WASHINGTON WILDFIRE SMOKE IMPACTS ADVISORY GROUP

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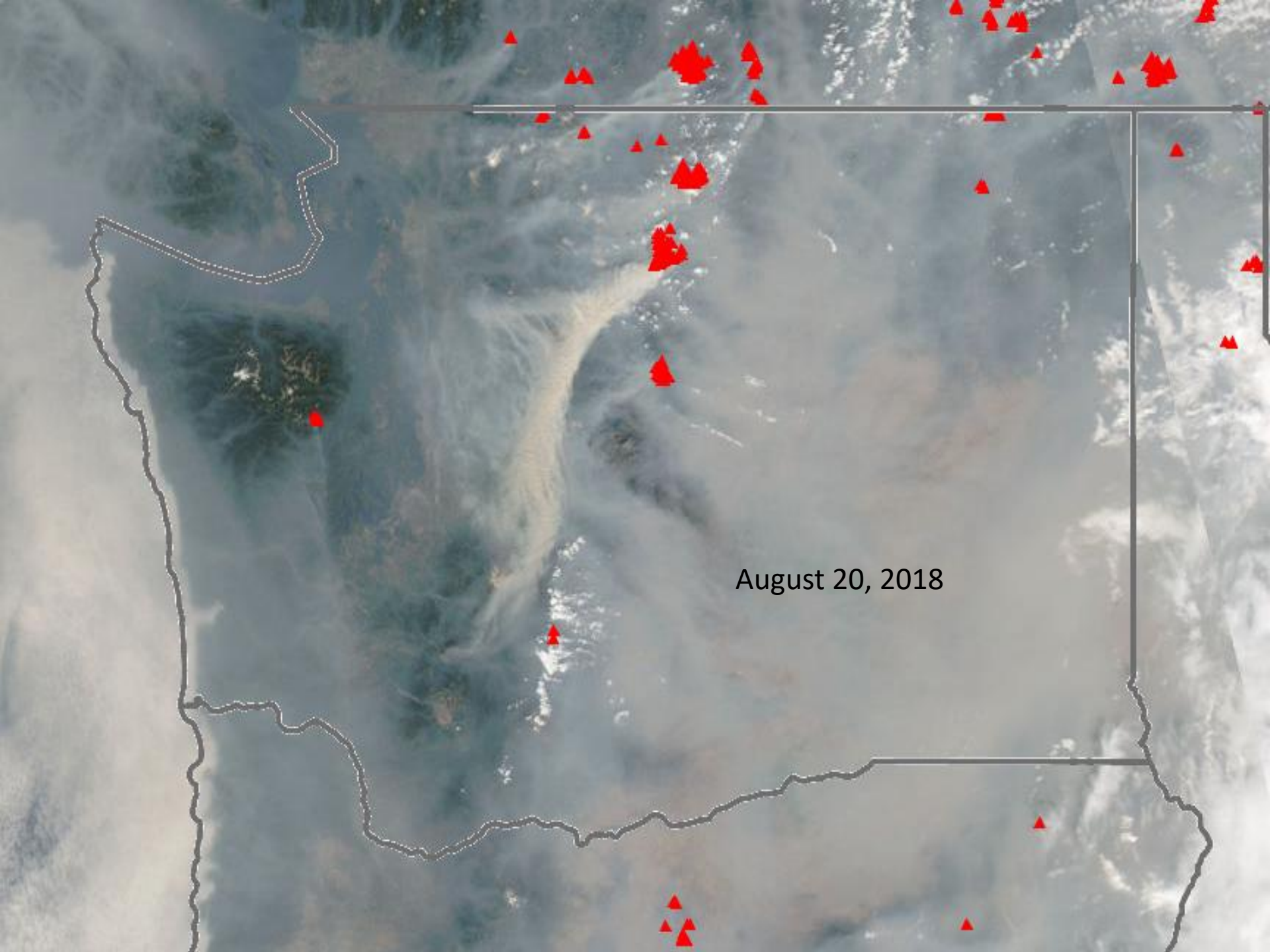
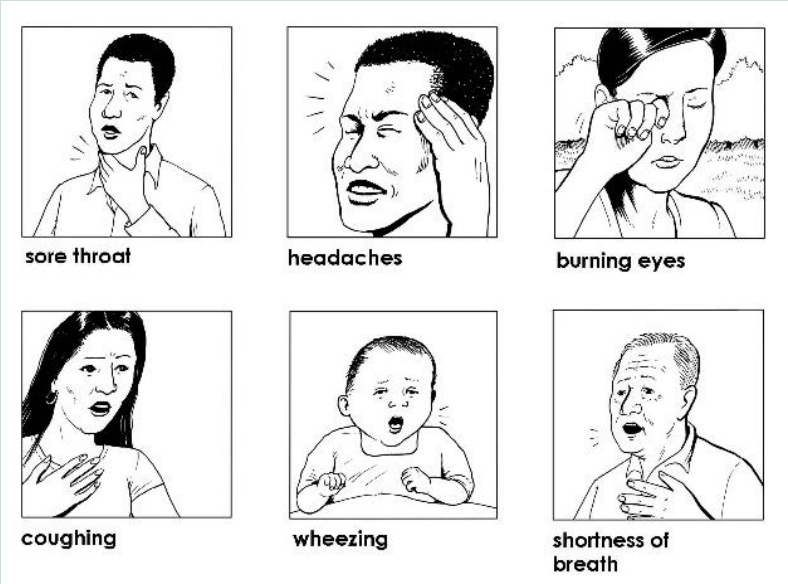

August 20, 2018

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

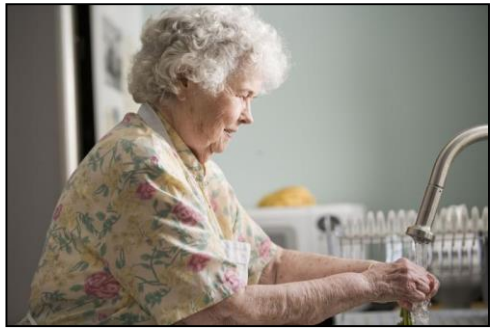
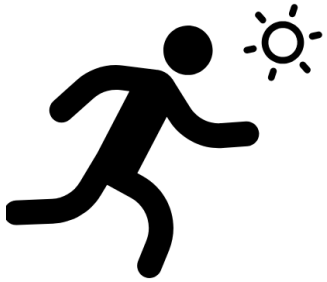


