EPA Tools and Resources webinar

Public Health Impact of Wildfire Emissions:
Update on the Wildfire Smoke Guide, Public Health Information and Communications Research

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Webinar Overview

Provide an update of:

- Wildfire smoke health facts relevant to public health
- 2017 Wildfire Smoke: Guide for Public Health Officials
- CME course “Air Particle Pollution and Your Patient’s Health”
- New EPA Wildland Fire Research website
- SmokeSense app
- Wildland Fire Sensor Challenge

Conflict of Interest Statement:
Wayne Cascio, MD, FACC
No conflicts of interest. The presentation represents the opinions of the speaker and does not necessarily represent the policies of the US EPA.
Wildfire Smoke and Health Effects
Health Effects of Wildfire Smoke
Systematic Reviews are Now Available


Environ Health Perspect. 2016; 124:1334–1343
Health effects known or suspected to be caused by wildland fire smoke:

- All-cause mortality
- Asthma & chronic obstructive pulmonary disease (COPD) exacerbations
- Bronchitis & pneumonia
- Childhood respiratory disease
- Cardiovascular outcomes
- Adverse birth outcomes
- Symptoms such as eye irritation, sore throat, wheeze and cough

Source: Studies reviewed in Liu et al 2015
Wildfire in the U.S.
Acreage Burned in the U.S. Annually

Present Concerns

✧ Increasing acreage burned

✧ Increasing impact on urban areas:
  
  • 10% of all land with housing is situated in the wildland-urban interface (WUI)
  
  • 38.5% of U.S. housing units (Radeloff et al. 2005)
  
  • >4,000 acres/day converted to WUI

✧ Increased vulnerability of populations

Adapted from https://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html
Wildland Fires & Their Emissions
A Community Public Health Issue
Large Wildland Fires are Costly
Estimating Health-Related Costs

- Burned 40K acres of peat bogs
- $20M in suppression efforts, 2 billion gallons of water, 202 days
- Cost of excess ED visits for asthma and heart failure ~ $1 million
- Additional estimates of health costs
  - 4.4 premature deaths
  - 31 non-fatal heart attacks
  - 41 bronchitis & 810 asthma attacks
  - 530 lower respiratory symptoms
  - 769 upper respiratory symptoms
  - 3,700 work days lost
- Health & death-related costs $48.4 million

Satellite image showing the location of Evans Road Fire in the Pocosin Lakes National Wildlife Refuge, NC


Who’s at Risk from Smoke?

Susceptible populations include –

• Pregnant women and fetuses
• Children
• Older populations
• Populations with pre-existing respiratory disease
• Populations with pre-existing cardiovascular disease

27% of U.S. population is at-risk

Populations suspected to be at greater risk –

• Populations with chronic inflammatory diseases (e.g., diabetes, obesity)
• Women, African-Americans and populations with lower socio-economic status*

Changing U.S. Demographic

• U.S. population will continue to:
  - Grow
  - Median age will shift upward

Higher Prevalence of Chronic Diseases Conferring Risk to Wildland Fire Smoke

• Aging U.S. population with increasing prevalence of:
  - Heart-lung disease, obesity, diabetes
Changing U.S. Demographic

- U.S. population will continue to:
  - Grow
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Higher Prevalence of Chronic Diseases Conferring Risk to Wildland Fire Smoke

- Aging U.S. population with increasing prevalence of:
  - Heart-lung disease, obesity, diabetes

Projected U.S. Population - 2060

Xu J, Murphy SL, Kochanek DK, Arias E. NCHS Data Brief No. 267, 2016
Annual average daily fire-PM$_{2.5}$ footprint for U.S. counties

How much does smoke contribute to air quality and how often does it lead to exceeding daily standard?

Health protective standards
- Annual: 12 μg/m$^3$ daily avg.
- Daily: 35 μg/m$^3$

# of days with fire-PM$_{2.5}$ above 35 μg/m$^3$ by counties of continental U.S.
National map of community-health vulnerability index and air pollution awareness to adverse health effects

Factors of Vulnerability
- Peds & Adult Asthma
- COPD
- Obesity
- Diabetes
- Hypertension
- % population age 65+
- Income, education, poverty, unemployment
• **Fraction of the population with an admission attributable to wildfire smoke is small**

• Interventions projected to prevent 11% to 63% of the hospital admissions and 7% to 39% of the deaths attributable to wildfire particles

