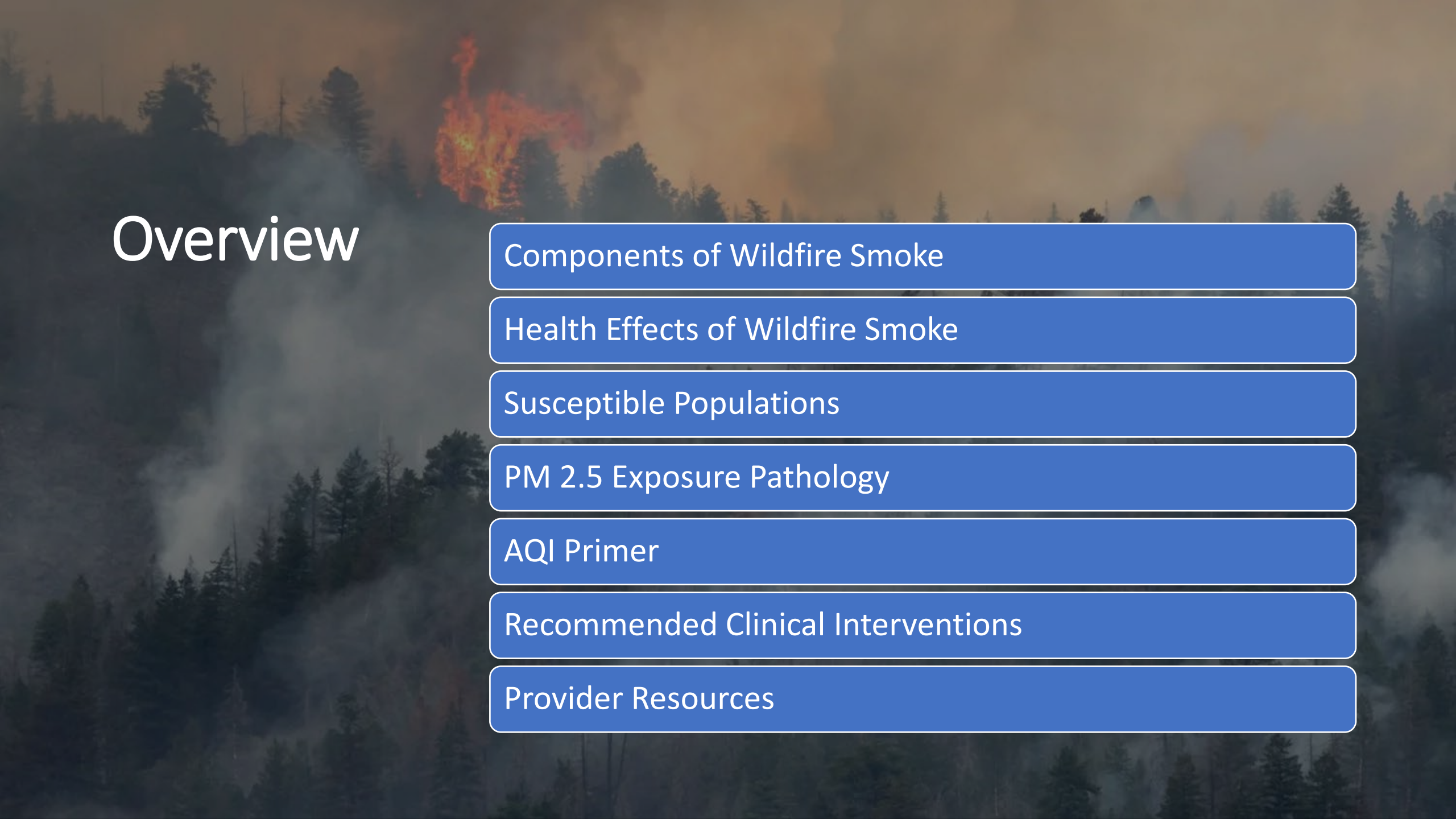
Wildfire Smoke & Health for Healthcare Providers

California Area Indian Health Service



Overview

- Components of Wildfire Smoke
- Health Effects of Wildfire Smoke
- Susceptible Populations
- PM 2.5 Exposure Pathology
- AQI Primer
- Recommended Clinical Interventions
- Provider Resources

Wildfire Smoke Components

Components of Wildfire Smoke

Wildfire smoke is a mixture of gases, particles and water vapor

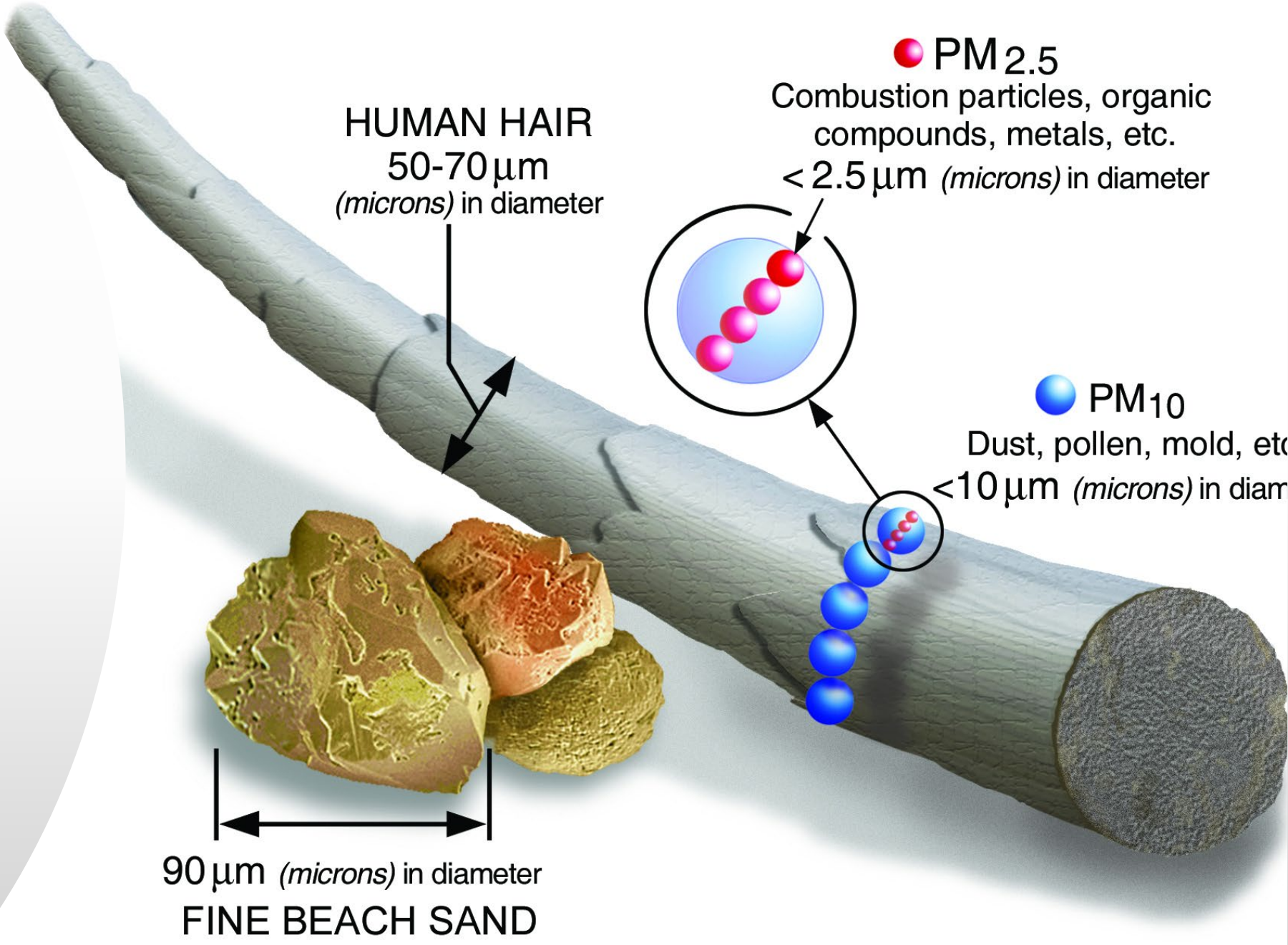
Fine particulate matter make up the bulk (90% by weight) of wildfire smoke