Photo credits: CDC/Dawn Arlotta 2009, www.pixabay.com

Steps to protect health from smoke

1. Stay informed about air quality

- Check the air quality hazard level

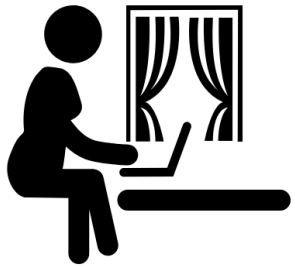


2. Limit exposure

- 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

Wildfire Smoke Impacts Advisory Group

27 Members

Including Washington State Department of Health, local health jurisdictions, tribal communities, Department of Ecology, Labor & Industries, regional clean air authorities, University of Washington

3 Sub Workgroups to address **3 Priorities** for the **2019 Wildfire Season**

Communication Workgroup	Closures Workgroup	Sensors Workgroup
Develop custom toolkit for local outreach and communication	Develop guidance for school and outdoor event closures	Develop guidance for low-cost sensors to use for health decisions

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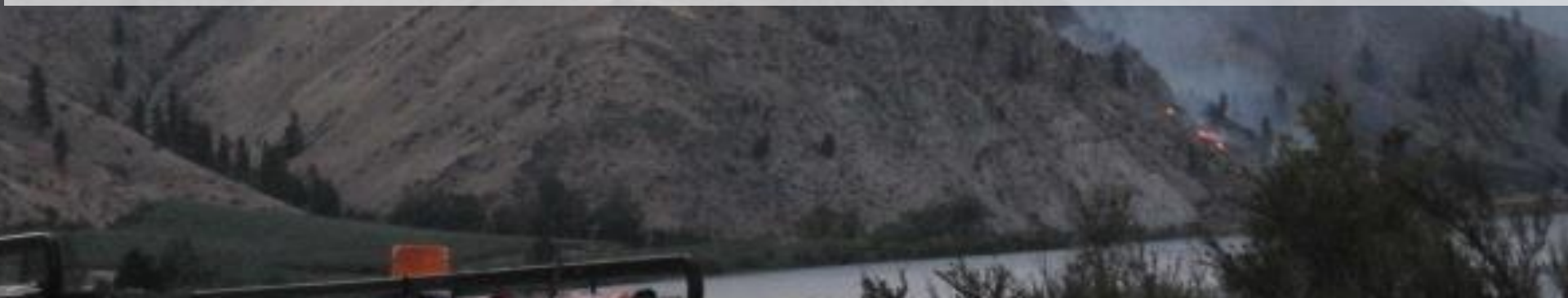
Goals of Communication Workgroup

Plan and develop an Education Outreach toolkit, including:

- Consistent messaging for pre-, during and post-wildfire season
- Identified audiences and specific intervention goals
- Resource materials in a format that allows for local-agency identification for use in various mediums

Target Audiences

General Public
Healthcare Providers
Facility Managers for outdoor camps and athletic activities
School K-12 Principles, superintendents & administrative staff
School nurses & school health team
Child care providers
Long-term Care and Assisted Living Facilities
Planners of Public Events



Wildfire Smoke Response Toolkit

- Created catalogue of available resources for key messages for each audience and timing

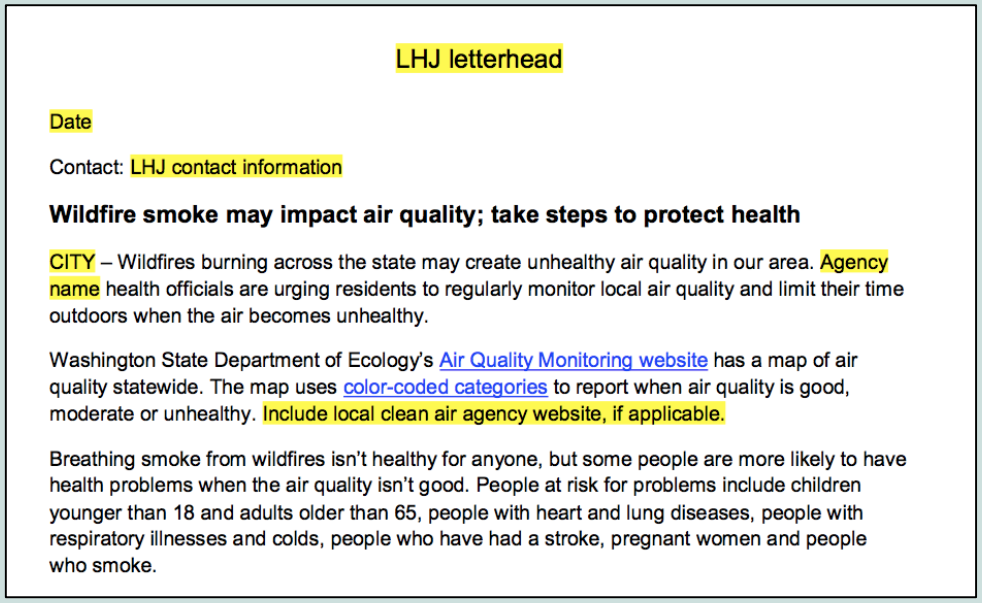
  Example from catalogue:

Audience	Key Messages	Appropriate Resources
School K-12 (includes principles, superintendents, administrative staff)	• Track air quality and utilize your resources • Follow alternative plan for recess/outdoor school activities to smoke exposure • Communicate and coordinate with local health jurisdiction and air quality authority • Follow closure recommendations when conditions are met • Takes steps to improve indoor air quality	4, 15, 28, 59, 68, 73

- Identified gaps and topics with inconsistent messages
  - N95 Mask Communication
  - Improving Indoor Air
  - Outdoor Activity Guide for adults
- Developed resources to fill gaps
- Templates for communications mediums for local use
- Distribution in progress

