Report to the Boards of Health

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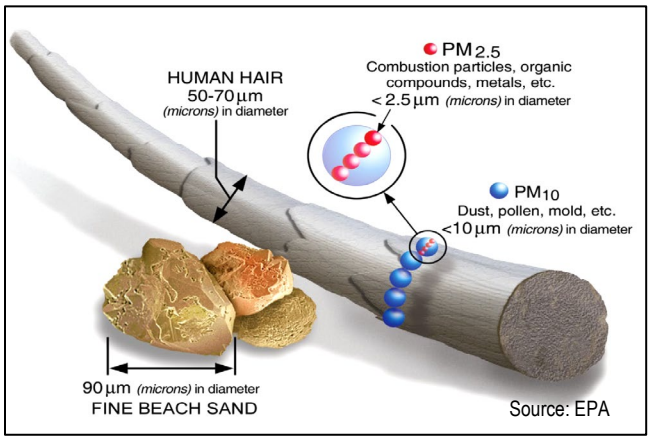
Air Quality

Wildfire smoke creates air pollution that can be a health hazard. The main pollutant from smoke is particulate pollution also called particulate matter. Other pollutants include carbon monoxide, ozone, hydrocarbons, and other organic chemicals, especially if buildings and man-made materials are burning.

Particulate matter (PM) is a general term for a mixture of solid and liquid droplets that can hang in the air. Particles 10 micrometers (µm) wide or smaller can be breathed in through the nose and throat and go into the lungs. Particles 2.5 µm and smaller can even get into the bloodstream. Particles from smoke are usually very small, many less than 1 µm.



Particulate matter and air pollution from wildfires can irritate the eyes and airways. It can also cause increased illness and early death from

- Asthma
- Bronchitis
- COPD
- Pneumonia
- Abnormal heart rhythms
- Heart attack
- Congestive heart failure
- Sudden cardiac arrest
- Stroke

Life stages and situations that are at higher risk from this exposure include:

- Children
  - Children spend more time outdoors and are usually at a greater activity level than adults.
  - The amount of air children inhale per pound of body weight compared to adults is higher, so they have a higher among of exposure compared to adults.
  - Children's lungs are still developing and more easily damaged. Some damage can be irreversible.
  - Children are more likely to have asthma than adults.
- Older adulthood (65 years of age and older)
  - Older adults are more likely to have pre-existing respiratory or cardiovascular diseases. There is also a decline in the body's defenses that occur as part of the aging process.
- Pregnant women
  - Pregnant women have a higher breathing rate, causing them to have a higher amount of exposure.
  - Exposures to the mother may affect the developing fetus.
  - Some evidence from wildfire smoke, and evidence from secondhand tobacco smoke exposure, show risks of lower birth weight with exposure to particulate matter prior to birth.
- Outdoor workers
  - Outdoor workers have longer periods of time exposed to smoke which can lead to increased risks of experiencing health effects.
- People with lower socioeconomic status (SES)

    - Those with lower SES typically have higher amounts of pre-existing health conditions and less access to medical care. This leads to a higher likelihood of untreated or insufficiently treated underlying health conditions.
    - They have less access to measures to reduce exposure, such as air conditioning or air filtration, which could lead to higher levels of exposure.
    - They may be exposed to higher levels of other pollutants due to the location of their homes, schools, and work environments.
- People with pre-existing health problems, specifically lung disease, cardiovascular diseases, and diabetes.

Healthy people can also be affected, especially if they are more active while outside, or are more sensitive to smoke.

Health Resources:

- Air Quality Index - A Guide to Air Quality and Your Health https://www.airnow.gov/sites/default/files/2018-04/aqi_brochure_02_14_0.pdf
- Particle Pollution and Your Health https://www.airnow.gov/sites/default/files/2018-03/pm-color.pdf
- Protecting Children from Wildfire Smoke and Ash https://www.airnow.gov/sites/default/files/2021-07/pehsu-protecting-children-from-wildfire-smoke-and-ash-factsheet.pdf
- How Smoke from Fires Can Affect Your Health https://www.airnow.gov/sites/default/files/2021-08/how-smoke-from-fire-can-affect-your-health-2021-v1-d1.pdf

For pets and animals:

- Protect Your Large Animals and Livestock from Wildfire Smoke https://www.airnow.gov/sites/default/files/2021-06/protect-your-large-animals-and-livestock-from-wildfire-smoke.pdf
- Protect Your Pets from Wildfire Smoke https://www.airnow.gov/sites/default/files/2021-06/protect-your-pets-from-wildfire-smoke.pdf

Action Steps

For the General Public:

1. Sign up and Start Receiving Your Air Quality Forecast https://www.enviroflash.info/signup.cfm
    a. Air Quality Guide for Particle Pollution https://www.airnow.gov/sites/default/files/2023-03/air-quality-guide-for-particle-pollution_0.pdf
2. Prepare for Fire Season https://www.airnow.gov/sites/default/files/2021-07/prepare-for-fire-season.pdf
3. Reduce Your Smoke Exposure https://www.airnow.gov/sites/default/files/2021-07/reduce-your-smoke-exposure.pdf
    a. Infographic: Reduce Health Risks In Areas With Wildfire Smoke https://www.airnow.gov/sites/default/files/2020-02/reduce-health-risks-with-wildfire-smoke-508.pdf
    b. Create a Clean Room to Protect Indoor Air Quality During a Wildfire https://www.epa.gov/indoor-air-quality-iaq/create-clean-room-protect-indoor-air-quality-during-wildfire OR https://www.airnow.gov/sites/default/files/2022-02/how-to-create-a-clean-room-at-home.pdf
    c. Indoor Air Filtration https://www.airnow.gov/sites/default/files/2022-02/indoor-air-filtration.pdf
    d. U.S. EPA: Guide to Air Cleaners in the Home https://www.epa.gov/sites/default/files/2018-07/documents/guide_to_air_cleaners_in_the_home_2nd_edition.pdf
    e. DIY Air Cleaner to Reduce Wildfire Smoke Indoors https://www.epa.gov/system/files/documents/2021-09/diy-air-purifier-infographic_final.pdf
4. Protect Your Lungs from Wildfire Smoke or Ash (Masks) https://www.airnow.gov/sites/default/files/2021-12/protect-your-lungs-from-wildfire-smoke-or-ash.pdf

5. Take care of your health. See: How Smoke from Fires Can Affect Your Health https://www.airnow.gov/sites/default/files/2021-08/how-smoke-from-fire-can-affect-your-health-2021-v1-d1.pdf

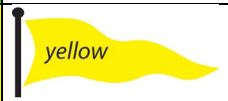
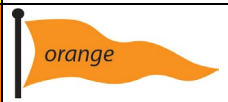
For Government Agencies/Businesses/Public Health:

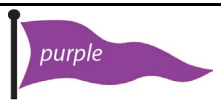
1. Sign up and Start Receiving Your Air Quality Forecast https://www.enviroflash.info/signup.cfm
    a. Other forecasting tools:
        i. 84 hr. forecast https://tools.airfire.org/websky/v2/run/standard/NAM84-0.15deg/2023070700/#viewer
        ii. Fire Potential Outlooks https://www.nifc.gov/nicc/predictive-services/outlooks
        iii. NASA Fire and Smoke mapping https://www.ospo.noaa.gov/Products/land/hms.html#maps
        iv. Other Wildland Fire / Air Quality Tools https://portal.airfire.org/
2. Wildfire Smoke: A Guide for Public Health Officials https://www.airnow.gov/publications/wildfire-smoke-guide/wildfire-smoke-a-guide-for-public-health-officials/
3. Consider setting up an air quality/smoke page. Example: https://wasmoke.blogspot.com/
4. Health effects of Common Air Pollutants Poster https://www.airnow.gov/sites/default/files/2018-03/common-air-pollutants-2011-lo.pdf
5. Employee and public building Health
    a. Occupational Safety and Health Administration Wildfires https://www.osha.gov/wildfires
    b. Outdoor Workers Exposed to Wildfire Smoke https://www.cdc.gov/niosh/topics/firefighting/wffsmoke.html
    c. Protecting Outdoor Workers Exposed to Smoke from Wildfires https://www.dir.ca.gov/dosh/wildfire/Worker-Protection-from-Wildfire-Smoke.html
    d. Wildfires and Indoor Air Quality in Schools and Commercial Buildings https://www.epa.gov/indoor-air-quality-iaq/wildfires-and-indoor-air-quality-schools-and-commercial-buildings
    e. ASHRAE: Planning Framework for Protecting Commercial Building Occupants from Smoke During Wildfire Events https://www.ashrae.org/file%20library/technical%20resources/covid-19/guidance-for-commercial-building-occupants-from-smoke-during-wildfire-events.pdf
6. School Information
    a. U.S. EPA: Air Quality and Outdoor Activity Guidance for Schools: Indoor Air Quality, A Guide for Educators https://www.cde.ca.gov/ls/fa/sf/iaq.asp
    b. Air Quality Guidance Template for Schools https://www.aqmd.gov/docs/default-source/air-quality/advisories/air-quality-guidance-for-schools.pdf?sfvrsn=6
7. Respirators
    a. NIOSH Respirator Trusted-Source Information https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/RespSource.html
    b. Non-occupational Uses of Respiratory Protection – What Public Health Organizations and Users Need to Know https://blogs.cdc.gov/niosh-science-blog/2018/01/04/respirators-public-use/