Some of the gases in wildfire smoke are dangerous and/or irritating

- Carbon Monoxide
- Ozone
- Volatile Organic Compounds

What is principle public health threat in wildfire smoke?

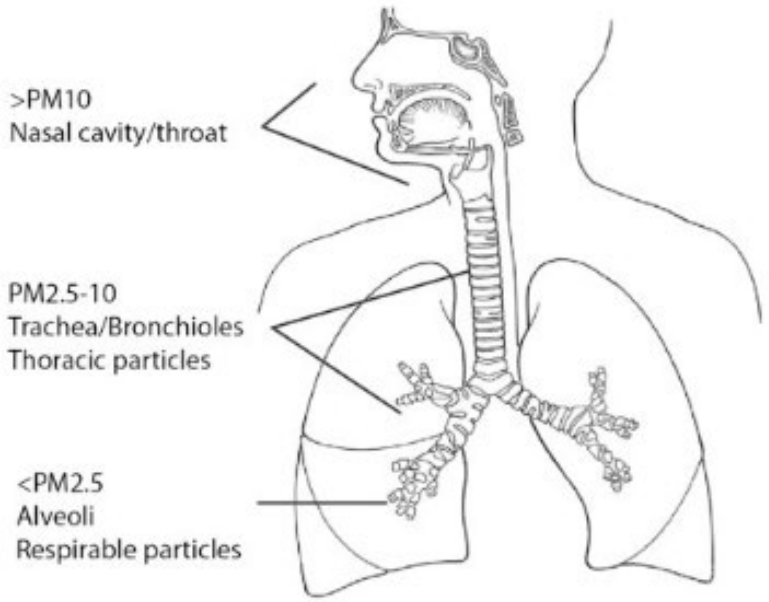
- **Particulate Matter (PM)**
  - 2 size groups:
    - PM 2.5 (90%)
    - PM 10 (10%)



Health Effects of Wildfire Smoke Exposure

Typical Symptoms of Short Term (i.e. daily) Wildfire Smoke Exposure

PM2.5 Exposure Pathology



- Particles 2.5 micrometers or smaller can travel deep into lungs and possibly enter bloodstream. This can lead to:
  - **Inflammation**
    - PM2.5 that enters blood can cause systemic inflammation and increased immune response.
      - Interleukin-6 production causes a cascade effect of other inflammatory factors leading to cell damage.
  - **Oxidative Stress**
    - PM2.5 increases Reactive Oxygen Species (ROS), which leads to reduced antioxidants.
      - Excessive ROS leads to cell damage, apoptosis, and carcinogenesis.
  - **Cell Apoptosis**
    - PM2.5 causes mitochondrial dysfunction and up-regulates production of apoptosis related proteins.

Synergistic effects with Heat

- Rahman et al. 2022
  - Study from 2014 to 2019, found that excess heat and PM 2.5 exposure had synergistic effect on mortality risk.
  - Exposure to both heat and particulate air pollution increased mortality risk by more than the sum of the increased mortality risk associated with each individual exposure to heat or smoke.
    - Mortality risk increased by over 21% on days with exposure to both heat and particulate air pollution.
  - Effect largely seen in patients over 75 years old.
- Novoselov, 2022
  - 42% of Californians were exposed to combo of extreme heat and PM 2.5 in 2020, with rural residents most affected.
  - Increasing number of smoke and extreme heat co-events have the potential to overwhelm health systems.
  - Public health guidance needs to take into account extreme heat and smoke co-exposures

Highly Susceptible Populations “Sensitive Groups”




For some groups of people wildfire smoke is more dangerous!

Sensitive and Very Sensitive People

Sensitive

Very Sensitive

PM2.5 Exposure Pathology

PM2.5 Exposure Pathology

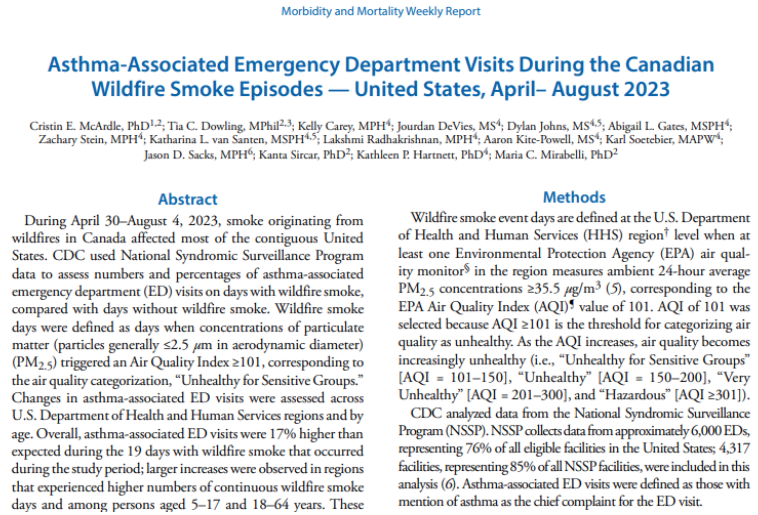
Short term exposure:

- Healthy Adults & Children Health Effects: eye/respiratory tract irritation, coughing, phlegm, chest tightness, difficulty breathing or shortness of breath with exertion.
- Sensitive Group Health Effects: aggravates lung disease, develop acute bronchitis and can trigger asthma attacks, heart attack, heart arrhythmias and stroke.