Templates for local use

- **Letters to target audiences**
- **News releases**



LHJ letterhead

Date

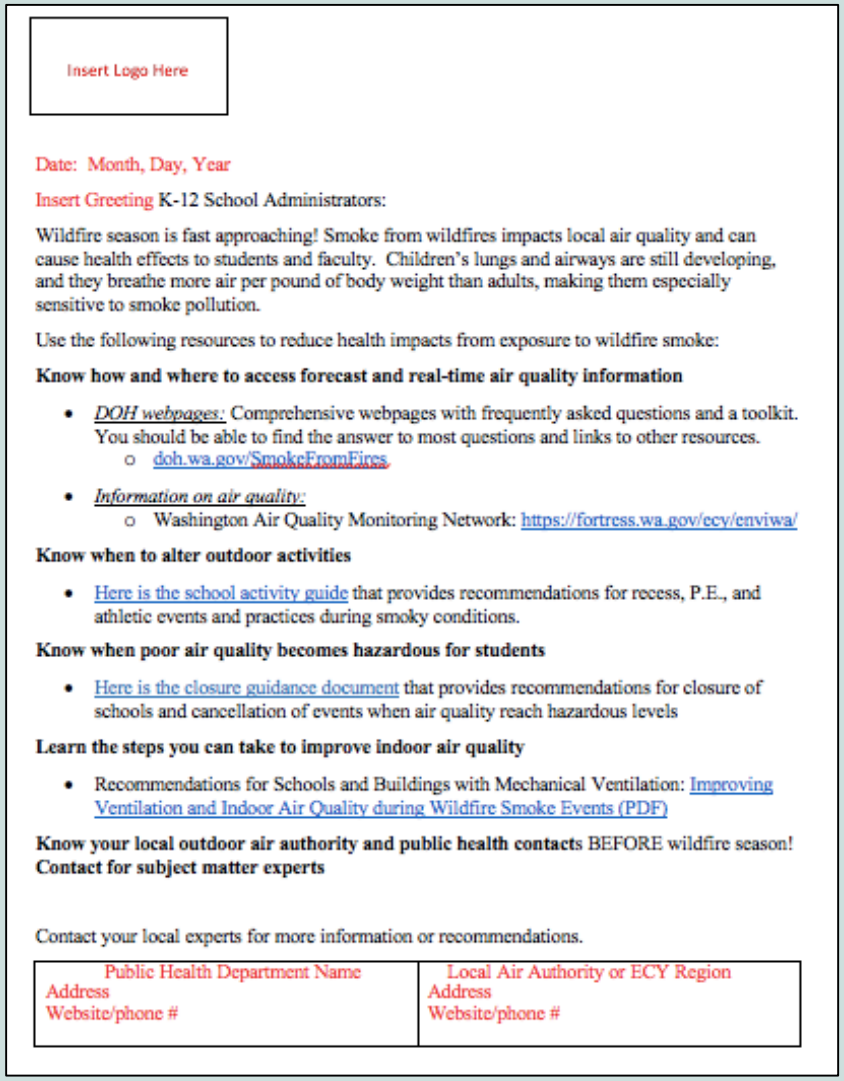
Contact: LHJ contact information

Wildfire smoke may impact air quality; take steps to protect health

CITY – Wildfires burning across the state may create unhealthy air quality in our area. Agency name health officials are urging residents to regularly monitor local air quality and limit their time outdoors when the air becomes unhealthy.

Washington State Department of Ecology's Air Quality Monitoring website has a map of air quality statewide. The map uses color-coded categories to report when air quality is good, moderate or unhealthy. Include local clean air agency website, if applicable.

Breathing smoke from wildfires isn't healthy for anyone, but some people are more likely to have health problems when the air quality isn't good. People at risk for problems include children younger than 18 and adults older than 65, people with heart and lung diseases, people with respiratory illnesses and colds, people who have had a stroke, pregnant women and people who smoke.



Insert Logo Here

Date: Month, Day, Year

Insert Greeting K-12 School Administrators:

Wildfire season is fast approaching! Smoke from wildfires impacts local air quality and can cause health effects to students and faculty. Children's lungs and airways are still developing, and they breathe more air per pound of body weight than adults, making them especially sensitive to smoke pollution.

Use the following resources to reduce health impacts from exposure to wildfire smoke:

Know how and where to access forecast and real-time air quality information

- *DOH webpages:* Comprehensive webpages with frequently asked questions and a toolkit. You should be able to find the answer to most questions and links to other resources.
  - doh.wa.gov/SmokeFromFires
- *Information on air quality:*
  - Washington Air Quality Monitoring Network: https://fortress.wa.gov/ecy/enviwa/

Know when to alter outdoor activities

- Here is the school activity guide that provides recommendations for recess, P.E., and athletic events and practices during smoky conditions.

Know when poor air quality becomes hazardous for students

- Here is the closure guidance document that provides recommendations for closure of schools and cancellation of events when air quality reach hazardous levels

Learn the steps you can take to improve indoor air quality

- Recommendations for Schools and Buildings with Mechanical Ventilation: Improving Ventilation and Indoor Air Quality during Wildfire Smoke Events (PDF)

Know your local outdoor air authority and public health contacts BEFORE wildfire season!
Contact for subject matter experts

Contact your local experts for more information or recommendations.

Public Health Department Name Address Website/phone #	Local Air Authority or ECY Region Address Website/phone #

Resources Developed to Address Gaps

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.

The most effective ways to protect yourself from wildfire smoke are to stay indoors, limit time outdoors and reduce physical activity. Consider relocation out of the smoky area, if possible. People who must be outside for extended periods of time in smoky air may benefit from wearing a special mask called a "particulate respirator." Most people will find it difficult to correctly use respirator masks. If the mask does not fit properly, it will provide little or no protection.

Will a face mask protect me from wildfire smoke?

Tight-fitting respirator masks labeled N95 or N100 may provide some protection – they filter-out fine particles but not hazardous gases (such as carbon monoxide, formaldehyde, and acrolein). However, if there are too many particles in the air – even particles that cannot be seen – the masks may not provide adequate protection.

