Washington State Department of Health

PUBLIC HEALTH RESPONSE TO WILDFIRE SMOKE

Julie Fox, PhD, MHS

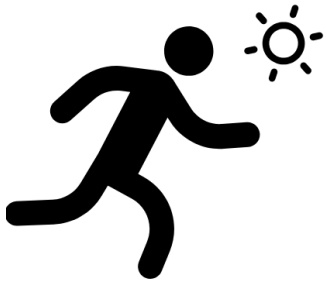
Steps to protect health from smoke

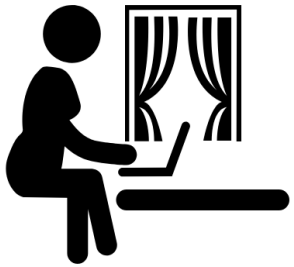
1. **Stay informed about air quality**
   - Check the air quality hazard level

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

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

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
- Developed resources to fill gaps
- Created templates for communications mediums for local use
- Distribution in progress

Target Audiences

General public

Healthcare providers

Facility managers for outdoor camps and athletic activities

School K-12 principals, superintendents & administrative staff

School nurses & school health team

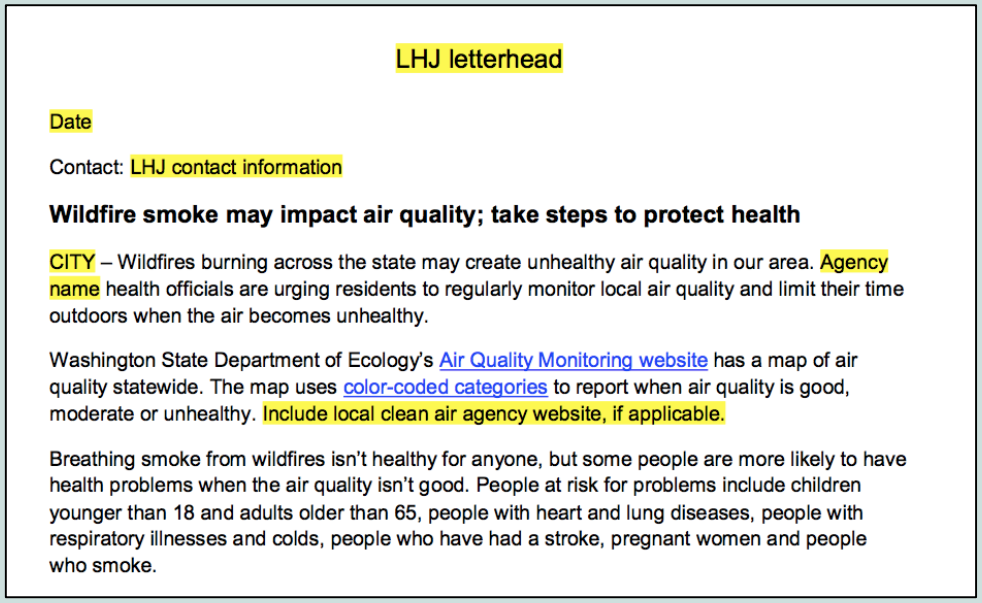
Child care providers

Long-term care and assisted living facilities

Planners of public events

Templates for local use

- Letters to target audiences
- News releases



LHJ letterhead

Date

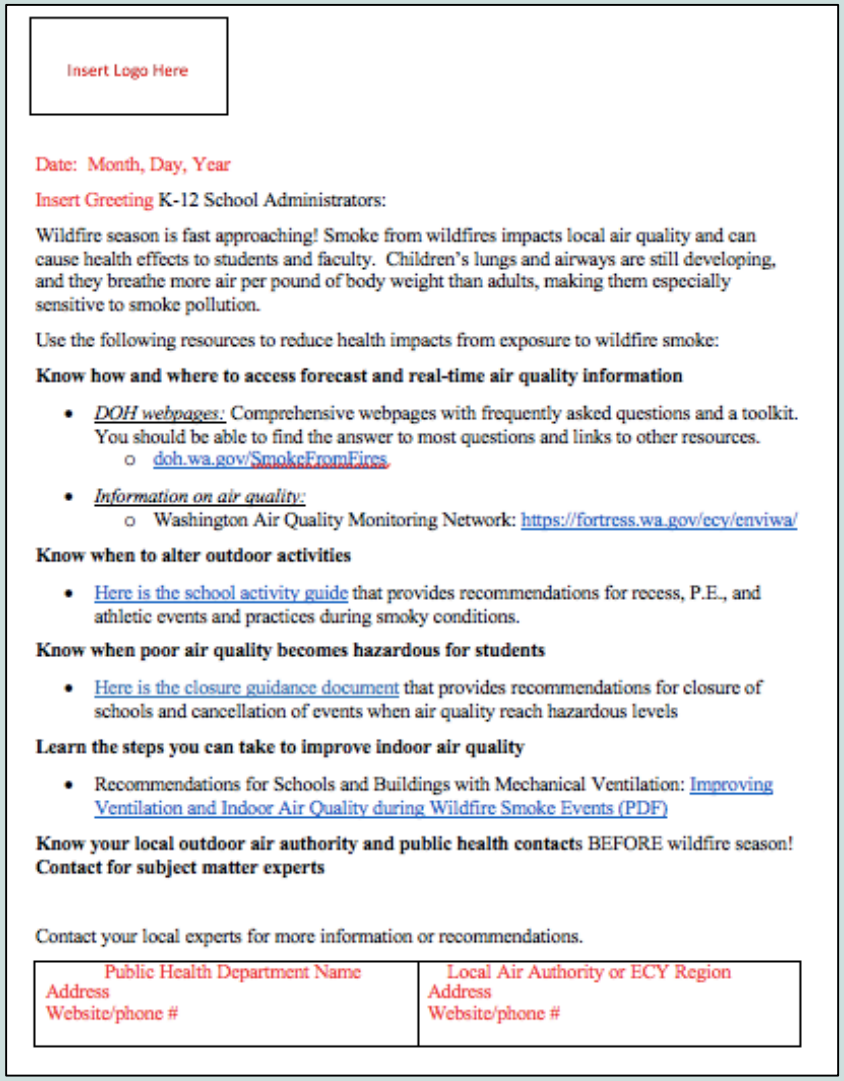
Contact: LHJ contact information

