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Patient Education: How Air Quality Can Impact Health

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Patient Education: How Air Quality Can Impact Health

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Why Is This A Problem?



I. AHEC Focus Area: Emerging Health Issue

Smoke from the Canadian wildfires and other causes of air particle pollution have become increasingly significant in Vermont during the Summer of 2023

Smoke and other causes of poor air quality impact the health of everyone and are especially dangerous to those who have pre-existing pulmonary and cardiovascular diseases such as asthma, COPD, heart disease and a history of stroke (Air Quality Alerts, Wildfires & Your Health, 2023)

Wildfire smoke contains particulate matter, carbon monoxide, nitrogen oxide and other volatile organic compounds that can drastically reduce air quality in areas directly impacted by wildfires and areas downwind of fires (Wildfires, 2020)



II. AHEC Focus Area: Social Determinants of Health

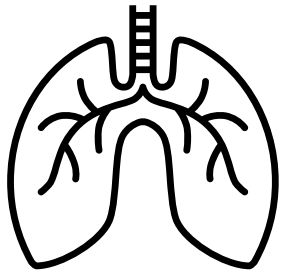
Certain groups who are more at risk of being impacted by air pollution include: children, older adults, pregnant people, outdoor workers, people who are unhoused, people with low-incomes and BIPOC individuals (Air Quality Alerts, Wildfires & Your Health, 2023)

In 2019, Vermont had the second highest rate of adult asthma (11.7%), second to Maine (11.8%), in the US (Asthma Data Pages, 2022)

Vermonters insured by Medicaid have higher asthma prevalence than Vermonters in general (19% compared to 12%) (Rutland County, Vermont: Quick Facts, 2022)

Median household income in Rutland County VT in 2021 was \$59,751 vs \$69,021 national average (Rutland County, Vermont: Quick Facts, 2022)

Public Health Cost Considerations



- In 2015 in Vermont, hospitalizations and ED visits for asthma cost \$6.4 million (Asthma Data Pages, 2022)
- Costs attributable to COPD in the US in 2020 was \$49 billion dollars (COPD Costs, 2021)
- To create a safe indoor environment with purified air free from smoke or other particulates, people can purchase air filters. However, indoor air purifiers with HEPA filters, which are most effective at filtering out smoke particles, can cost upward of \$1,000. (Best Air Purifiers for Wildfire Smoke, 2023). This is an unfathomable amount for most people in low-income areas, like Rutland County, to spend in order to have clean air indoors.

Community Perspectives

- “Summer 2023 has been a demonstrably bad summer for wildfires and air pollution. 2-3 of 4 Canadian wildfires that have affected Vermont have caused air quality to be unhealthy for sensitive groups for multiple days and even unhealthy for all on an hourly basis in some VT locations” (David Grass, climate scientist at VT Dept of Health)
- “In Vermont, we have been seeing an increase in Emergency Department and Urgent Care visits for respiratory illnesses relating to wildfires and poor air quality. There is data suggestive of a correlation with this summer’s wildfires and COPD exacerbations” (David Grass, climate scientist at VT Dept of Health)
- “Attendance for some outdoor events has been diminished due to recent wildfire smoke and poor air quality. We anticipate more concern from the community if the wildfires continue into the Fall when youth sports begin” (Bill Moore, Director of Recreation for the Town of Brandon, VT)

Intervention and Methodology

- Research was conducted to find educational posters and brochures that were easily understandable, eye-catching, promoted conversation with health professionals and contained links to other vetted resources
- EPA brochures were placed in the lobby and at the check-out desk
- Effects of Particle Pollution poster was placed in each exam room and bathroom

Effects of Common Air Pollutants

RESPIRATORY EFFECTS

Symptoms:

- Cough
- Phlegm
- Wheezing
- Chest tightness
- Shortness of breath

Increased sickness and premature death from:

- Asthma
- Bronchitis (acute or chronic)
- Emphysema
- Pneumonia

Development of new disease:

- Chronic bronchitis
- Premature aging of the lungs

How Pollutants Cause Symptoms

Effects on Lung Function:

- Narrowing of airways (bronchoconstriction)
- Decreased air flow

Airway Inflammation:

- Influx of white blood cells
- Abnormal mucus production
- Fluid accumulation and swelling (edema)
- Death and shedding of cells that line airways

Increased Susceptibility to Respiratory Infection

How Pollutants Cause Symptoms

Symptoms:

- Chest tightness
- Chest pain (angina)
- Palpitations
- Shortness of breath
- Unusual fatigue

Increased sickness and premature death from:

- Coronary artery disease
- Abnormal heart rhythms
- Congestive heart failure
- Stroke

How Pollutants Cause Symptoms

Effects on Cardiovascular Function:

- Low oxygenation of red blood cells
- Abnormal heart rhythms
- Altered autonomic nervous system control of the heart

Vascular Inflammation:

- Increased risk of blood clot formation
- Narrowing of vessels (vasoconstriction)
- Increased risk of atherosclerotic plaque rupture

Reduce your risk by using the Air Quality Index (AQI) to plan outdoor activities – www.airnow.gov

AQI Levels of Health Concern	AQI Values	What Action Should People Take?
Good	0-50	Enjoy Activities
Moderate	51-100	People unusually sensitive to air pollution: Plan strenuous outside activities when air quality is better
Unhealthy for Sensitive Groups	101-150	Sensitive Groups: Cut back or reschedule strenuous outside activities Caution: People with lung disease, children and older adults and people who are active outdoors Particle Pollution: People with heart or lung disease (including diabetes), older adults and children Carbon Monoxide: People with heart disease and possibly infants and fetuses Nitrogen Dioxide: People with lung disease, children and older adults Sulfur Dioxide: Active children and adults with asthma
Unhealthy	151-200	Everyone: Cut back or reschedule strenuous outside activities Sensitive groups: Avoid strenuous outside activities
Very Unhealthy	201-300	Everyone: Significantly cut back on outside physical activities Sensitive groups: Avoid all outside physical activities

Airborne particles, the main ingredient of haze, smoke, and airborne dust, present serious air quality problems in many areas of the United States. This particle pollution can occur year-round—and it can cause a number of serious health problems, even at concentrations found in many major cities.



Particulate emissions from boats, such as this brown haze over Boston.

What is particle pollution?
Particle pollution is a mixture of microscopic solids and liquid droplets suspended in air. This pollution, also known as particulate matter, is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores).
The size of particles is directly linked to their potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. Exposure to such particles can affect both your lung and your heart. Larger particles are of less concern, although they can irritate your eyes, nose, and throat.

Small particles of concern include "fine particles" (such as those found in smoke and haze), which are 2.5 micrometers in diameter or less; and "coarse particles" (such as those found in wind-blown dust), which have diameters between 2.5 and 10 micrometers.

Are you at risk from particles?

People with heart or lung disease, older adults, and children are considered at greater risk from particles than other people, especially when they are physically active. Exercise and physical activity cause people to breathe faster and more deeply—and to take more particles into their lungs.
People with heart or lung disease—such as coronary artery disease, congestive heart failure, and asthma or chronic obstructive pulmonary disease (COPD)—are at increased risk, because particles can aggravate these diseases. People with diabetes also may be at increased risk, possibly because they are more likely to have underlying cardiovascular disease.

Older adults are at increased risk, possibly because they may have undiagnosed heart or lung disease or diabetes. Many studies show that when particle levels are high, older adults are more likely to be hospitalized, and some may die at aggravated heart or lung disease.
Children are likely at increased risk for several reasons. Their lungs are still developing; they spend more time at high activity levels and they are more likely to have asthma or acute respiratory diseases, which can be aggravated when particle levels are high.