- Keep in mind that one of the main sources of particulate matter in the winter months in Michigan are wood burning units used for heat (https://www.ladco.org/public-issues/great-lakes-air-quality/).
    - The EPA has resources to help educate the public and businesses to reduce the risks with wood burning for heat at https://www.epa.gov/burnwise.
    - Also the state has provided an "Outdoor Burning Model Ordinance A Guide for Michigan Counties, Cities, Villages, and Townships" which includes verbiage for Outdoor Wood Furnaces available at https://www.michigan.gov/documents/deq/deq-ess-caap-modelordinance_312507_7.pdf

Health effects, public messages, and recommended actions for each AQI category

NOTE: Higher advisory levels automatically incorporate all of the guidance offered at lower levels

AQI Category (AQI Values)	Flag Color	Health Effects	Warning Messages	Other Action Step Messages for Public	Recommended Actions for Consideration
Good (0–50)		None expected	None	None	If smoke event forecasted, implement communication plan. Example: Public Health Wildfire Smoke Communication Guide, Montana
Moderate (51–100)		Possible aggravation of heart or lung disease	• Unusually sensitive people should consider limiting prolonged or heavy exertion/activity. • People with heart or lung disease should pay attention to symptoms. Individuals with symptoms of lung or heart disease (repeated coughing, shortness of breath or difficulty breathing, wheezing, chest tightness or pain, palpitations, nausea, unusual fatigue or lightheadedness) should contact a health care provider.	• If having symptoms, reduce exposure by following advice in box below.	• Prepare for full implementation of *School Activity Guidelines* (https://www.airnow.gov/sites/default/files/2021-03/school-outdoor%20activity%20guidance.pdf). • Issue public service announcements (PSAs) advising public about health effects, symptoms, and ways to reduce exposure. • Distribute information about exposure avoidance.
Unhealthy for Sensitive Groups (101–150)		Increasing likelihood of respiratory or cardiac symptoms in sensitive individuals, aggravation of heart or lung disease, and premature death in people with heart or lung disease and older adults.	**Sensitive Groups** (People with heart or lung disease, the elderly, children, and pregnant women) should: • Limit time spent outdoors. • Avoid physical exertion/activity. • People with asthma should follow their asthma management plan. • Individuals with symptoms of lung or heart disease that may be related to excess smoke exposure (repeated coughing, shortness of breath or difficulty breathing, wheezing, chest tightness or pain, heart palpitations, nausea, unusual fatigue or lightheadedness) should contact a health care provider.	• Keep doors and windows closed, seal large gaps as much as possible. • Avoid using exhaust fans (e.g., kitchen, bathroom, clothes dryer, and utility room exhaust fans). • If cooling is needed, turn air conditioning to re-circulate mode in home and car, or use ceiling fans or portable fans. Turn fans to recirculate mode. • If a home has a central heating and/or air conditioning system, install higher-efficiency filters (e.g., filters rated at MERV 13 or higher) if they can be accommodated by the system. The system's circulating fan can be temporarily set to operate continuously to obtain maximum particle removal by the central air system's filter, although this will increase energy use and costs. • Operate appropriately sized portable air cleaners to reduce indoor particle levels. • Avoid indoor sources of pollutants, including tobacco smoke, heating with wood stoves and kerosene heaters, frying or broiling foods, burning candles or incense, vacuuming (unless with HEPA filter), using paints, solvents, cleaning products, and adhesives. • Keep at least a 5-day supply of medication available and have a supply of non-perishable groceries to avoid leaving the home.	• Evaluate implementation of *School Activity Guidelines* • If smoke event projected to be prolonged, evaluate and notify about possible sites for cleaner air shelters. • If smoke event projected to be prolonged, prepare evacuation plans for at-risk populations. See Appendix B of Wildfire Smoke: A Guide for Public Health Officials