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 #

Wildfire Smoke Impacts Advisory Group

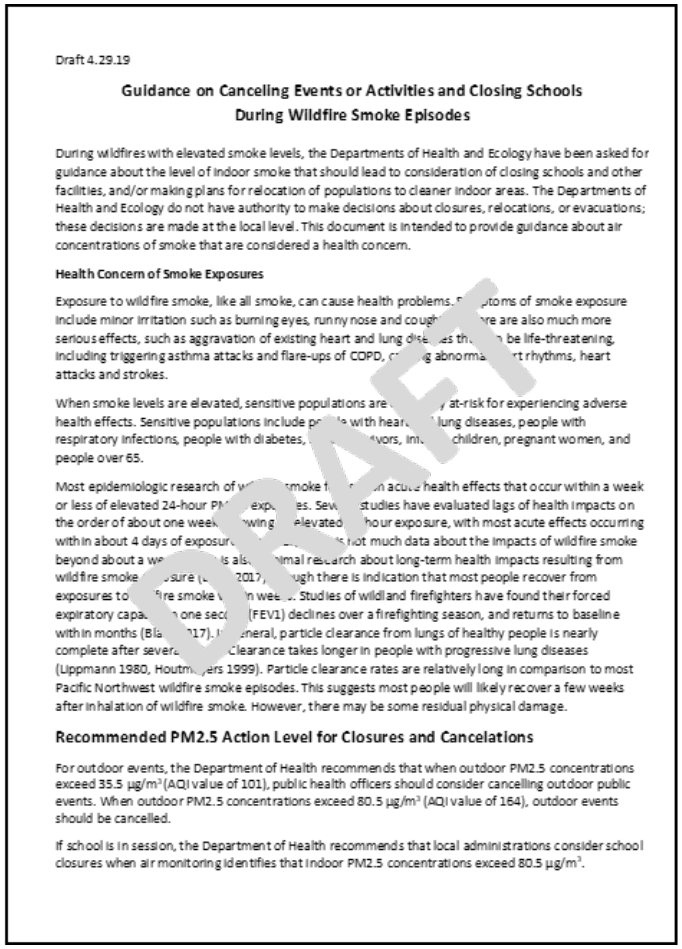
27 Members

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

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 cough. 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 or lung diseases, people with respiratory infections, people with diabetes, organ transplant survivors, infants and 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. Several studies have evaluated lags of health impacts on the order of about one week following elevated 24-hour exposure, with most acute effects occurring within about 4 days of exposure. There is not much data about the impacts of wildfire smoke beyond about a week. There is also minimal research about long-term health impacts resulting from wildfire smoke exposure (Liu 2017), although 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 µg/m³ (AQI value of 101), public health officers should consider cancelling outdoor public events. When outdoor PM2.5 concentrations exceed 80.5 µg/m³ (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 µg/m³.