• Estimated economic value of the prevented deaths exceed or **far** exceed intervention costs for interventions that do not use portable air cleaners

• For portable air cleaner use, mortality-related economic benefits exceed intervention costs

• **Cost effectiveness improved by intervening only in the homes of older people who experience most of the health effects of particles from wildfires**
Wildfire Smoke and Public Health Information
AirNow (www.AirNow.gov)
Fires: Current Conditions Page

- Current Smoke Map generated by NOAA HMS
- Current Advisories – State/Local/Tribal agency blogs and Wildland Fire Air Quality Response Program
Wildfire Smoke Guide 2016

- Primarily a federal/California document; housed on AirNow website
- Updated air quality and health information
- Evidenced-based exposure reduction measures
- Entirely new section on communicating air quality
  - Uses “Current Particulate Matter (PM)” levels from AirNow
  - Uses satellite information on Fires: Current Conditions page
  - Visual range information updated
- PEHSU fact sheets about children’s health, 2011
- Information about new interagency Wildland Fire Air Quality Response Program

https://www3.epa.gov/airnow/wildfire_may2016.pdf
New Wildfire Smoke Guide 2017
Coming in Late Summer/Fall

- Updated look
- Addition of ozone
- Smoke vs. urban particles
- Add sections
  - PM web course
  - Sensors
  - Ash clean-up
- Stand-alone fact sheets
  - Children
  - Older adults
  - Pets/livestock
  - Preseason preparedness
  - Exposure reduction
  - Respirator use
  - Ash clean-up
  - Know when to evacuate
Wildfire Smoke Guide 2017
Example Draft Fact Sheets

Wildfire Smoke Factsheet
Prepare for Fire Season

If you live in an area that is regularly affected by smoke or where the wildfire risk is high, take steps to prepare for the season. Know how to get ready before a wildfire and know how to protect yourself from smoke exposure during a wildfire.

Prepare Before a Wildfire
- Stock up on food, water, and supplies you will need in case you are unable to leave your home.
- If you have heart or lung disease, check with your doctor about what you should do during smoke events.
- If you have asthma or another lung disease, consult your respiratory management plan.
- Have a supply of N95 masks and learn how to use them. They are available at many home improvement stores and online.
- Organize your important items and know where they are stored.
- Understand how you will receive alerts and health warnings, including air quality reports and public service announcements, and local evacuation routes.

Exposure to Particle Pollutants
- Indoor sources of particulate matter (PM) come from combustion events such as smoking, cooking, and wood-burning. During a wildfire, outdoor PM can increase indoor PM levels. Good ventilation can help keep indoor levels lower. Reduced ventilation can increase indoor PM levels.

Filtration Options
- There are two effective options for improving indoor air filtration: using a portable air cleaner or using high-efficiency portable air cleaning appliances. Before discussing filtration options, it is important to understand the basics of filter efficiency.
- Filter Efficiency: The most common standard for filter efficiency is the Minimum Efficiency Reporting Value (MERV) rating. The MERV rating for residential filters ranges from 1 to 12. The higher the MERV, the greater the percentage of particles captured as the air passes through the filter media. 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 and cooling system of the home can effectively reduce indoor PM. A home typically will have a low MERV (1-4).

Portable Air Cleaner
- A portable air cleaner is a small appliance that can be placed in a room to improve indoor air quality. Portable air cleaners can be effective at removing PM from the air, but they can also be expensive and require ongoing maintenance.

Recommendations
- Plan ahead and be prepared. Stock up on food, water, and supplies you will need in case you are unable to leave your home.
- Have a supply of N95 masks and learn how to use them. They are available at many home improvement stores and online.
- Organize your important items and know where they are stored.
- Understand how you will receive alerts and health warnings, including air quality reports and public service announcements, and local evacuation routes.

Wildfire Factsheets Under Development
Original PEHSU Wildfire Factsheet available at: http://www.pehsu.net/cgi/page.cgi/resources.html
Particle Pollution and Your Patients’ Health

Applied for continuing education credit from CDC for physicians, nurses and health educators

https://www.epa.gov/pm-and-your-patients-health/patient-education-tools
Particle Pollution and Your Patients’ Health is a short, evidence-based training course that:

- Describes the biological mechanisms for cardiovascular and respiratory health effects with particle pollution exposure
- Helps health-care providers advise their patients about particle pollution exposure
- Provides practical education tools to help patients understand how particle pollution exposure can affect their health and how to use Air Quality Index to protect health

Particle Pollution and Your Patients' Health is designed for:

- Diverse range of physicians
- Nurses and nurse practitioners
- Public health officials/practitioners
- Asthma educators
- Other medical professionals who counsel patients about lung, heart or vascular disease
What is Particle Pollution?