It appears that risk varies throughout a lifetime, generally being higher in early childhood, lower in healthy adolescents and younger adults, and increasing in middle age through old age as the incidence of heart and lung disease and diabetes increases. Factors that increase your risk of heart attack, such as high blood pressure or elevated cholesterol levels, also may increase your risk from particles. In addition, scientists are evaluating new studies that suggest that exposure to high particle levels may also be associated with low birth weight in infants, pre-term deliveries, and possibly fetal and infant deaths.

How can particles affect your health?

Particle exposure can lead to a variety of health effects. For example, numerous studies link particle levels to increased hospital admissions and emergency room visits—and even to death from heart or lung diseases. Both long- and short-term particle exposures have been linked to health problems.
Long-term exposures, such as those experienced by people living for many years in areas with high particle levels, have been associated with problems such as reduced lung function and the development of chronic bronchitis—and even premature death.
Short-term exposures to particles (hours or days) can aggravate lung disease, causing asthma attacks and acute bronchitis, and may also increase susceptibility to respiratory infections. In people with heart disease, short-term exposures have been linked to heart attacks and arrhythmias. Healthy children and adults have not been reported to suffer serious effects from short-term exposures, although they may experience temporary minor irritation when particle levels are elevated.

What are the symptoms of particle exposure?

Even if you are healthy, you may experience temporary symptoms, such as irritation of the eyes, nose, and throat; coughing; phlegm; chest tightness; and shortness of breath.



If you have lung disease, you may not be able to breathe as deeply or as vigorously as normal, and you may experience coughing, chest discomfort, wheezing, shortness of breath, and unusual fatigue. If you have any of these symptoms, reduce your exposure to particles and follow your doctor's advice. Contact your doctor if symptoms persist or worsen.

If you have heart disease, particle exposure can cause serious problems in a short period of time—even heart attacks—with no warning signs. So don't assume that you are safe just because you don't have symptoms. Symptoms such as chest pain or tightness, palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these symptoms, follow your doctor's advice.

How can you avoid unhealthy exposure?

Your chances of being affected by particles increase the more strenuous your activity and the longer you are active outdoors. If your activity involves prolonged or heavy exertion, reduce your activity time—substitute another that involves less exertion. Go for a walk instead of a jog, for example. Plan outdoor activities for days when particle levels are lower. And don't exercise near busy roads; particle levels generally are higher in these areas.

Particle levels can be elevated indoors, especially when outdoor particle levels are high. Certain filters and room air cleaners can help reduce indoor particle levels. You also can reduce particle levels indoors by not smoking inside, and by reducing your use of other particle sources such as candles, wood-burning stoves, and fireplaces.

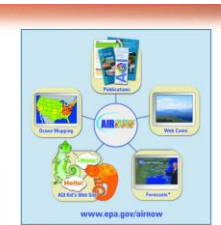
How can the Air Quality Index help?

In many areas, local media provide air quality forecasts telling you when particle levels are expected to be unhealthy. Forecasts use the same format as EPA's Air Quality Index, or AQI, a tool that state and local agencies use to issue public reports of actual levels of particles, ground-level ozone, and other common air pollutants.

Using the AQI's color-coded scale, these forecasts help you quickly learn when air pollution is expected to reach unhealthy levels in your area. In the newspaper forecast below, for example, the black arrow points to the "orange" range, indicating that particle levels are expected to be unhealthy for sensitive groups. On television, you might hear a meteorologist say something like this: "Tomorrow will be a *code orange* air quality day, with particle pollution at levels that are unhealthy for sensitive groups. If you have heart or lung disease, or if you're an older adult or a child, you should plan strenuous activities for a time when air quality is better."



AQI Index	Air Quality	Health Advisory
0 to 50	Good	
51 to 100	Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion.
101 to 150	Unhealthy for Sensitive Groups	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.
151 to 200	Unhealthy	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.
201 to 300	Very Unhealthy	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.