Long term exposure:

- Reduced lung function, chronic bronchitis, increased risk of heart and lung disease and cancer, premature death.
- Air pollution shortens lifespan by 1.5 years on average throughout the USA*.

*Source: Cardiovascular Research, Vol. 116, Issue 7, June 2020 pp.1334 https://academic.oup.com/cardiovascres/article/116/11/1910/5770885



Morbidity and Mortality Weekly Report

Asthma-Associated Emergency Department Visits During the Canadian Wildfire Smoke Episodes — United States, April– August 2023

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Abstract

During April 30–August 4, 2023, smoke originating from wildfires in Canada affected most of the contiguous United States. CDC used National Syndromic Surveillance Program data to assess numbers and percentages of asthma-associated emergency department (ED) visits on days with wildfire smoke, compared with days without wildfire smoke. Wildfire smoke days were defined as days when concentrations of particulate matter (particles generally ≤2.5 μm in aerodynamic diameter) ($PM_{2.5}$) triggered an Air Quality Index ≥101, corresponding to the air quality categorization, "Unhealthy for Sensitive Groups." Changes in asthma-associated ED visits were assessed across U.S. Department of Health and Human Services regions and by age. Overall, asthma-associated ED visits were 17% higher than expected during the 19 days with wildfire smoke that occurred during the study period; larger increases were observed in regions that experienced higher numbers of continuous wildfire smoke days and among persons aged 5–17 and 18–64 years. These

Methods

Wildfire smoke event days are defined at the U.S. Department of Health and Human Services (HHS) region† level when at least one Environmental Protection Agency (EPA) air quality monitor§ in the region measures ambient 24-hour average $PM_{2.5}$ concentrations ≥35.5 $\mu g/m^3$ (*5*), corresponding to the EPA Air Quality Index (AQI)¶ value of 101. AQI of 101 was selected because AQI ≥101 is the threshold for categorizing air quality as unhealthy. As the AQI increases, air quality becomes increasingly unhealthy (i.e., "Unhealthy for Sensitive Groups" [AQI = 101–150], "Unhealthy" [AQI = 150–200], "Very Unhealthy" [AQI = 201–300], and "Hazardous" [AQI ≥301]).

CDC analyzed data from the National Syndromic Surveillance Program (NSSP). NSSP collects data from approximately 6,000 EDs, representing 76% of all eligible facilities in the United States; 4,317 facilities, representing 85% of all NSSP facilities, were included in this analysis (*6*). Asthma-associated ED visits were defined as those with mention of asthma as the chief complaint for the ED visit.

Wildfire Smoke Exposure and Respiratory Disease:

- Effects include:
  - Breathing difficulties (e.g., coughing, wheezing, and chest tightness);
  - Exacerbations of chronic lung diseases (e.g., asthma and COPD);
    - Leading to increased medication usage, emergency department visits, and hospital admissions.
  - Increased risk for asthma attacks for children with asthma.
- Incidence
  - In US during 2023 Canadian wildfires saw 17% increase in ED asthma visit
  - 1999 Hoopa saw medical visits increase by 52% for respiratory illness during an active forest fire vs. the previous year

Wildfire smoke exposure of individuals with Cardiovascular Disease:

- Symptoms include palpitations, unusual fatigue or lightheadedness, shortness of breath, chest tightness, pain in chest, neck or shoulder.
- Triggering of ischemic events: angina pectoris, heart attacks, and stroke.
- Worsening heart failure
- Heart arrythmias and blood clot formation
- Leading to emergency department visits, hospital admissions, and even death.
- An estimated 130,000 premature deaths and 180,000 non-fatal heart attacks each year due to particulate pollution

Wildfire smoke exposure of Pregnant Women:

- Higher risk of preterm birth and lower birth weight in unborn baby.
  - Effects are similar to smoking commercial tobacco during pregnancy.

Wildfire Smoke Exposure and AI/AN Communities

Greater exposure to wildfire smoke due to less access to measures to reduce exposure

Higher likelihood of untreated or insufficiently treated health conditions

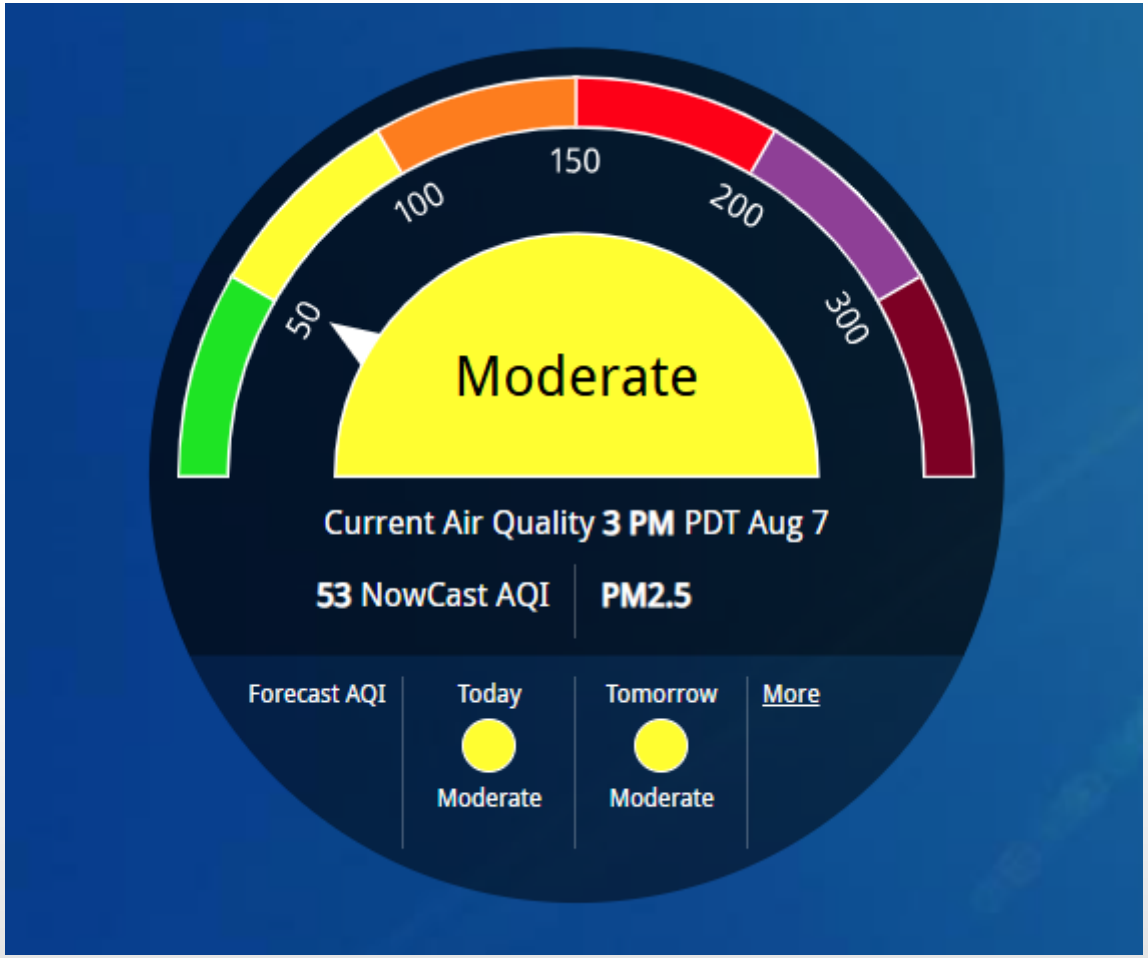
Increase risk of exacerbation of heart and lung diseases leading to ED visits, hospital admissions and even death