On this page:
- What is particle pollution and what types of particles are a health concern?
- Where does particle pollution come from?
- Where and when is particle pollution a problem?

What is particle pollution and what types of particles are a health concern?

Particle pollution refers to particles in the air, which can be made up of solid, liquid, or a combination of both substances. They can be single chemicals, soot, or pollen spores.

The air we breathe is contaminated with dust, dirt, soot, and other particulate matter that can be harmful. Some of these particles can only be detected with instruments, but others are visible to the naked eye.

Your patients who are concerned about the health effects of particle pollution and who are diagnosed with respiratory and cardiovascular conditions should be informed about the effects of having an air filter in their homes. This can help reduce the exposure to indoor pollutants, which can cause respiratory and cardiovascular disease.

Once inhaled, these particles can adhere to the lining of the lungs and cause irritation, allergic reactions, and even cancer.

Image courtesy of the U.S. EPA

https://airnow.gov/index.cfm?action=aqibasics.particle
Cardiovascular Effects

- How does particle pollution affect the cardiovascular system?
- What are the cardiovascular effects?
- What are the acute exposure effects?
- What are the chronic exposure effects?

Why is particle pollution a cardiovascular health concern?

Cardiovascular disease accounts for the greatest number of deaths in the United States. One in three Americans has heart disease. In every three deaths, one represents cardiovascular disease.

Traditional risk factors, such as high blood pressure, high cholesterol, smoking, and diabetes, increase risk for heart disease. Other factors, such as air pollution, can act independently of these risk factors to increase the risk of cardiovascular disease.

The development of cardiovascular disease is linked to adverse effects on cardiovascular structure and function. For example, small particles can initiate inflammation and contribute to the development of arterial plaque, leading to atherosclerosis and heart attacks and strokes. (Newby DE, et al., 2002)

Bit.ly/epahealthyheart
https://airnow.gov/index.cfm?action=aqibasics.particle
Respiratory Effects

Particle Pollution and Your Patients' Health

Respiratory Effects

On this page:

- Why is particle pollution a respiratory health concern?
- How does particle pollution affect the respiratory system?
- What are the respiratory effects of acute exposure?
- What are the respiratory effects of chronic exposure?
- How does particle pollution affect people with asthma?
- What are the health disparities for asthma?
- How does particle pollution affect people with COPD?
- What is the role of fine particles in lung cancer incidence and mortality?

Why is particle pollution a respiratory health concern?

Studies have linked particle pollution exposure to a variety of respiratory health effects, including:

- Respiratory symptoms including cough, phlegm, and wheeze
- Acute, reversible decrement in pulmonary function
- Inflammation of the airways and lung (this is acute and neutrophilic)
- Bronchial hyperreactivity
- Acute phase reaction
- Respiratory infections
- Respiratory emergency department visits
- Respiratory hospitalizations
- Decreased lung function growth in children

https://airnow.gov/index.cfm?action=health_providers.index
https://airnow.gov/index.cfm?action=aqibasics.particle
Patient Exposure and the Air Quality Index

Patient Exposure and Your Patients' Health

Should I recommend that my patients reduce their particle pollution?

Yes. All people should be educated about the health effects of particle pollution and how to reduce exposure.

Your patients with heart or lung diseases, older adults, and lower SES are more likely to be affected by particle pollution exposure reduction measures. The American Heart Association (Brook et al., 2010), concluded that all patients with cardiovascular disease should be educated about the cardiovascular risks posed by air pollution.

In your patient education, you should encourage awareness of air quality weather broadcasts, on websites, or through the use of mobile app (airnow.gov) has forecasts as well as links to the education recommendations for reducing exposure by basing activities on AQI.