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:

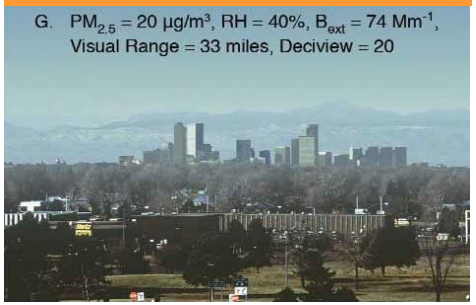
- What is the forecast for how long the wildfire smoke levels will remain high?
- Is there an option to relocate to an area with cleaner air?
- Is the visibility safe for driving?

Recommended measurement of $PM_{2.5}$

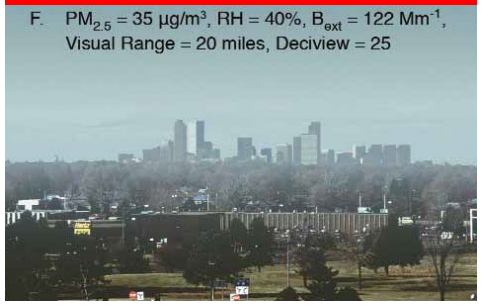
- **For outdoor events & activities:** *outdoor* PM2.5 concentrations
- **For schools:** *indoor* PM2.5 concentrations

PM2.5 Concentrations:

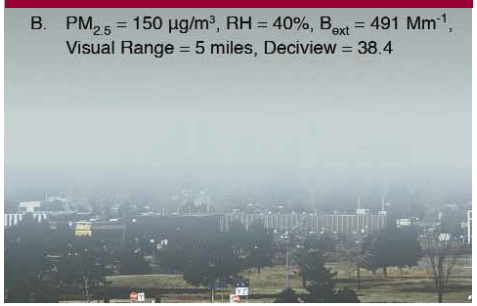
20 µg/m³



35 µg/m³

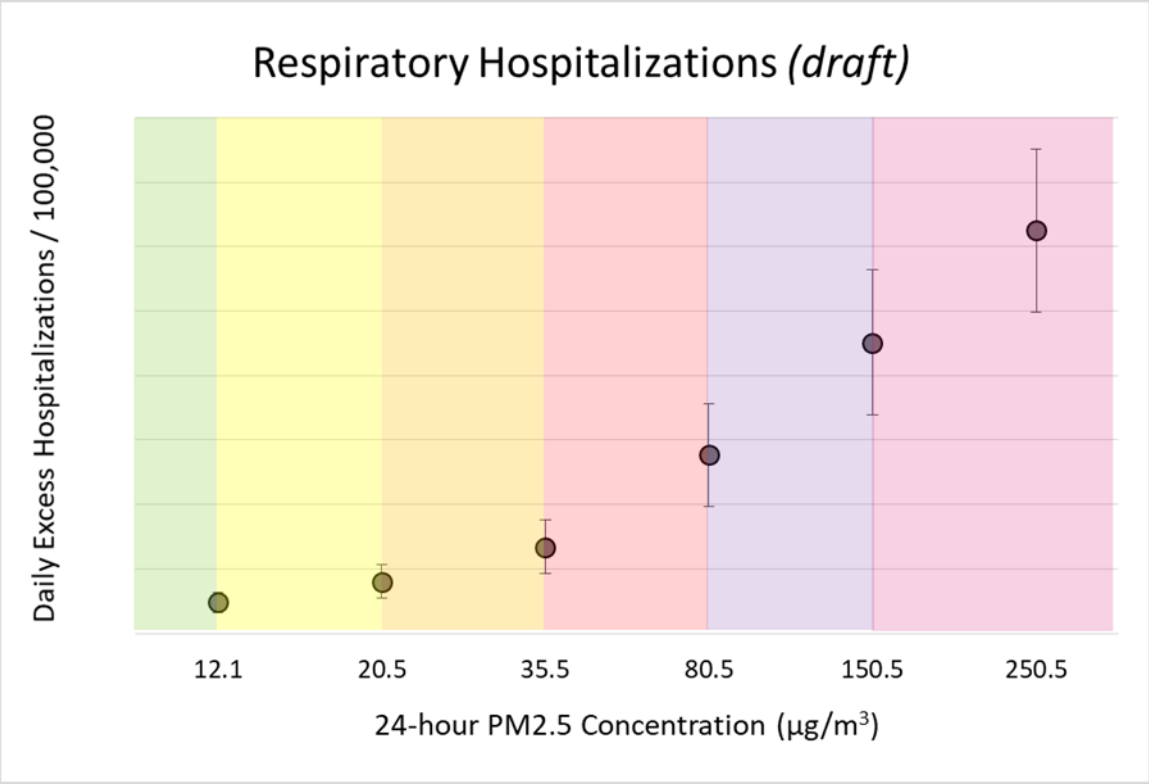


150 µg/m³



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

Preliminary estimates of excess hospitalizations attributed to wildfire smoke



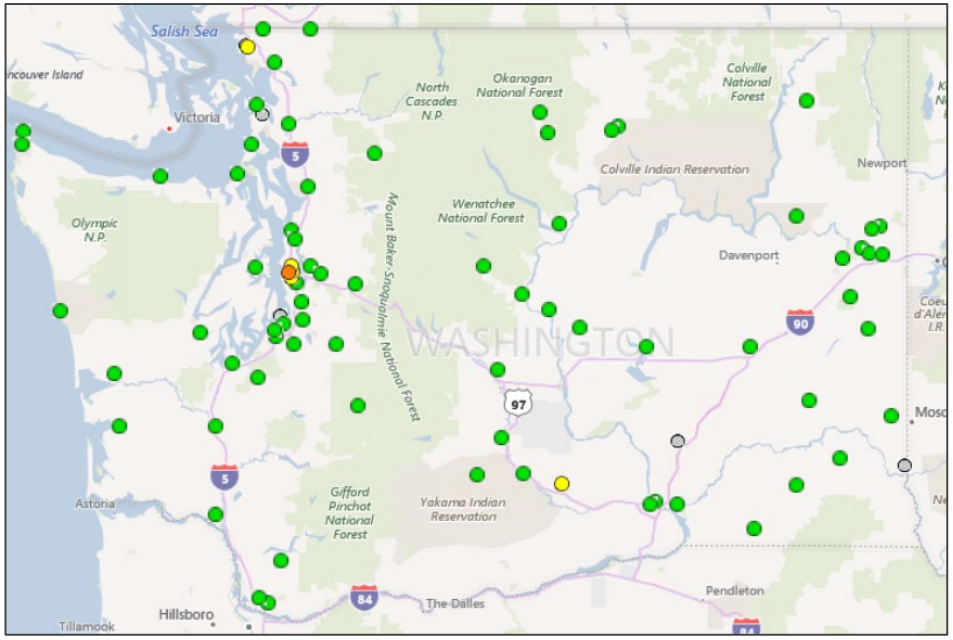
What is an acceptable level of risk?

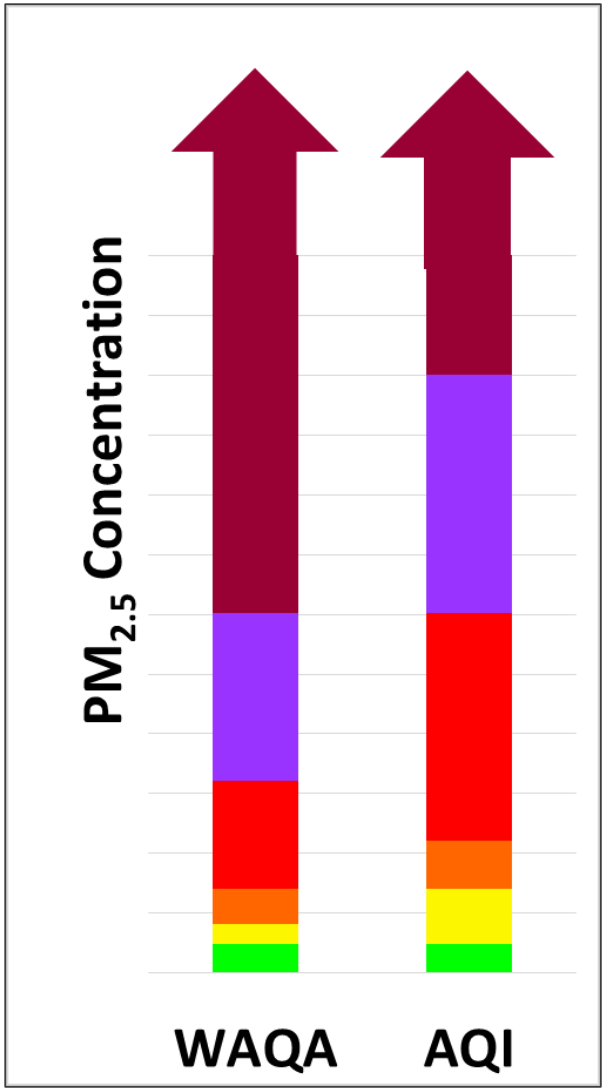
Risk Estimate Data Sources

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

Washington Air Quality Advisory (**WAQA**) vs. EPA's Air Quality Index (**AQI**)

WAQA designed to be more health protective





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

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 ar not cancelled, increase rest periods and substitutions to allow for lower breathing rate	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.