AQI Category (AQI Values)	Flag Color	Health Effects	Warning Messages	Other Action Step Messages for Public	Recommended Actions for Consideration
Unhealthy (151–200)		Increased aggravation of heart or lung disease and premature death in persons with heart or lung disease and older adults; increased respiratory effects in general population.	• **Sensitive Groups:** Should avoid prolonged or heavy exertion/activity. • **Everyone:** Should limit prolonged or heavy exertion/activity. • Limit time spent outdoors. • Individuals with symptoms of lung or heart disease that may be related to excess smoke exposure (repeated coughing, shortness of breath or difficulty breathing, wheezing, chest tightness or pain, palpitations, nausea or unusual fatigue or lightheadedness) should contact your health care provider.	• **Sensitive Groups:** Stay in a "clean room" at home. • **Everyone**: Follow advice for sensitive groups in box above. • Identify potential "cleaner air" shelters in the community.	• Full implementation of *School Activity Guidelines* • Consider canceling outdoor events (e.g., concerts and competitive sports), based on public health and travel considerations.
Very Unhealthy (201–300)		Significant aggravation of heart or lung disease, premature death in persons with heart or lung disease and older adults; significant increase in respiratory effects in general population.	• **Everyone**: Should avoid prolonged or heavy exertion/activity and stay indoors, preferably in a space with filtered air.	• **Everyone:** If symptomatic, seek medical attention. If you are unable to create your own cleaner indoor air space to shelter in place, evacuate to a cleaner air shelter or leave the area, if it is safe to do so.	• Move all school activities indoors or reschedule them to another day. • Cancel school physical activities (e.g., physical education, athletic practice) unless the school is able to provide cleaner indoor air for the students. • Consider closing some or all schools. • Cancel outdoor events involving activity (e.g., competitive sports). • Consider canceling outdoor events that do not involve activity (e.g. concerts).
Hazardous (> 300)		Serious aggravation of heart or lung disease, premature death in persons with heart or lung disease and older adults; serious risk of respiratory effects in general population.	• **Everyone:** Should avoid any outdoor activity, and stay indoors, preferably in a space with filtered air.	• **Everyone**: If symptomatic, seek medical attention. If you are unable to create your own cleaner indoor air space to shelter in place, evacuate to a cleaner air shelter or leave the area, if it is safe to do so.	• Consider closing schools[1]. • Cancel outdoor events (e.g., concerts and competitive sports). • Consider air quality in indoor workplaces and take measures to protect workers as needed. See Appendix D of Wildfire Smoke: A Guide for Public Health Officials • Consider curtailment of outdoor work activities unless the workers have a fully implemented respirator plan in place and clean air respite breaks. • If PM levels are projected to remain high for a prolonged time, consider evacuation of at-risk populations.

1 See Children's Health and Wildfire Smoke Workshop: Workshop Recommendations https://www.airnow.gov/sites/default/files/2022-01/childrens-health-wildfire-smoke-workshop-recommendations.pdf for more detailed guidance. Newer schools with a central air cleaning filter may be more protective than older, leakier schools. Also, being at school may mean children's activity levels can be better monitored.

This table was adapted from Wildfire Smoke: A Guide for Public Health Officials https://www.airnow.gov/publications/wildfire-smoke-guide/wildfire-smoke-a-guide-for-public-health-officials/

Recommendations:

1. Sign up and Start Receiving Your Air Quality Forecast https://www.enviroflash.info/signup.cfm

2. Be prepared for poor air quality days. Develop a plan for yourself and your community before fire season starts.

Sources

- Wildfire Smoke: A Guide for Public Health Officials https://www.airnow.gov/publications/wildfire-smoke-guide/wildfire-smoke-a-guide-for-public-health-officials/
- As referenced in text