Balanced, evidence-based responses to these scenarios:

• Older man with hypertension, hyperlipidemia, diabetes & atherosclerotic coronary artery disease has shortness of breath and chest pain when walking

• Older woman with heart failure appears to be volume overloaded with increased central pressures

• Man with a five-year history of coronary artery disease, received a shock from his Implantable cardioverter-defibrillator (ICD) for sustained and rapid ventricular tachycardia

• Older man, complains of frequent cough with phlegm, which he has developed in the recent months

• Boy (6th grade) with asthma, has wheeze

• Woman, non-smoker who has seasonal allergy symptoms (rhinitis, conjunctivitis) that she cannot control with the over-the-counter medication
High Particle Pollution Events

Particle Pollution and Your Patients' Health

Patient Exposure and High Particle Pollution Events

On this page:

- Introduction
- What steps can I advise for my patients who live in areas where wildfires are likely to occur?
- How can my patients use respirators to protect themselves from wildfire smoke?

Introduction

Ozone and the other common pollutants year, in many parts of the country, particulates the AQI. These events are usually wildfires, but on a smaller spatial and toxicants. Excess burning in valleys during winter-tidew the reduction of exposure to particle pollutants:

Particulate matters are wildfies, other fires, transpore needed with some fires depending on how.

Portions of the text in the following sections for Public Health Officials (May 2016), "wildfire smoke events, to take measures to protect the public from smoke and rash, who provided expertise of a number of translations, Lawrence Berkeley National Laboratory, Forest Service, Pediatric Environmental Health Specialty Units, and the California Air Resources Board and Department of Public Health.

Consistent with Wildfire Smoke: Guide for Public Health Officials
Ozone Pollution and Your Patients' Health

Ozone and Your Patients' Health: About this Course

Ozone and Your Patients' Health is designed for family practice doctors, pediatricians, nurse practitioners, asthma educators, and other medical professionals who counsel patients about asthma, air pollution, or exercise. Patients and their families may also use this material to learn the science behind ozone’s effect on respiration and how to manage their respiratory health using the Air Quality Index.

Course Objectives

Upon completion of this course, you will be able to:

- Describe how ozone is formed and where it is found
- Identify the effects that exposure to ozone has on the general population
- List the different effects of ozone at varying exposure concentrations and durations
- Identify the effects that ozone has on asthma patients
- Explain the purpose and use of the Air Quality Index
- Identify common sources of information about the Air Quality Index
- Address typical patient questions and clinical scenarios relating to ozone exposure

Clinical Scenarios

The Clinical Scenarios section of this course provides real-world examples of how to apply the course content to patient care.

Does not offer CME at this time

Asthma and Outdoor Air Pollution

1. Air pollution can make asthma symptoms worse and trigger attacks.
   If you or your child has asthma, have you ever noticed symptoms get worse when the air is polluted? Air pollution can make it harder to breathe. It can also cause other symptoms, like coughing, wheezing, chest discomfort, and burning feeling in the lungs.

   Two key air pollutants can affect asthma. One is ozone (found in smog). The other is particle pollution (found in haze, smoke, and dust). When ozone and particle pollution are in the air, adults and children with asthma are more likely to have symptoms.

2. You can take steps to help protect your health from air pollution.
   - Get to know how sensitive you are to air pollution.
   - Notice your asthma symptoms when you are physically active. Do they happen more often when the air is more polluted? If so, you may be sensitive to air pollution.

   - Also notice any asthma symptoms that begin up to a day after you have been outdoors in polluted air. Air pollution can make you more sensitive to asthma triggers, like mold and dust mites. If you are more sensitive than usual to indoor asthma triggers, it could be due to air pollution outdoors.

   - Know when and where air pollution may be bad.
   - Ozone is often worst on hot summer days, especially in the afternoons and early evenings.
   - Particulate pollution can be bad any time of year, even in winter. It can be especially bad when the weather is calm, allowing air pollution to build up.
   - Particle levels can also be high:
     - Near busy roads, during rush hour, and around factories.
     - When there is smoke in the air from wood stoves, fireplaces, or burning vegetation.

Cardiovascular Disease

1. Sabia que la contaminación del aire puede provocar ataques al corazón, ataques cerebrales y otros problemas de salud?
   Según estudios médicos, la contaminación del aire puede provocar ataques al corazón, ataques (derrames) cerebrales y artritis, sobre todo en personas que están en situación de riesgo de padecer estas afecciones. Además, en las personas con una afición llamada insuficiencia cardíaca, la contaminación del aire puede reducir aún más la capacidad del corazón de bombear la sangre de la forma que necesita hacerlo. Las partículas muy pequeñas son los contaminantes más preocupantes que provocan estos efectos. La contaminación por partículas se encuentra en la neblina, el humo y el polvo, y a veces en el aire que parece limpio. Esta hoja informativa te explica cómo puede:
   - Conseguir información actualizada sobre la calidad local del aire
   - Proteger su salud cuando la contaminación por partículas se encuentra en niveles inútiles