These masks should not be used on young children. The masks do not come in sizes that would fit well enough to provide the tight seal necessary to reduce exposure. They also don't seal well on people with beards.

Respirator masks can be found at many hardware and home repair stores and pharmacies. 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 choose a one-strap paper dust mask or a surgical mask that hooks around your ears – these don't protect against the fine particles in smoke.
- Choose a size that fits over your nose and under your chin. It should seal tightly to your face. If the mask doesn't fit properly, it will provide little, if any, protection and may offer a false sense of security.
- Don't use bandanas or towels (wet or dry) or tissue held over the mouth and nose. These may relieve dryness but they won't protect your lungs from wildfire smoke.

Anyone with lung or 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 make existing medical conditions worse. The extra effort it takes to breathe through a respirator mask can make it uncomfortable to use them for very long. These masks may benefit people who must be outside for extend periods of time.

How do I use my respirator mask?

- Place the mask over your nose and under your chin, with c
above. Adjust the mask so that air cannot get through at the e
mask allows unfiltered air to enter and be inhaled.
- Pinch the metal part of the mask tightly over the top of yo
- Follow instructions on the package to check for a tight face

Adult Outdoor Activity Guide

Air Quality Conditions

Check your local air conditions at https://fortress.wa.gov/ecy/enviwa/

Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy for Everyone	Very Unhealthy for Everyone	Hazardous for Everyone
Washington Air Quality Advisory (WAQA) Concentration Levels (PM2.5 µ/m³)					
0 to 12.0	12.1 to 20.4	20.5 to 35.4	35.5 to 80.4	80.5 to 150.4	Greater than 150.4
Air pollution is low, so there is little health risk. It's a great day for everyone to be outdoors.	People with health conditions should limit spending any time outdoors and avoid vigorous outdoor activities. They may begin to have worsened symptoms.	All sensitive groups should limit spending any time outdoors. People with health conditions may have worsened symptoms. Healthy people may start to have symptoms.	Everyone, especially sensitive groups, should limit time spent outdoors, avoid vigorous activities outdoors, and choose light indoor activities.	Everyone should stay indoors, avoid all vigorous activity, close windows and doors if it's not too hot, set your AC to recirculate, and use a HEPA air filter if possible.	People with heart or lung disease, or those who have had a stroke, should consult their healthcare provider about leaving the area and wearing a properly-fitted respiratory mask if they must go outdoors. Follow burn bans and evacuation orders.

WILDFIRE SMOKE FACTSHEET

Healthy Indoor Air

When wildfire smoke gets inside your home it can make your indoor air unhealthy, but there are steps you can take to protect your health and improve the air quality in your home. Reducing indoor air pollutant emissions during smoke events can decrease indoor particle levels, which may partially compensate for the increased particle loading from the outdoor air. For example, avoid burning candles, smoking tobacco products, using aerosol products, and avoid using a gas or wood-burning stove or fireplace. To avoid re-suspending particles, do not vacuum during a fire event, unless using a HEPA-filter equipped vacuum. Another step healthy indoor air is air filtration. This fact sheet discusses effective options for filtering your home's indoor air to reduce indoor air pollution. Staying inside with the doors and windows closed can usually reduce exposure to ambient air pollution by at least a third or more. People, especially at-risk individuals, who live in areas that are regularly affected by smoke from wildfires or who are in an area where the wildfire risk has been determined to be high, would be well advised to create a "clean room" in their home.

Create a clean air room at home

Designate a room in your home as a clean air room. A good choice is an interior room, with as few windows and doors as possible, such as a bedroom. Suggestions for maintaining a clean air room include:

• Pre-clean (vacuum and dust) your room and ensure you have on hand any filter replacements. • During an event, keep windows and doors closed. • Run your air conditioner or central air system, if you have one. If the air conditioner provides a fresh air option, keep the fresh-air intake closed to prevent smoke from getting inside. If you are using a central air system, run it continuously by switching the thermostat fan from "Auto" to "On". • If you don't have central air, set up a properly sized room air cleaner, and check to ensure maximum filter efficiency • During a wildfire smoke event, do not vacuum anywhere in the house, unless using a HEPA-filter equipped vacuum. • Do not smoke or burn anything anywhere in the house, including candles or incense.

If it is too warm to stay inside with the windows closed, or if you are very sensitive to smoke, seek shelter elsewhere.

Filtration Options

There are two effective options for improving air filtration in the home: 1) upgrading the central air system filter, and 2) using high efficiency portable air cleaners. Keep windows closed while using these options. Before discussing filtration options, it is important to understand the basics of filter efficiency.

Filter Efficiency

The most common industry standard for filter efficiency is the Minimum Efficiency Reporting Value, or "MERV rating." The MERV scale for residential filters ranges from 1 through 20. The higher the MERV rating the more particles are captured as the air passes through the filter. Higher MERV (higher efficiency) filters are especially effective at capturing very small particles that can most affect health.

Central Air System Filter

The filter used in the central heating/cooling system of the home can effectively reduce indoor particle concentrations when the system is operating or when only the fan is turned on. Most home systems use a low MERV (1-4) fiberglass filter that is 1" thick. Replacing this filter with a medium efficiency filter (MERV 5-8) can significantly improve the air