How much smoke is too much?

AQI Primer

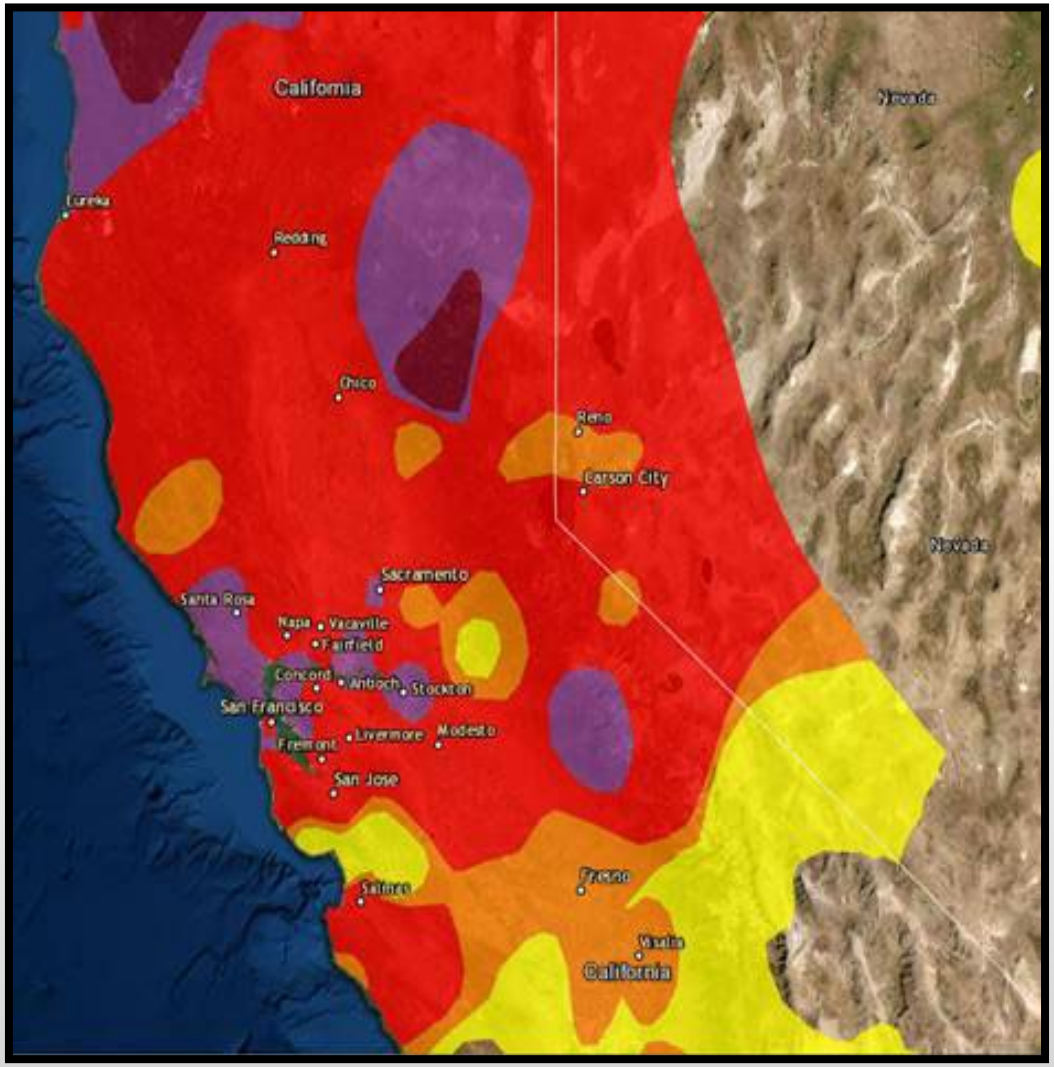
What is the Air Quality Index?

- AQI tells you how safe the air is to breath.
  - Index numbers are linked to the amount of PM 2.5 found in the air
- The higher the AQI number the greater the amount of wildfire smoke is in the air
- AQI also uses color to indicate how safe the air is
  - Color ranges from green to maroon



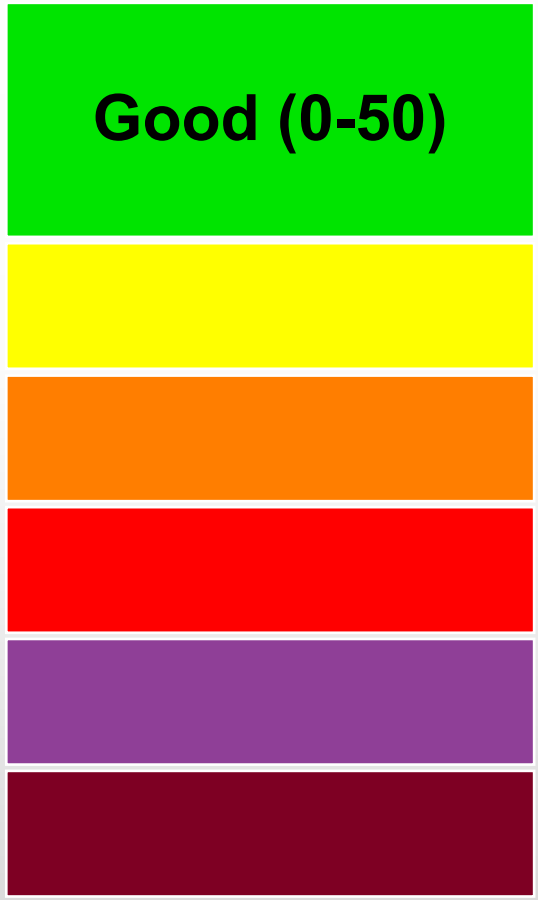
If there is a fire in your area:

- Check the AQI for your area
- Sources for AQI information:
  - Local TV/Radio weather broadcast
  - Local Air Quality Management District
    - **Will have the most site specific information for your area**
    - **https://ww2.arb.ca.gov/california-air-districts**
  - Visit fire.airnow.gov
    - Show most current PM 2.5 AQI levels.
    - Includes data from purple air monitors



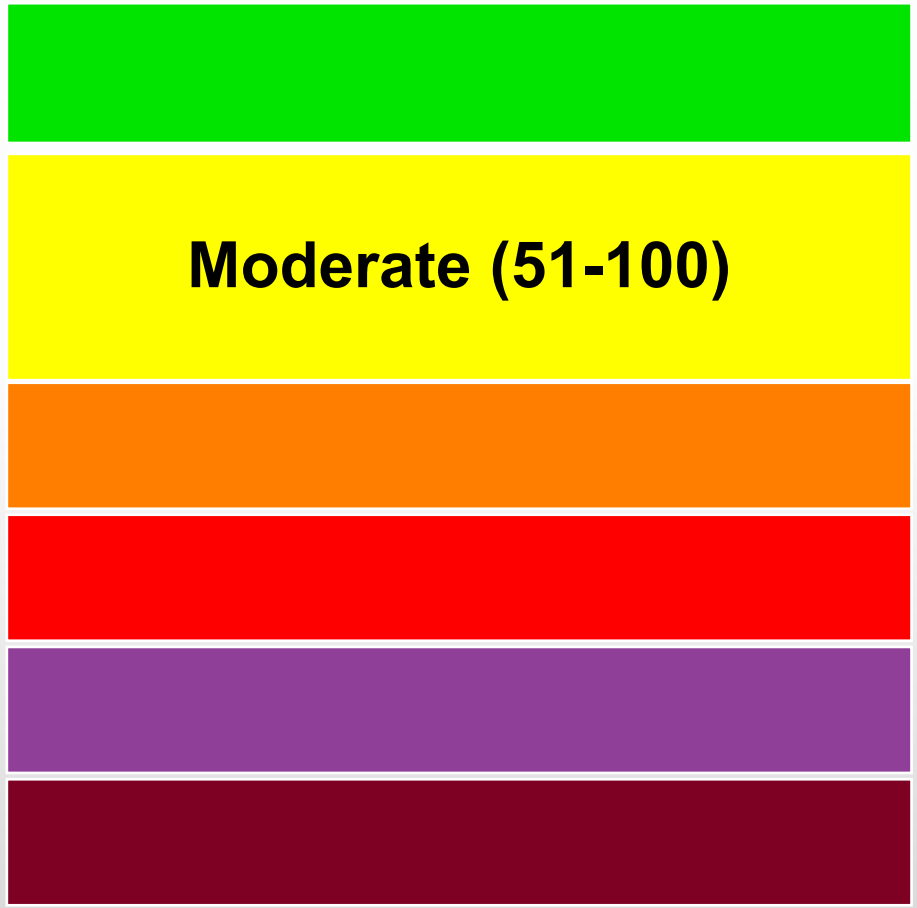
Northern California Air Quality per AirNow.gov 9/11/2020

What does it mean when the AQI is green?



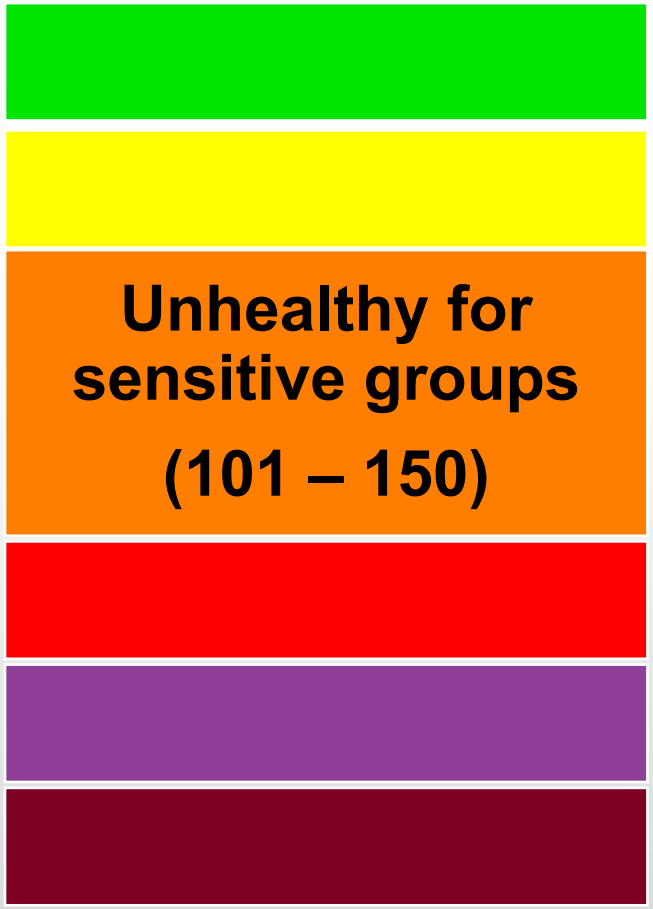
What does this mean?	Actions to take
Air quality is healthy for everyone	None. It's a great day to be outside.

What does it mean when the AQI is yellow?



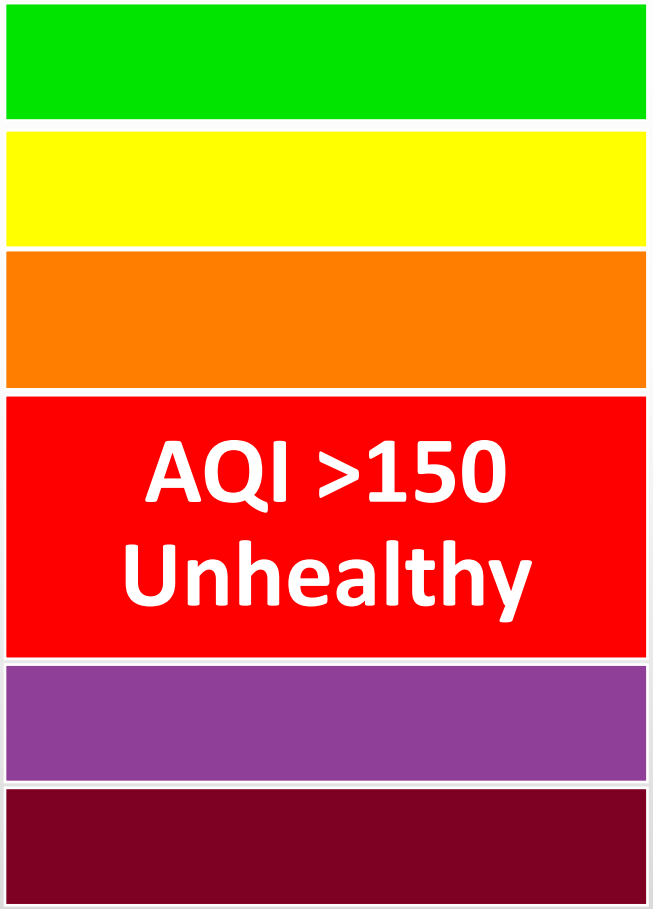
What does this mean?	Actions to take
Air quality can be harmful to very sensitive groups	Very sensitive groups should spend less time outdoors and avoid strenuous outdoor activities

What does it mean when the AQI is orange?