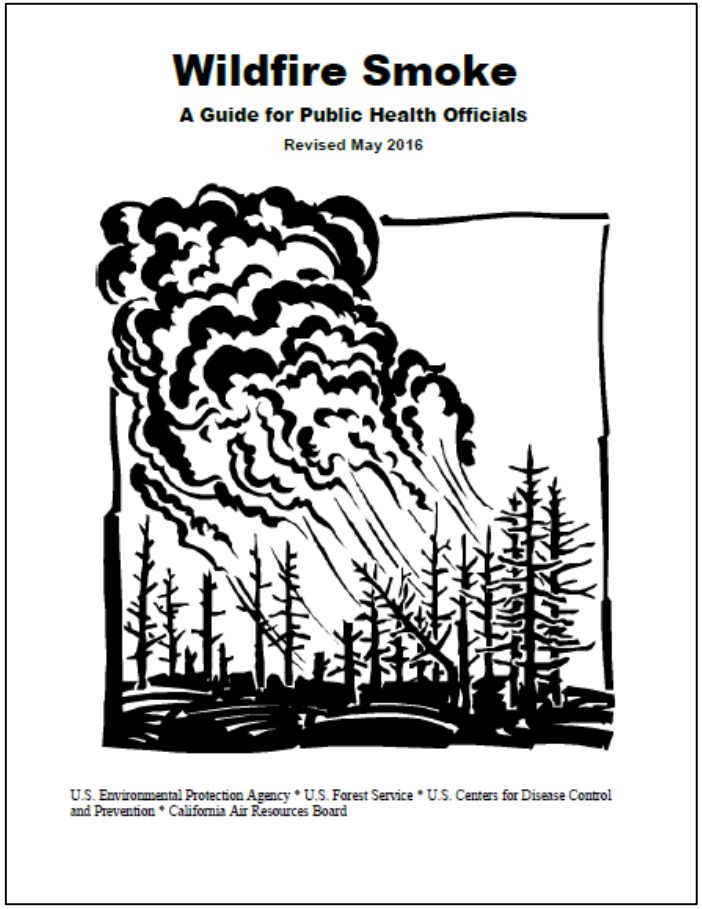
WAQA "Unhealthy" Category (>35.4 µg/m^3):

Cancel or move children's athletic events and practices to an area with good air quality

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

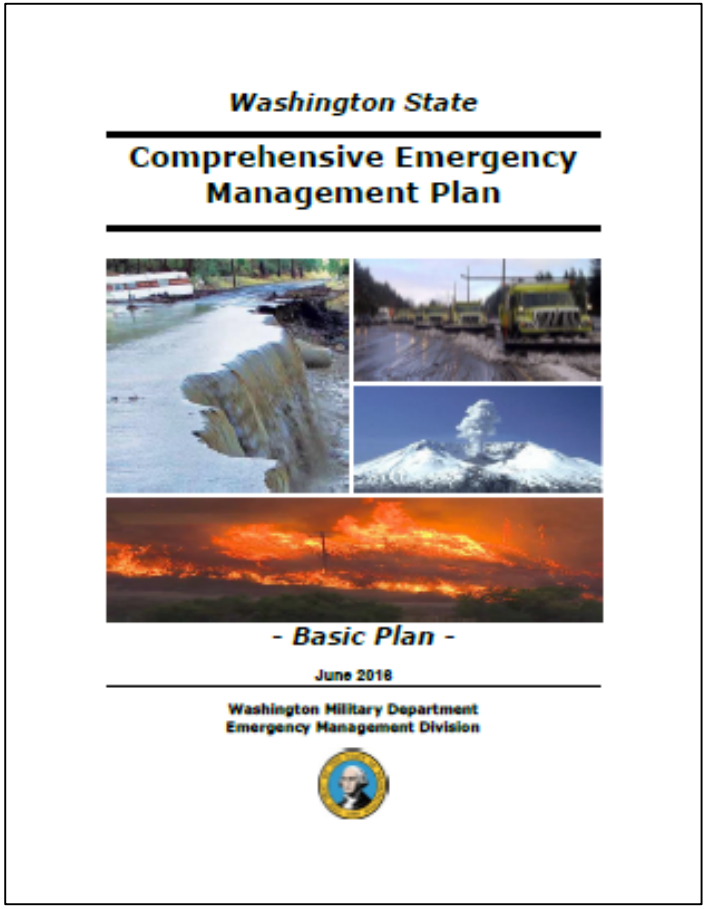
Existing wildfire smoke response guidance