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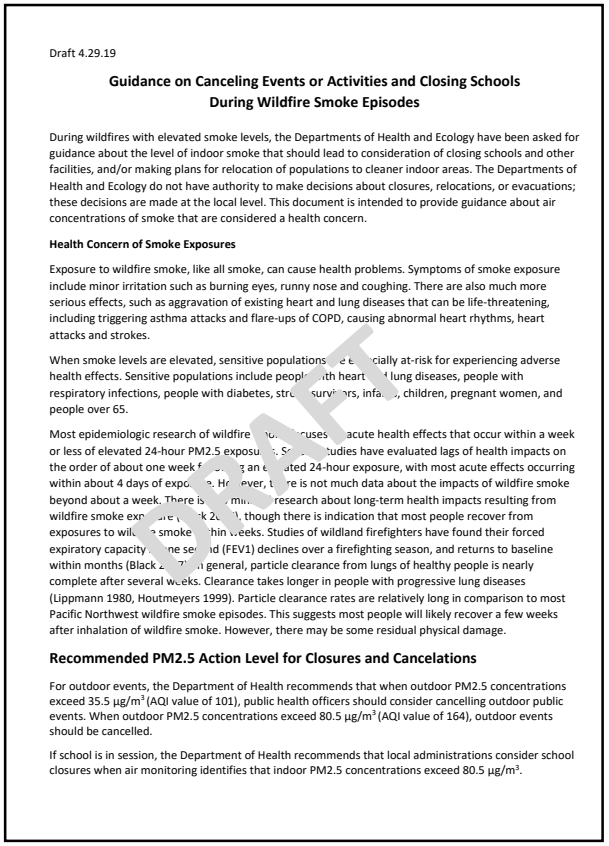
Draft Wildfire Smoke Closures Guidance



Draft 4.29.19

Guidance on Canceling Events or Activities and Closing Schools During Wildfire Smoke Episodes

During wildfires with elevated smoke levels, the Departments of Health and Ecology have been asked for guidance about the level of indoor smoke that should lead to consideration of closing schools and other facilities, and/or making plans for relocation of populations to cleaner indoor areas. The Departments of Health and Ecology do not have authority to make decisions about closures, relocations, or evacuations; these decisions are made at the local level. This document is intended to provide guidance about air concentrations of smoke that are considered a health concern.

Health Concern of Smoke Exposures

Exposure to wildfire smoke, like all smoke, can cause health problems. Symptoms of smoke exposure include minor irritation such as burning eyes, runny nose and coughing. There are also much more serious effects, such as aggravation of existing heart and lung diseases that can be life-threatening, including triggering asthma attacks and flare-ups of COPD, causing abnormal heart rhythms, heart attacks and strokes.

When smoke levels are elevated, sensitive populations are especially at-risk for experiencing adverse health effects. Sensitive populations include people with heart and lung diseases, people with respiratory infections, people with diabetes, stroke survivors, infants, children, pregnant women, and people over 65.

Most epidemiologic research of wildfire smoke focuses on acute health effects that occur within a week or less of elevated 24-hour PM2.5 exposures. Studies have evaluated lags of health impacts on the order of about one week following an elevated 24-hour exposure, with most acute effects occurring within about 4 days of exposure. However, there is not much data about the impacts of wildfire smoke beyond about a week. There is minimal research about long-term health impacts resulting from wildfire smoke exposure (Black 2017), though there is indication that most people recover from exposures to wildfire smoke within weeks. Studies of wildland firefighters have found their forced expiratory capacity in one second (FEV1) declines over a firefighting season, and returns to baseline within months (Black 2017). In general, particle clearance from lungs of healthy people is nearly complete after several weeks. Clearance takes longer in people with progressive lung diseases (Lippmann 1980, Houtmeyers 1999). Particle clearance rates are relatively long in comparison to most Pacific Northwest wildfire smoke episodes. This suggests most people will likely recover a few weeks after inhalation of wildfire smoke. However, there may be some residual physical damage.

Recommended PM2.5 Action Level for Closures and Cancelations

For outdoor events, the Department of Health recommends that when outdoor PM2.5 concentrations exceed 35.5 $\mu g/m^3$ (AQI value of 101), public health officers should consider cancelling outdoor public events. When outdoor PM2.5 concentrations exceed 80.5 $\mu g/m^3$ (AQI value of 164), outdoor events should be cancelled.

If school is in session, the Department of Health recommends that local administrations consider school closures when air monitoring identifies that indoor PM2.5 concentrations exceed 80.5 $\mu g/m^3$.

DRAFT

- Health concern & steps to reduce exposures
- Factors to consider in closures and cancelations
- Measurement of PM2.5
- Estimated risk (TBD)
- Action level

Factors to consider for cancelations

Examples for outdoor events & activities:

- What is the forecast for how long the wildfire smoke levels will remain high?
- Is there an option to relocate to an area with cleaner air?
- Is the visibility safe for driving?

Evidence of health impacts from wildfire smoke exposure

• All-cause mortality	Strong
• Increased hospitalizations	Strong

• Worsening respiratory disease
  • Asthma
  • COPD
  • Bronchitis
  • Pneumonia
	Very Strong

• Worsening heart disease	Inconclusive but suggestive
• Stroke • Type II Diabetes • Neurological and cognitive impairment • Pre-term and low birthweight babies • Others…	Growing evidence for PM2.5, little known for wildfire smoke

Sources: Reid et al. EHP 124 (9): 2016. Cascio et al. Sci total Env. 624: 2018

Selected study for risk estimates of respiratory hospitalizations

Study	Gan et al. 2017 at CSU
Health Outcome	Respiratory hospitalizations
Study Location	Washington
Study Populations	All ages, M & F
Wildfire Years	2012
Lag Days Incorporated	0-5 days