Daily air quality and health information are available on the AIRNOW Web site.

AIRNOW
AIRNOW® (www.epa.gov/airnow) is a Web site that gives daily information about air quality, including ground-level ozone and particles, and how they may affect you. AIRNOW contains:

- Real-time particle levels for many locations.
- Air quality forecasts for many cities across the country.
- Kids' Web page and associated teacher curriculum.
- State Web pages.
- Links to state and local air quality programs.
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Photo courtesy of The Weather Channel.
Office of Air and Radiation
www.epa.gov
September 2003
EPA-453F-03-001

Particle Pollution and Your Health

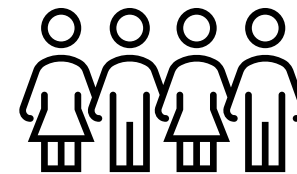
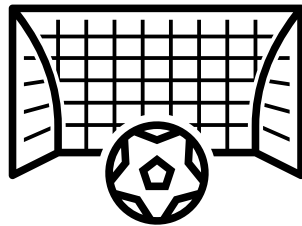
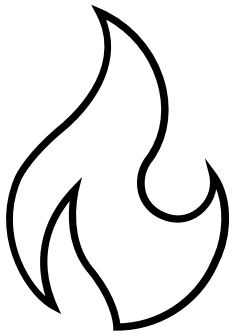
What Is Particle Pollution?

Are You at Risk?

How Can You Protect Yourself?

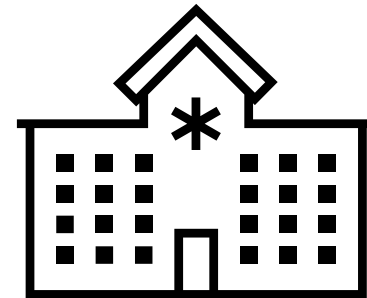
Theoretical Results and Responses

- Widespread community awareness of the impact that wildfire smoke and other air particle pollution can have on one's pulmonary and cardiovascular health
- For people in sensitive groups to habitually check air quality reports and feel comfortable making decisions to attend or miss outdoor events based on air quality measurements
- For Brandon, VT and other towns to have protocols in place for canceling outdoor events and sporting activities for children, older people and people with pulmonary and cardiac conditions who are particularly vulnerable to health effects from poor air quality



Theoretical Evaluation of Effectiveness and Limitations

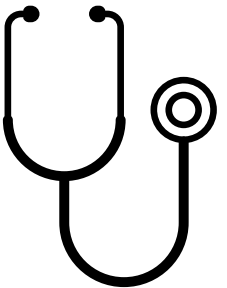
- Theoretical evaluation of effectiveness:
 - A survey would be sent out randomly to patients at Brandon Primary Care who had been at the office within the last month
 - This survey would assess for patient understanding that brochures and posters on air pollution and air quality are available at the office
 - The survey would also ask if the patient had utilized the poster and pamphlet resources
 - Patients would be asked if they have made any changes to protect their own health from recent wildfire smoke and air particle pollution since viewing these resources
- Limitations:
 - Patients lost to follow-up
 - Patients who are not willing to respond to the survey
 - Patients who do not utilize the pamphlet and poster resources





Recommendations for Future Interventions

- A collaboration between the Vermont Department of Health and towns to make educational materials on air pollution easily accessible to schools and families involved in recreational sports would increase community awareness of the impacts of poor air quality on health
- Educate local providers on how to effectively communicate the impact of poor air quality on pulmonary and cardiovascular health
- Providers should screen patients who are especially vulnerable to the effects of wildfire smoke and air particle pollution, and make recommendations for staying safe and provide educational resources



References

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Poster source:

<https://www.airnow.gov/sites/default/files/2018-03/common-air-pollutants-2011-lo.pdf>

Pamphlet source:

<https://www.airnow.gov/sites/default/files/2018-03/pm-color.pdf>