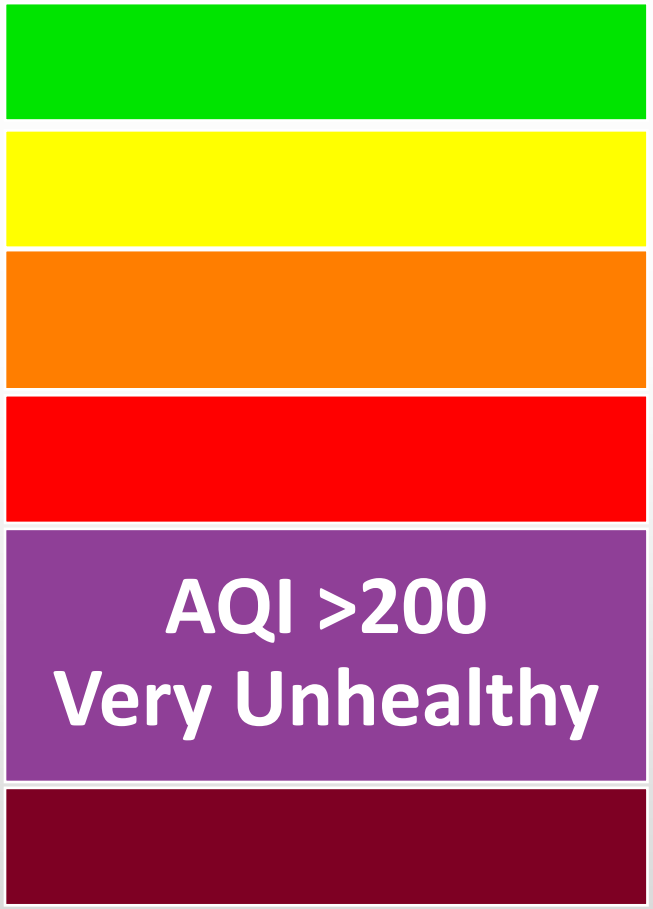
What does this mean?	Actions to take
Air quality can be dangerous for sensitive groups	Sensitive groups should avoid strenuous outdoor activities, limit time outdoors and wear a mask

What does it mean when the AQI is red?



What does this mean?	Actions to take
Air quality is unhealthy for all groups	• Everyone should limit strenuous outdoor activities • Everyone should limit time outdoors • Wear a mask when outdoors • Sensitive groups should stay inside a “clean room” at home • Avoid vacuuming, burning candles, frying/broiling foods, gas range, aerosol sprays, fireplaces, wood burning stove • Do not run window fans • Set AC to recirculate in home and vehicle

What does it mean when the AQI is purple?



What does this mean?	Actions to take
Air quality is very unhealthy for all groups	• Everyone should avoid strenuous outdoor activity • Stay indoors preferably in a space with filtered air • Everyone should wear a mask when outdoors

What does it mean when the AQI is maroon?

What does this mean?	Actions to take
Air quality is dangerous for all groups	• Everyone should stay indoors • Limit time outdoors to essential activities • Use a portable air cleaner-- *especially if family members have conditions such as asthma or heart/lung disease* • If symptomatic seek medical attention. • If you are unable to create a clean room in your home evacuate to a cleaner air shelter or leave the area

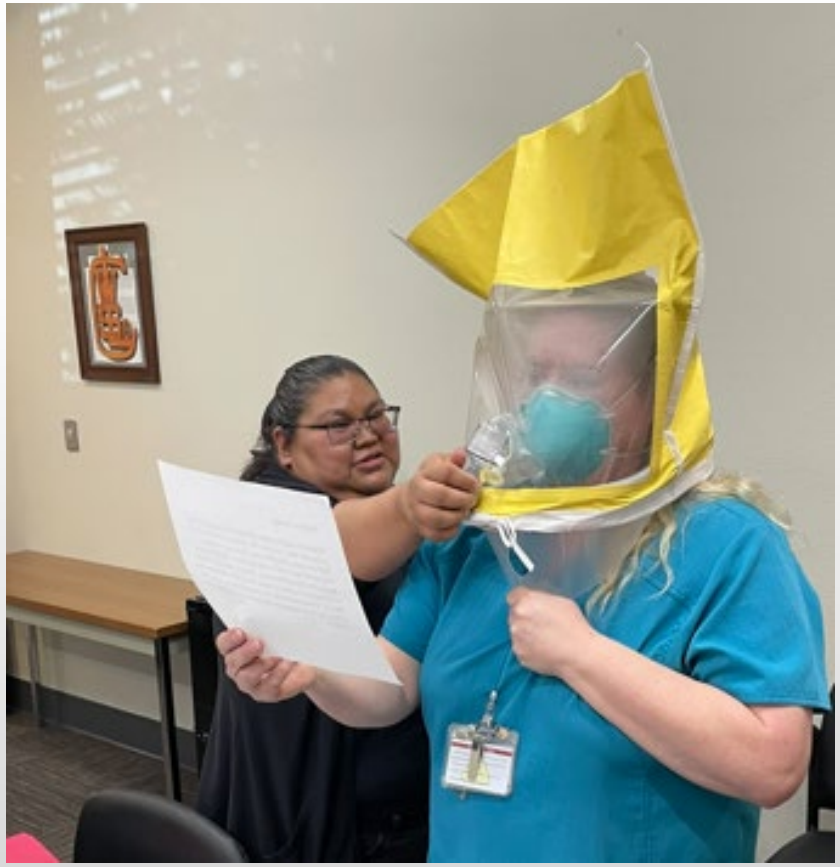
Wildfire Smoke Workplace Guidance

- **Cal OSHA has rules for workers working outdoors when wildfire smoke is present**
  - **Supervisors are to monitor AQI during wildfire season**
  - **When AQI > 150 (Unhealthy):**
    - Outdoor work should be limited
    - Ensure exposure does **not exceed 1 hour (cumulative) per day**
    - Voluntary use of N95 by workers
      - Users need to sign voluntary use agreement per OSHA Respiratory Standard
      - Supervisors are to encourage their use

