps
- These filter out particles but not CO or other gases
- Surgical masks **not** effective
- Close fit required for tight seal
  - Requires correct size and sometimes brand
  - Requires clean shave
- Not currently approved for children
- Consult physician before use if have chronic condition
General public use of particle face masks: complicated messaging

- NIOSH-Approved Respirator Masks
  - N95, N100 or P100 commonly sold
  - N, P, R with 95% efficiency or greater are all appropriate
- 2 straps
- These filter out particles but not CO or other gases
- Surgical masks **not** effective
- Close fit required for tight seal
- Requires correct size and sometimes brand
- Requires clean shave
- Not currently approved for children
- Consult physician before use if have chronic condition

*The right face mask can provide some protection for some people for a limited time when it’s not possible to stay indoors.*
Audience Poll

Do you receive questions from the public or your patients about face mask use for wildfire smoke or other air pollutants?

...If yes, what do you recommend?
Wildfire Smoke Impacts Advisory Group

Members:
WA Dept of Health, local health departments, tribes, WA Dept of Ecology, WA Labor & Industries, regional clean air authorities

Communication Workgroup
Develop plan for local outreach and communication

Closures Workgroup
Develop guidance for school and outdoor event closures

Sensors Workgroup
Develop guidance for low-cost sensors use for health decisions
Risk Based Approach to Health Decisions
(proposed draft, in progress)

Example: Hospitalizations or Mortality

What is an acceptable risk level?
Excess mortality count per 100,000 population

$$= y_0 \times \text{Attributable Fraction} = y_0 \times (1 - \exp^{-\beta \Delta x})$$

- ‘$y_0$’ is the background (summer non-wildfire smoke) mortality rate in WA per 100,000
- ‘$\beta$’ is the concentration-response factor (CRF, the estimated slope of the log-linear relationship)
- ‘$\Delta x$’ change in PM2.5 concentration = PM2.5 wildfire smoke action level – summer non-wildfire smoke PM2.5

Factors to Consider in School Closures
(draft, in progress)

1. Is there any information about how long the wildfire smoke levels will remain high?
2. Have all options for immediately improving indoor air quality been attempted?
3. If the facility is closed, where will people go instead? Is the air quality expected to be better there?
4. If children or others who require care are involved, will adults be available as caretakers?
5. Will there be economic or job security impacts of parents missing work to attend to children?
Factors to Consider in School Closures *(draft, in progress)*

6. In the process of moving people, will they be more exposed outdoors than if they had just stayed indoors?
7. Is it safe to walk to school?
8. Is the visibility outside safe for driving?
9. Are there other safety concerns about relocating people?
10. Are sensitive students and staff allowed to stay home if it’s safer?

...Other items to consider?
Concluding remarks

- An increase in wildfire smoke response is following the increase in smoke

- Coordination with multiple agencies and organizations is critical

- Many basic questions remain for health guidance
Thank you!

Julie Fox
Ambient Air Epidemiologist
Office of Environmental Public Health Sciences
julie.fox@doh.wa.gov

Smoke from Fires Website:
www.doh.wa.gov/smokefromfires
References

- Anenberg SC et al. Env Health Perspectives. 2010 Sep;118(9):1189-95.
- Oberdörster et al. Env Health Perspectives. 113 (7): 2005.
- Reid et al. Env Health Perspectives. 124 (9): 2016.
Average of Annual rates 2013-2017

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory Hospitalizations* (%)</th>
<th>% of Deaths (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>18-64</td>
<td>35</td>
<td>22</td>
</tr>
<tr>
<td>≥65</td>
<td>54</td>
<td>77</td>
</tr>
</tbody>
</table>

*2015 was excluded because the ICD codes changed in this year.

Exposure to smoke from fires can cause or worsen health problems. **KNOW THE SYMPTOMS**

If you have a health condition, smoke from fires may worsen your symptoms. When smoke levels are high, even healthy people can have symptoms or health problems. Symptoms can range from minor irritations to life-threatening complications, including:

- Sore throat
- Headaches
- Burning eyes
- Coughing
- Wheezing
- Shortness of breath
- Chest pain

Health conditions can include:
- Asthma
- COPD
- Diabetes
- Heart or lung disease
- Respiratory illness
- Colds
- Strokes survivors

If you have any minor irritations take steps to protect your health. Limit your time spent outdoors, avoid strenuous activities and keep indoor air clean. **Dial 911 for emergency assistance if symptoms are serious like shortness of breath or chest pain.**

For more information on how to stay healthy and safe, visit the Washington State Department of Health Smoke From Fires page:

[www.doh.wa.gov/SmokeFromFires](http://www.doh.wa.gov/SmokeFromFires)

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**Smoke from fires can be dangerous for those over 65**

**Take these steps to protect your health**

**Stay informed on air quality**
- Visit WA Smoke Blog (www.wasmoke.blogspot.com) for current air quality conditions and smoke forecasts.
- Pay attention to local news for health warnings and air quality reports in your area.

**Avoid smoky air**
- Limit your time outside, avoid intense physical activities and keep indoor air clean when smoke levels are “unhealthy for sensitive groups,” “unhealthy,” “very unhealthy,” and “hazardous.”
- If you have a health condition, such as lung or heart diseases, diabetes, are a stroke survivor or have a cold, follow this advice when the smoke levels are “moderate.”

**Keep indoor air clean**
- Close windows and doors, pay attention to the heat, and stay hydrated.
- Use fans or air conditioner (AC) when it’s hot, and set your AC to recirculate. If you don’t have AC and it’s too hot to stay home, go to a place with AC like a mall or library.
- Don’t smoke, use candles, or vacuum.
- Use an air cleaner with a HEPA filter.

**Contact your healthcare provider**
- If you have heart or lung diseases and your symptoms get worse around smoke, contact your healthcare provider. **Call 911 if you or someone else has serious symptoms—like trouble breathing.**

[www.doh.wa.gov/SmokeFromFires](http://www.doh.wa.gov/SmokeFromFires)

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Visit our website for these and more available in several languages:  
[https://www.doh.wa.gov/CommunityandEnvironment/AirQuality/SmokeFromFires/SmokefromFiresToolkits](https://www.doh.wa.gov/CommunityandEnvironment/AirQuality/SmokeFromFires/SmokefromFiresToolkits)