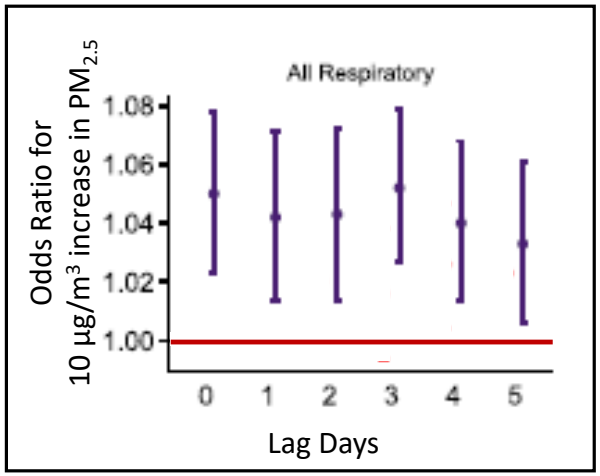
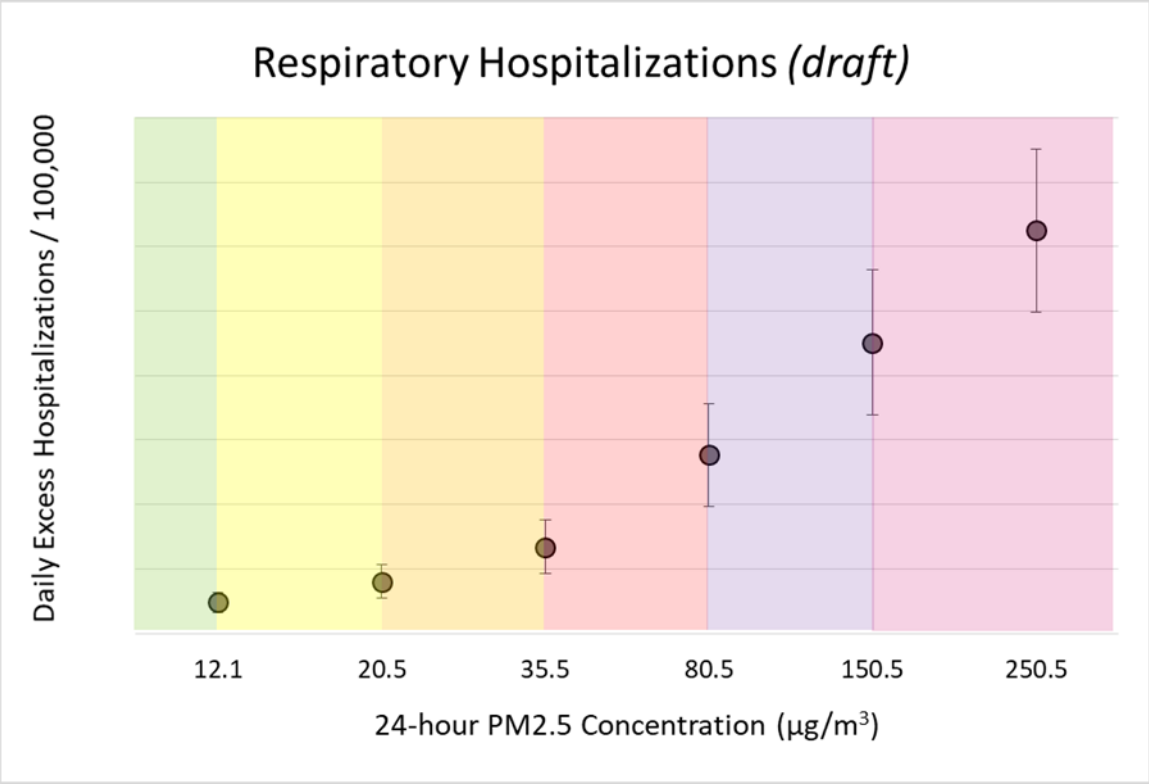


Figure adapted from Gan et al 2017 for GWR Smoke.

Full Citation:
Gan RW et al. Comparison of wildfire smoke estimation methods and associations with cardiopulmonary-related hospital admissions. Geohealth. 2017 Mar;1(3):122-136.

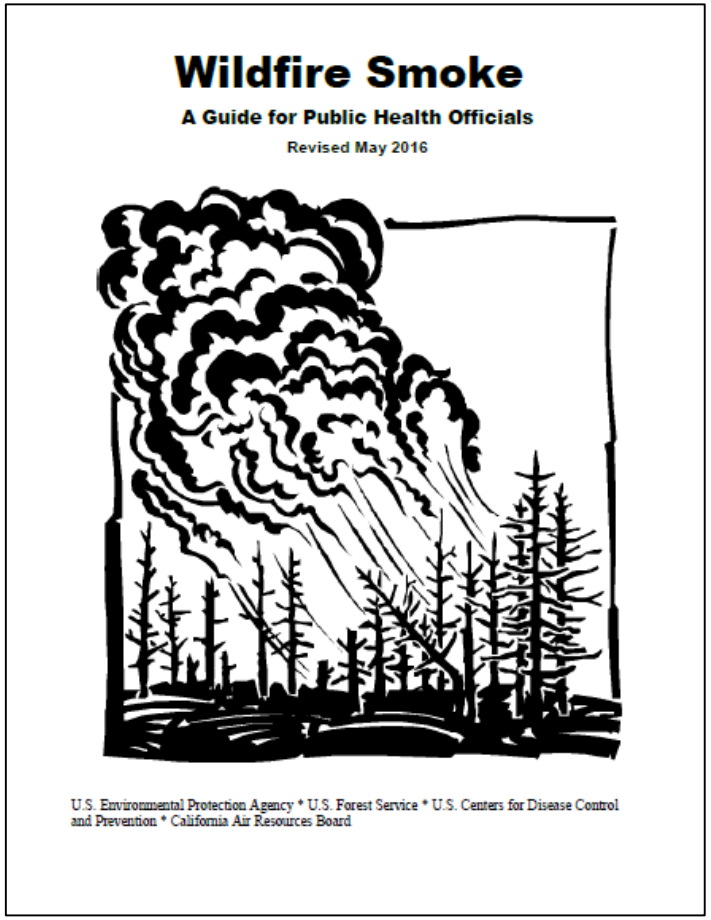
Preliminary estimates of excess hospitalizations attributed to wildfire smoke