US EPA & Other Agencies:



https://www3.epa.gov/airnow/wildfire_may2016.pdf

Washington State:



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 closures action levels

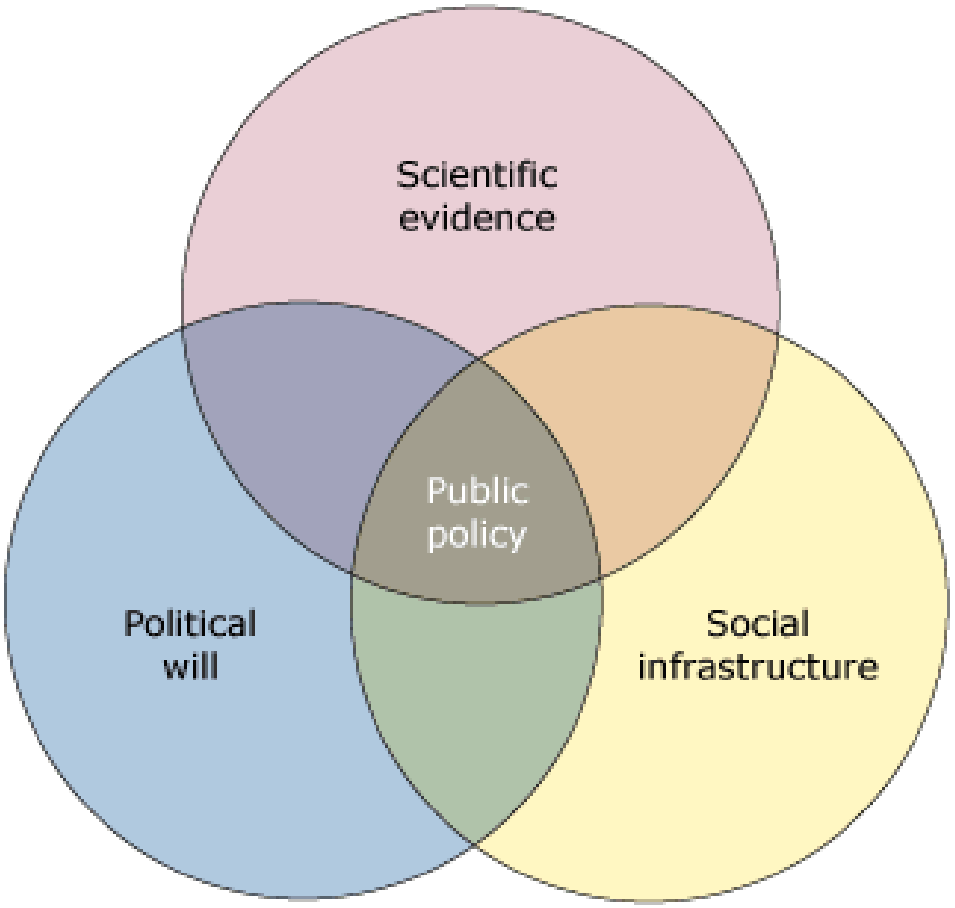
WA Comprehensive Emergency Management Plan with WAQA
(similar language in Wildfire Smoke Guide with AQI)

- 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

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

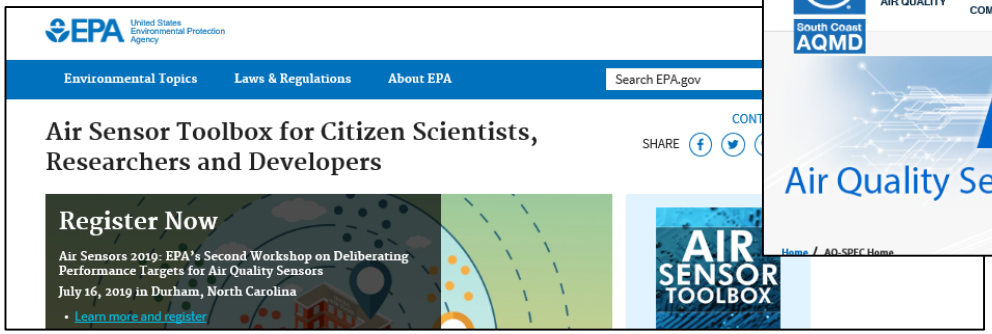
3 Sub Workgroups to address **3 Priorities** for the **2019 Wildfire Season**