2. ¿Qué puede proteger su salud?
   Hacer ejercicio con regularidad es importante para tener buena salud, sobre todo si padeces enfermedades del corazón. Algunos ejercicios pueden llevar a un estilo de vida más saludable y reducir tu riesgo de padecer problemas del corazón o ataques cerebrales provocados por la contaminación del aire. Además:
   - Si padece de enfermedades del corazón o ha sufrido un ataque cerebral, consulte con su proveedor de atención médica sobre las mejores formas de proteger su salud cuando la calidad del aire es inútil.
   - Hablar con su proveedor de atención médica sobre el riesgo de padecer enfermedades del corazón o un ataque cerebral y planear hacer menos ejercicio físico del habitual.

3. Sepa dónde y cuándo los niveles de contaminación por partículas pueden ser inútiles.
   Los niveles de contaminación por partículas pueden ser elevados en cualquier época del año. También pueden ser elevados:
   - Cerca de vías muy transitadas, en zonas urbanas (sobre todo en horas pico) y en zonas industriales.
   - Cuando hay humo en el aire proveniente de casas de leña, chimeneas, quemadoras de vegetación o incendios forestales.

www3.epa.gov/airnow/asthma-flyer.pdf (English)
www3.epa.gov/airnow/heartflyer.pdf (English)
www3.epa.gov/airnow/heartflyer-sp.pdf (Spanish)

www3.epa.gov/airnow/health-prof/EPA-poster-Spanish-2008.pdf (Spanish)
EPA Wildland Fire Research
New Web Page

Featuring:

• Links to Public Health Information
• Research Areas
• Research Publications and Other Resources
• Wildland Fire Sensor Challenge
• Smoke Sense Study and app

https://www.epa.gov/air-research/wildland-fire-research-protect-health-and-environment
Wildland Fire Smoke Risk Communication
Locations for Fires > 50,000 Acres
Washington State for 2015

AirNow Sessions Hits in Washington State 2015
With Fires Burning > 50,000 Acres

Acres Burned (thousands)
- (50, 70)
- (70, 76)
- (76, 100)
- (100, 150)
- (150, 220)

Fires
- CARPENTER RD.
- Chelan Complex
- COUGAR CREEK
- LimeBelt
- NORTH STAR
- Okanogan
- Reach
- STICKPIN
- TUNK BLOCK
- WOLVERINE

Session Hits (in thousands)

Courtesy of: Ana Rappold NHEERL/ORD/US EPA
Main finding were:

- Smoke-related public health messages are communicated via a variety of channels
- Limited evidence for their effectiveness
- Recall, understanding and compliance are facilitated by messages using simple language
- Compliance differs by socio-demographics
- At-risk groups may be advised to stay indoors before the general population, in order to protect the at-risk populations

Conclusions:

“Experimental research, as well as evaluations, are required to examine the effectiveness of modern communication channels, channels to reach at-risk groups, and the “stay indoors” message.”

Aims of Smoke Sense:

- Measure the effect of wildfire smoke exposure on health and productivity
- Develop health risk communication strategies to improve public health outcomes

As part of this, researchers have developed a Smoke Sense mobile phone application to:

1) Collect user input on how smoke events impact their health and daily activities
2) Provide information about the smoke exposure and recommended health risk messages
Smoke Sense Project
Improving Public Health Outcomes
• Intended to stimulate development of low-cost, light-weight, accurate & easily deployable sensor technology that could be used by first responders and public health agencies during wildland fires

• Collaborative project between ORD, OAQPS, Regional offices, federal partners (USFS, NASA, NOAA, CDC, NPS) and NGOs

• Announced in early 2017, 9 month development window, testing and judging in 2018

• Designing complimentary projects with EPA Regional offices and other interested groups to field test sensors in a wildland fire scenario
For More Information Visit

WILDFIRE GUIDE - A GUIDE FOR PUBLIC HEALTH OFFICIALS, UPDATED May 2016

- AirNow
  - Current Conditions
  - Health Providers Page
  - Wildfire Smoke and Health
  - Wildfire Smoke: Guide for Public Health Officials
  - Wildfire Trends
- EPA Wildfire Research Webpage
- California Air Resources Board Resources
- CDC Wildfire Factsheets
- Wildland Fire Air Quality Response Program

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

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