When the AQI is Dangerous:

Respiratory protection is required per Cal OSHA if AQI > 500 (Dangerous)

- User must be part of Respiratory Protection Plan if mandated to wear a respirator
  - Have a physician complete a medical evaluation
  - Respiratory Hazard Analysis must be completed
    - ID task, exposure hazard, type PPE assigned
  - User must be fit tested for the N95 (by brand/model) they are provided
  - Documentation must be filed with the Safety Officer
    - Medical evaluation, hazard analysis, fit test results for each user



Recommended Clinical Interventions

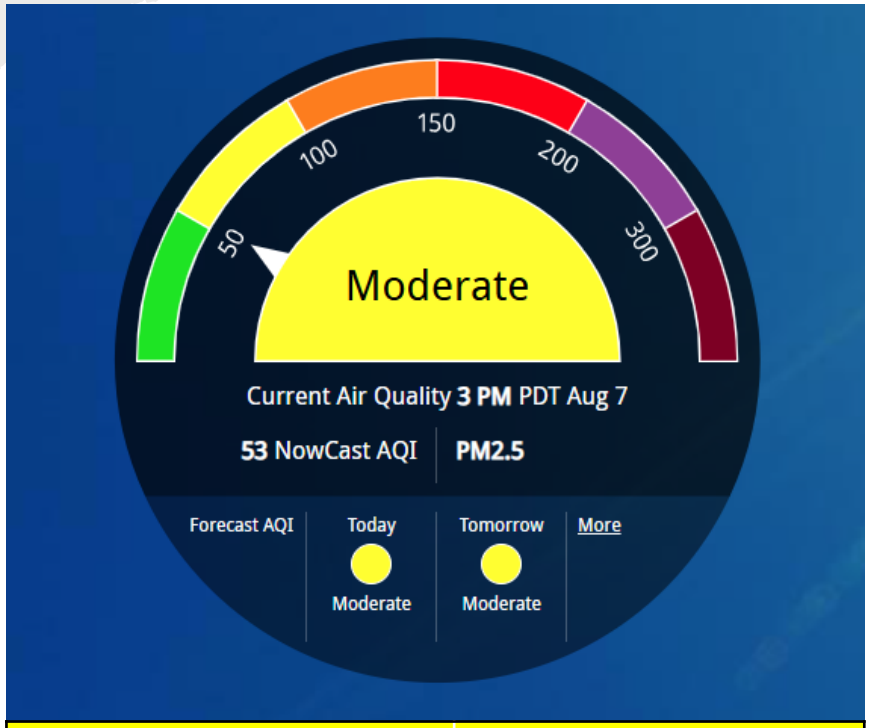
Recommended Clinical Interventions

1. Establish a Wildfire Action Plan with High-Risk Patients.

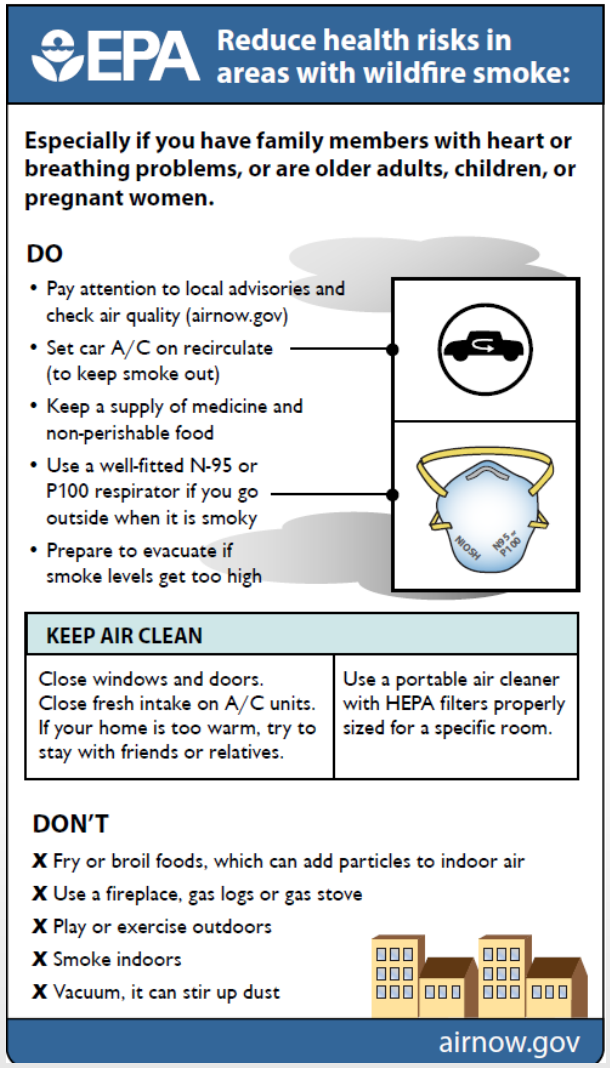
- Plan that ensures patients understand risks present
- Assesses their ability to access AQI information and understand it
- Home assessment for indoor air pollution sources – help create a plan for their specific environment to reduce exposure
- Create a tailored plan of action for each AQI category for their specific condition
- Create a tailored plan for evacuation

Recommended Clinical Interventions

2. **Establish a Communication Plan**.
   - Public health officials should communicate the health threat with their community during a wildfire event. Your communication plan should address:
     - Who should be given specific information.
     - What information will be provided:
       - Assemble a library of infographics and flyers to alert the public during wildfire smoke events
       - Decision Guidance for closure of schools and cancelation of outdoor activities/events.
     - When information will be delivered.
     - What communication channels will be used.



What does this mean?	Actions to take
Air quality can be harmful to very sensitive groups	Very sensitive groups should spend less time outdoors and avoid strenuous outdoor activities



Smoky Air from Fires

The Five Most Important Tips to Protect Yourself and Your Family

1. Pay attention to air quality reports on radio, TV or in the newspaper and follow instructions about outdoor activities and safety measures.
2. If you are advised to stay indoors, keep indoor air as clean as possible. Keep windows and doors closed. If you don't have an air conditioner and it is too hot with the windows closed, consider visiting the mall, the library, or a place with air conditioning for temporary relief.
3. Keep car windows closed while driving and run the air conditioner on the inside air setting.
4. Drink plenty of water.
5. Follow your doctor's advice about medicines and about managing your health conditions. Call your doctor if your symptoms worsen. Keep at least a five day supply of medication on hand.