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

Develop Air Measurement & Sensors Guidance Document

Build on existing resources

- EPA & South Coast AQMD



https://www.epa.gov/air-sensor-toolbox

http://www.aqmd.gov/aq-spec

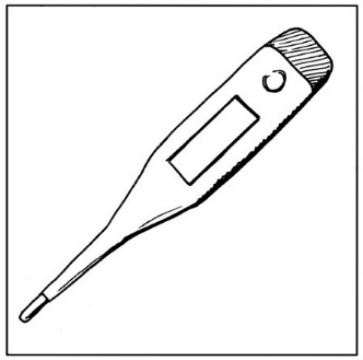
Assessment: Learn from those already using low cost sensors to manage health risks

- Best practices
- Research and validation work
- User-friendliness

Challenging Topics: Request for Research and Input

How do we balance the risk of heat impacts with the risk of smoke inhalation?

- Go indoors and close windows and doors
- Majority in Washington do not have air conditioners
  - Rely on open windows at night for cooling
- Current messages
  - "Be mindful of the heat"
  - "Use your judgement"
  - "Consider leaving the area or going somewhere else with AC"



How should guidance change when smoke events are LONG?

- If there is no active effort to reduce indoor PM with a portable air cleaner or filter in-line with HVAC, how long will $PM_{2.5}$ levels indoors typically stay less than outdoors in real-world homes?
  - Without an air cleaner, is there any benefit to staying indoors over a long period?
- Would it be reasonable to suggest individuals purchase their own low-cost sensors to track home indoor air quality?
- How do we address mental health issues?

With long smoke events, what is the impact of lost physical activity vs. avoided smoke exposure?

Enjoy the outdoors
People with health conditions limit time outdoors and strenuous outdoor activity
All sensitive groups limit time outdoors strenuous outdoor activity
Everyone limit time outdoors and strenuous outdoor activity, choose light indoor activity
Everyone stay indoors and avoid all strenuous activity
Everyone stay indoors and avoid all strenuous activity

VS.

Washington State in 2016*	Adults	10th Graders
Met national recommendations for aerobic activity	58%**	24%

** 2015 data

*Source: WA State Health Assessment 2018.
https://www.doh.wa.gov/Portals/1/Documents/1000/2018SHA_FullReport.pdf

Source: CDC/Amanda Mills

Source: Puget Sound Clean Air (video): http://www.pscleanair.org/525/DIY-Air-Filter

Source: Holly Myers, Yakima Health Dept

Growing list of questions and concerns

- How effective is closing schools and cancelling outdoor events & activities in reducing risk?
- Are there safety issues with DIY box fans with air filters attached?
- What do we recommend for homeless populations?
- Is there a real risk to children wearing N95 face masks (if they fit)?
- Does wearing a face mask increase risk for people with cardiopulmonary diseases?
- Is our risk communication improving public health?

Thank you!

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

Smoke from Fires Website:

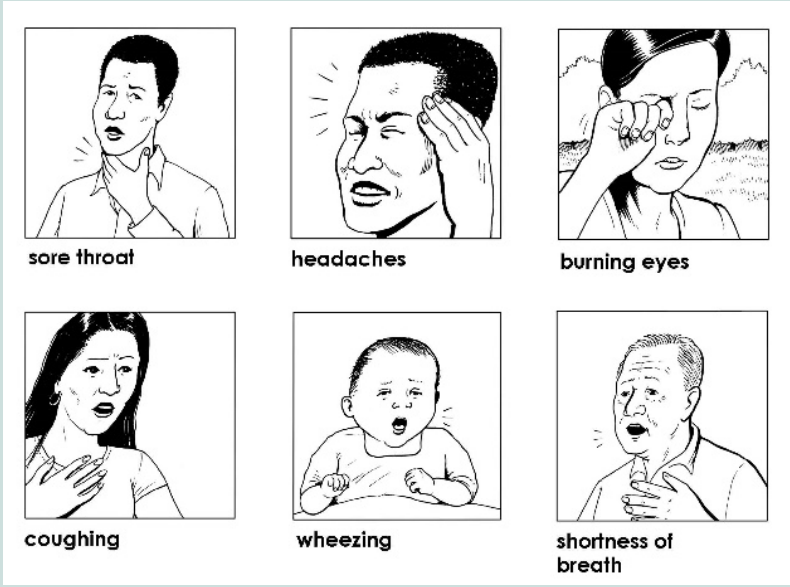
www.doh.wa.gov/smokefromfires

Washington State Department of Health

Extra Slides

Minor to deadly responses

- Eye irritation
- Cough, wheeze
- Cardiovascular morbidities
- Respiratory morbidities
- Overall increased hospitalizations & deaths