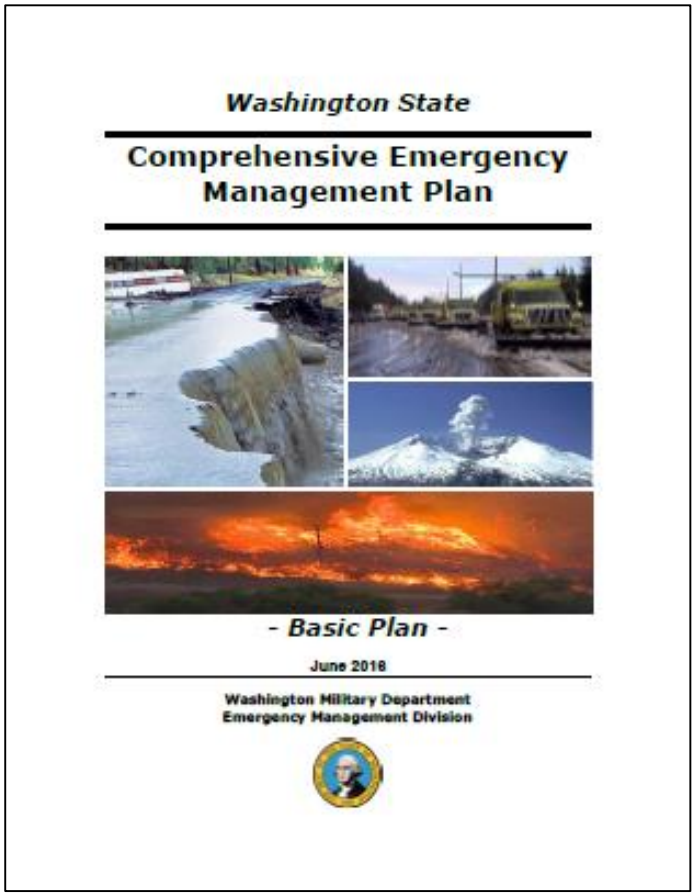
What is an acceptable level of risk?

Risk Estimate Data Sources
Wildfire smoke rate: Gan et al. 2017. Non-wildfire smoke rate (2006-2014): WA Dept of Health, WA Hospital Discharge Data, Sept 2018.

Existing wildfire smoke response guidance for closures



US EPA and other agencies:
https://www3.epa.gov/airnow/wildfire_may2016.pdf



Attach 1 "Wildfire Response—Severe Smoke Episodes": http://mil.wa.gov/uploads/pdf/PLANS/esf-8-appendix-5-attachment-1-severe-smoke-episodes-2017.pdf

Discussion of action levels

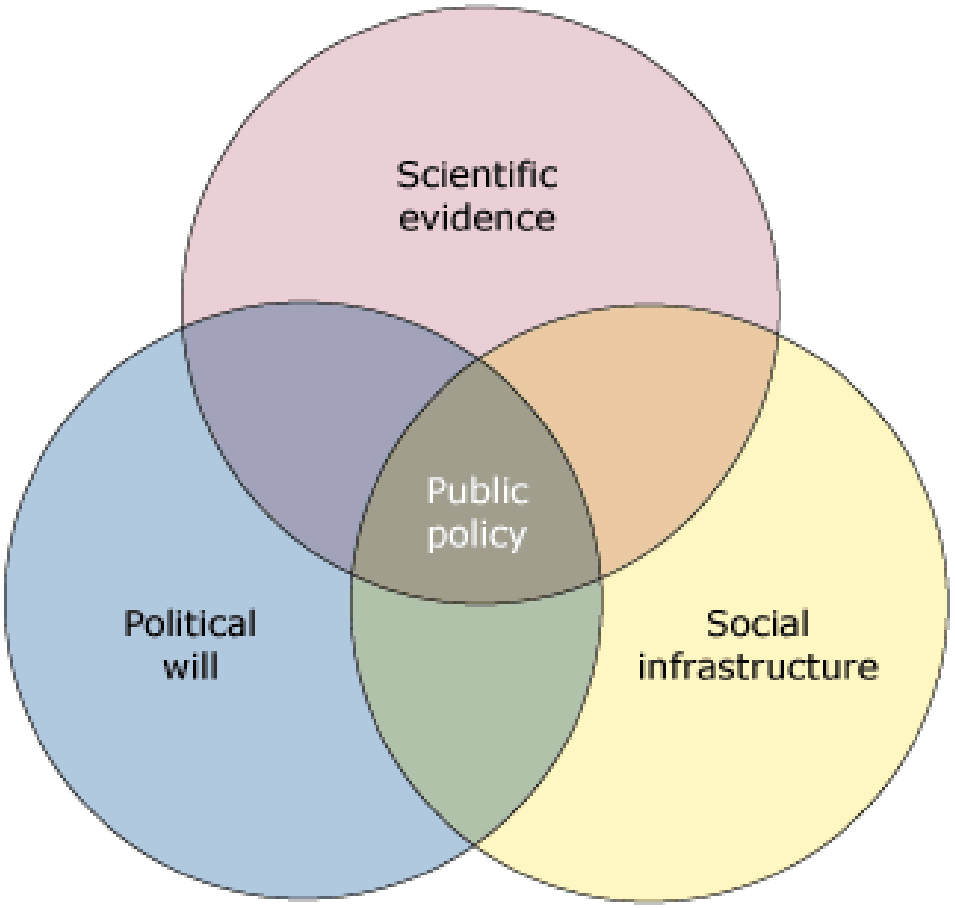
WAQA Guidance in WA Comprehensive Emergency Management Plan:
(similar language for AQI in EPA Wildfire Smoke Guide)

- Cancel outdoor public events.
- If school is in session, discuss school closure with school administrators.

WAQA PM2.5 Concentration* ($\mu g/m^3$)	
Very Unhealthy	**Hazardous**
80.5	150.5

*Lower break-point of hazard category.

Balance in Public Policy



Source: Wilcox LS. Worms and germs, drink and dementia: US health, society, and policy in the early 20th century. Prev Chronic Dis 2008;5(4). http://www.cdc.gov/pcd/issues/2008/oct/08_0033.htm

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Goals of Sensors Workgroup

Develop guidance for use of low-cost air sensors to assist in decisions about indoor and outdoor activities.