Important to Remember

- Children, the elderly, pregnant women and people with lung and heart problems are more likely to be affected by health threats from smoke.
- Dust masks are not effective against wildfire smoke.

Air Conditioning and Swamp Cooler Information

Run an air conditioner if you have one, but keep any fresh air intake closed and filter clean to prevent outdoor smoke from getting inside. If you see heavy, visible smoke outside, do not use a swamp cooler.

Wildfire Evacuation

If you are evacuated, be prepared to be away from your home for an undetermined amount of time. Be sure to take:

- Vital records (birth certificates, marriage license, etc.)
- Medications and prescription eyeglasses
- Pets

Drive carefully when visibility is reduced because of smoke, and remember that fire crews are working hard to put out fires. Be courteous and do not go sight-seeing in evacuated areas.

Assemble a library of wildfire smoke public health education material

Assemble library of infographics for use in social media

Recommended Interventions

3. HEPA Air Purifier Distribution Programs:

Prioritize distribution to Sensitive and Very Sensitive Groups in your community

4. N95 Distribution:

Include don/doff training or distribution of handouts on proper donning.

A word about Masks

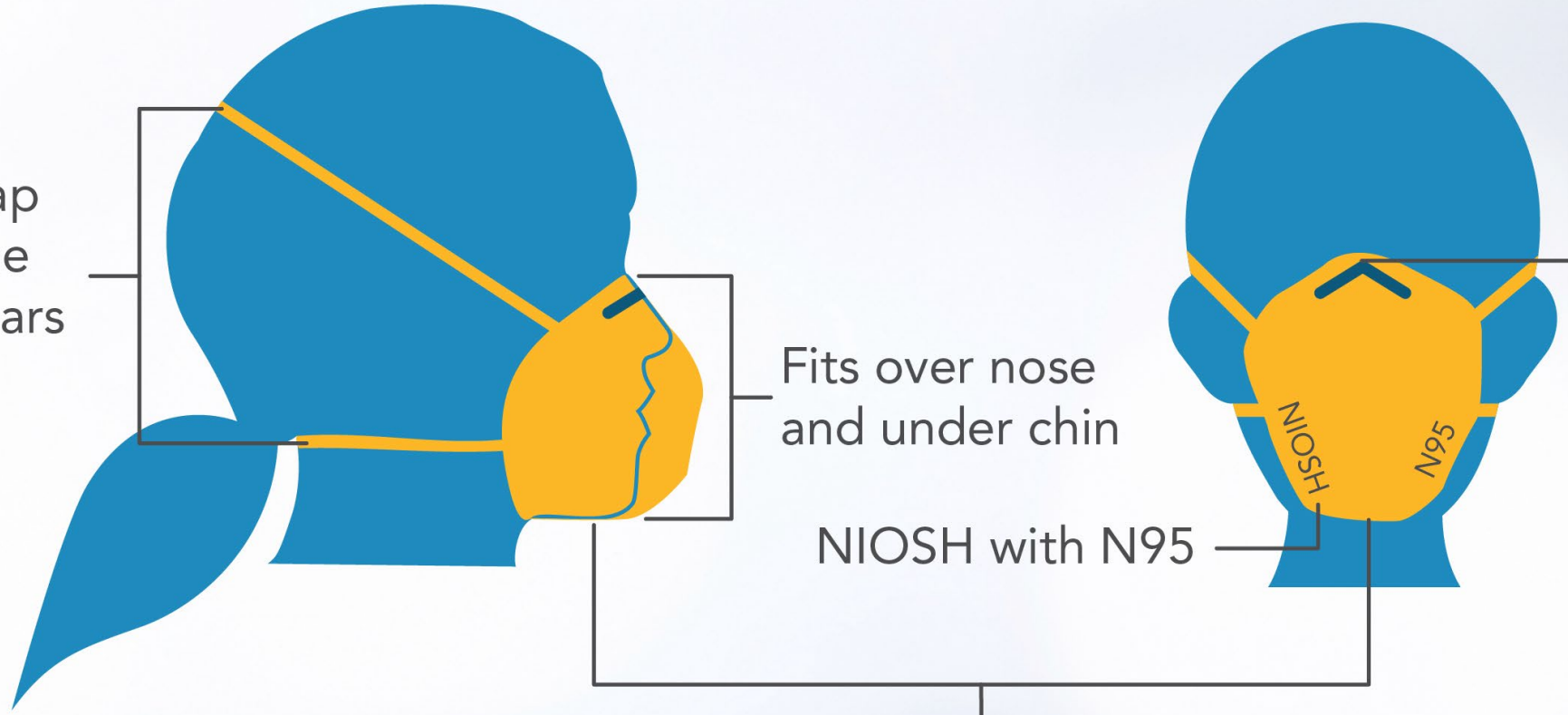
Dust masks (paper masks) or masks with one strap or two straps that loop around the ear will not protect from PM2.5.

- Will not produce a snug fit or do not have needed filtering capabilities.

N95 respirator should have 2 straps that go around the head for a proper fit

Wear N95 Masks Correctly

Use **N95** respirator masks marked **NIOSH** for the best protection against smoke



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Recommended Clinical Interventions

5. **During High Smoke Events (AQI above 100 for more than a few days):**

   - Monitor healthcare capacity and plan for facility surge due to asthma, COPD, and metabolic and cardiovascular disease exacerbations.

   - Proactively counsel patients on strategies to avoid or reduce smoke exposure, especially among individuals with asthma, COPD, or cardiovascular disease, children, older adults, and those who are pregnant.

   - Counsel High Risk patients to monitor their symptoms and have adequate stores of medications.
     - Advise to have at least a 1 week supply on hand.

Recommended Clinical Interventions

6. For prolonged smoke events (lasting more than a few days) partner with other agencies/organizations to provide spaces with cleaner air for the public to go during the day.

Provider Resources

Provider Resources

- Wildfire Smoke: A Guide for Public Health Officials
  - Has 5 Chapters that cover Wildfire Smoke Health Effects, Composition and Air Quality Impacts, Strategies to Reduce Exposure, Communication Strategies during Smoke Events, and Recommendations for Public Health Officials.

- EPA Online Training for Health Professionals
  - Wildfire Smoke and Your Patients' Health Online Training
  - Particle Pollution and Your Patients' Health Online Training
  - Other Health Care Professional Resources

- Wildfires and Health for Providers Factsheet
  - is a factsheet to help explain wildfire smoke health effects to patients

- Establishing a Wildfire Action Plan for Providers
  - a guide that can be used to help create a wildfire action plan for patients.

- **Reach out to your local IHS Environmental Health Officer for copies of handouts or other resources mentioned in this presentation.**

CADEHS Contacts

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