Fewer people suffer the most severe impacts

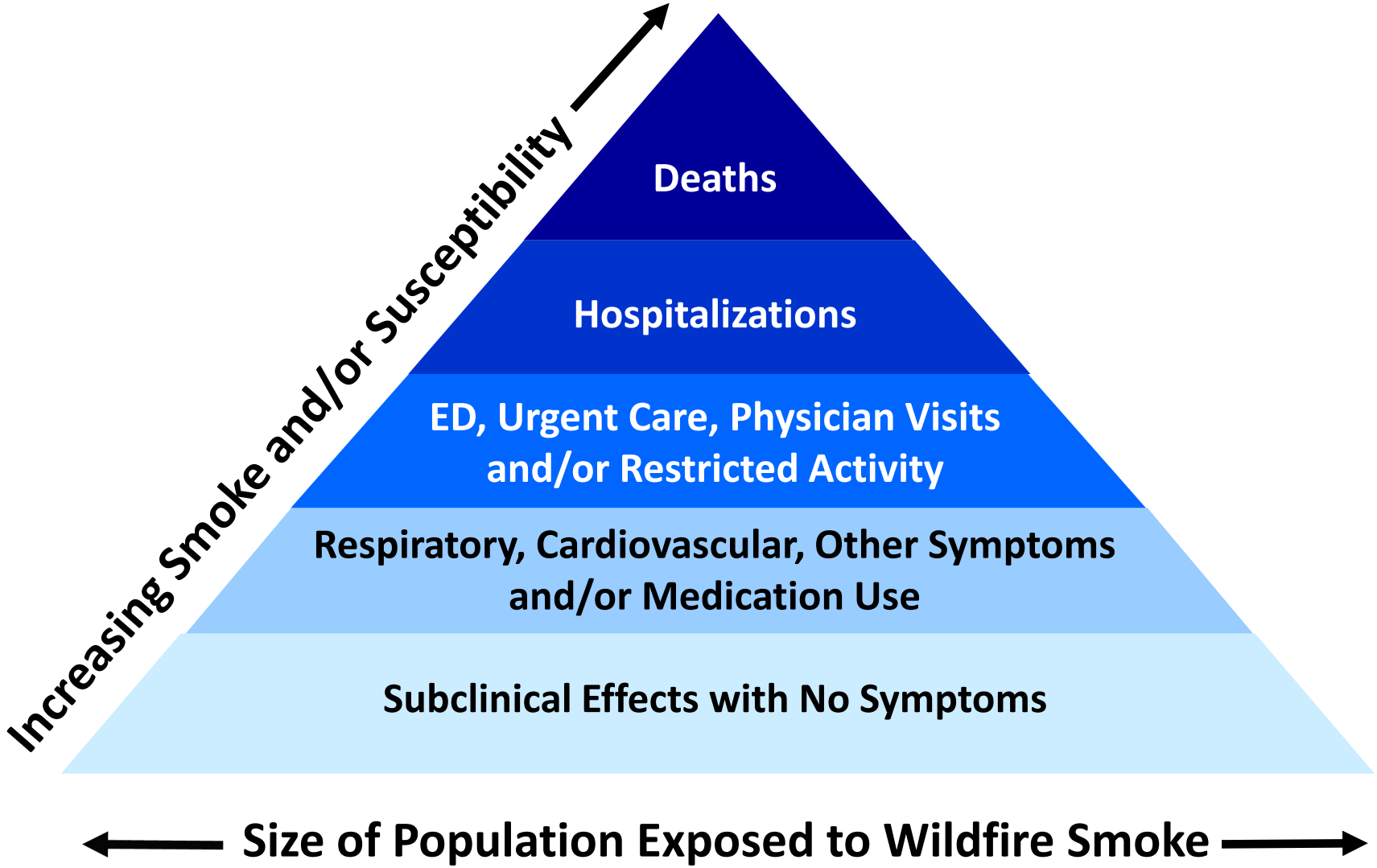


Figure Adapted from: Cascio et al. Sci total Env. 624: 2018

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

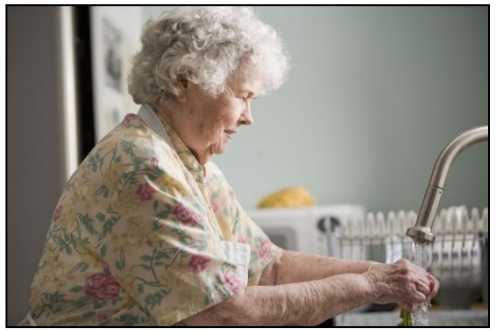


Photo credits: CDC/Dawn Arlotta 2009, www.pixabay.com

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