- Summary of measurement reliability and accuracy
- Guidance about how, when and where to use monitors indoors and outdoors

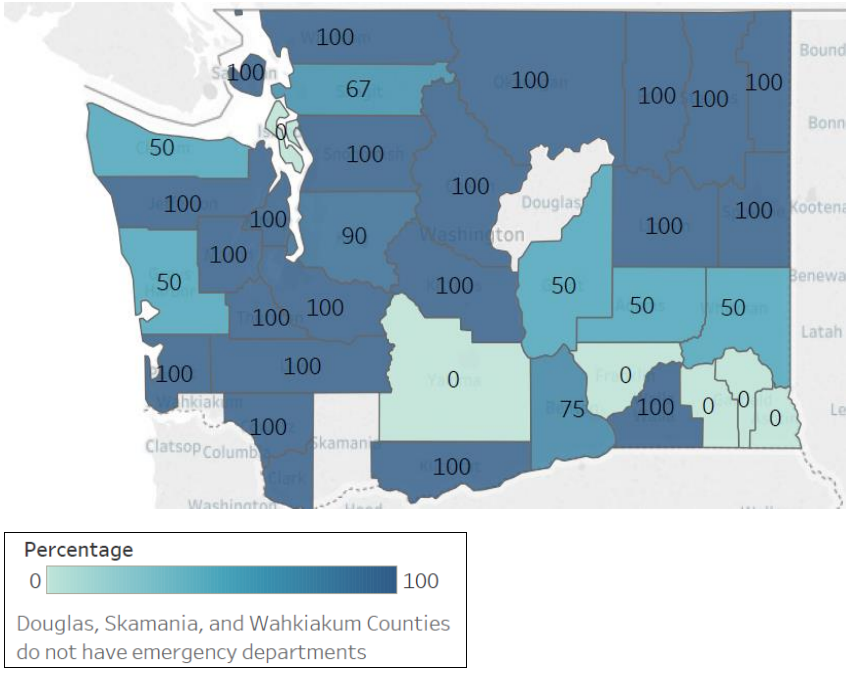
Image Source: EPA, https://www.epa.gov/air-sensor-toolbox

Planned Assessments

1. Learn from those already using low cost sensors to manage health risks
   - Best practices

2. Assess current practices in use of air quality and health data during smoke events
   - Awareness and use of syndromic surveillance data (RHINO)
   - Sources and use of AQ monitoring data
   - Awareness and use of low cost sensors and guide

Percentage of Emergency Departments Available in NSSP ESSENCE (Feb 2019):



Figures courtesy of Department of Health, Syndromic Surveillance RHINO Team

Thank you!

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University of Washington

Julie Fox
Ambient Air Epidemiologist
Office of Environmental Public Health Sciences
Washington Department of Health

Panel Discussion

Holly Myers	Environmental Health Director	Yakima Health District
Len Adams	Community Environmental Health, Healthy Homes Program Manager	Tacoma-Pierce County Health Department
Kris Ray	Air Quality Program Manager	Confederated Tribes of the Colville Reservation
Lauren Jenks	Director of Office of Env Public Health Sciences	WA Dept of Health

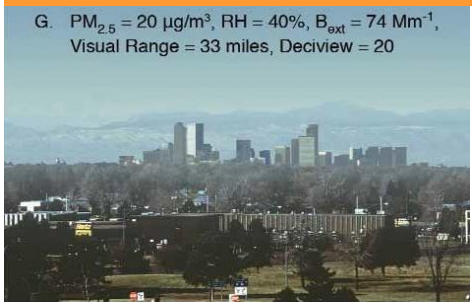
Extra Slides

Recommended measurement of $PM_{2.5}$

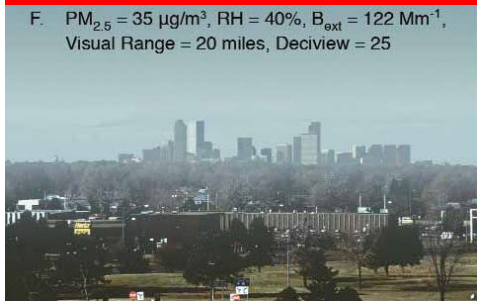
- **For outdoor events & activities:** *outdoor* PM2.5 concentrations
- **For schools:** *indoor* PM2.5 concentrations

PM2.5 Concentrations:

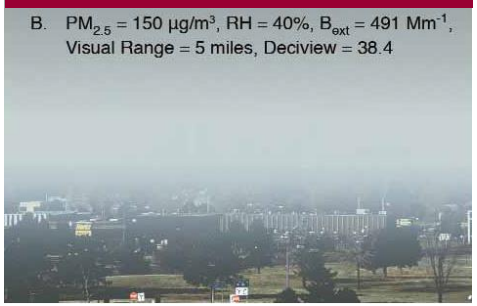
20 µg/m³



35 µg/m³



150 µg/m³



Photos of Denver, CO: Poirot, R. AWMA *EM* 2011 (Sept) 10-15

Large population sensitive to wildfire smoke

Sensitive Population	% of WA Population (2016 or 2017 data)
Children <18 years	24%
People 65+ years	15%
Chronic Obstructive Pulmonary Disease, Emphysema & bronchitis	6%
Asthma	10%
Heart Disease	12%*

* Percent in whole US population, not specific to WA

Sources: WA Office of Financial Mgmt and Behavioral Risk Factor Surveillance System in Community Health Assessment Tool, Cascio et al. Sci total Env. vol 624, 2018

Washington Air Quality Advisory: English / Spanish / Arabic / Chinese / Korean / Punjabi / Russian / Somali / Tagalog / Ukrainian / Vietnamese

DOH Air Pollution and School Activities Guide

	Air Quality Conditions* First, check local air conditions at https://fortress.wa.gov/ecy/enviwa/ and then use this chart.				
	Good	**Moderate**	**Unhealthy for Sensitive Groups**	**Unhealthy**	**Very Unhealthy/ Hazardous**
Recess (15 minutes)	No restrictions.	Allow students with asthma, respiratory infection, lung or heart disease to stay indoors.	Keep students with asthma, respiratory infection, and lung or heart disease indoors.	Keep all students indoors and keep activity levels light.	Keep all students indoors and keep activity levels light.
P.E. (1 hour)	No restrictions.	Monitor students with asthma, respiratory infection, lung or heart disease. Increase rest periods or substitutions for these students as needed.	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.	Conduct P.E. indoors. Limit students to light indoor activities.	Keep all students indoors and keep activity levels light.
Athletic Events and Practices (Vigorous activity 2-3 hours)	No restrictions.	Monitor students with asthma, respiratory infection, lung or heart disease. Increase rest periods and substitutions for these students as needed.	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.	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.	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.

Source: WA Dept of Health; www.doh.wa.gov/Portals/1/Documents/Pubs/334-332.pdf