

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.



Particles contribute to haze, 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 lungs 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 diseases—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 of 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 asthma**, carefully follow your asthma management plan when particle levels are high. Your doctor can help you develop a plan if you don’t have one.

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—or 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.

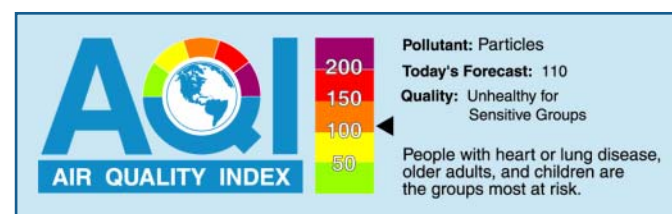
Particle Pollution and Your Health

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."



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

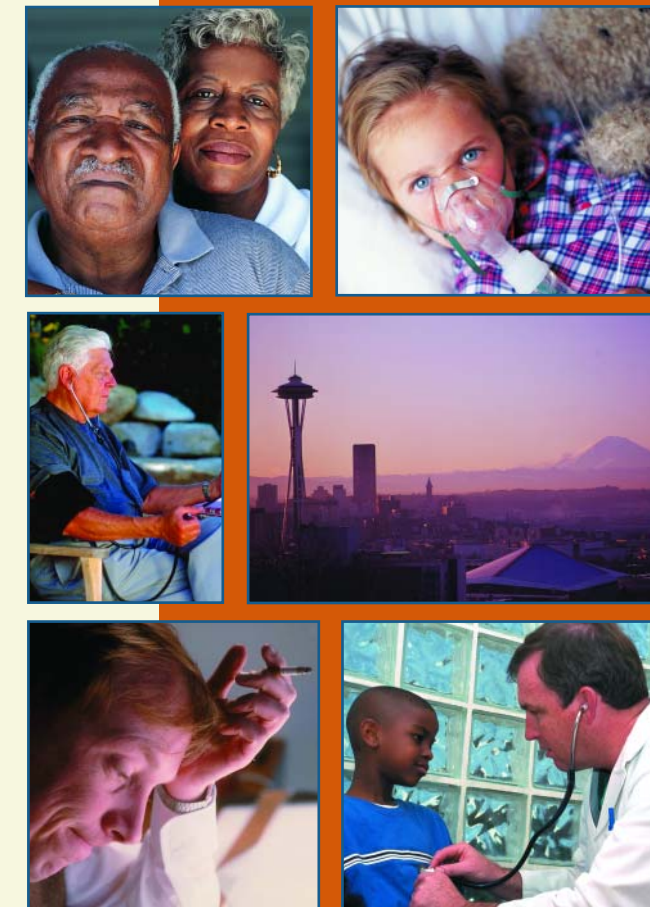
AIRNOW

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.
- Smoke Web page.
- Links to state and local air quality programs.
- Ideas about what you can do to reduce particles. For example, you can keep your car, boat, and other engines well-tuned, and avoid using engines that smoke. You can also participate in local energy conservation programs.

*Photo courtesy of The Weather Channel.

Office of Air and Radiation
www.epa.gov/air
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What Is Particle Pollution?

Are You at Risk?

How Can You Protect Yourself?

AIR QUALITY INDEX FOR PARTICLE POLLUTION		
Air Quality Index	Air Quality	Health Advisory
0 to 50	Good	None.
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.

Effects of Common Air Pollutants

RESPIRATORY EFFECTS



Symptoms:

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

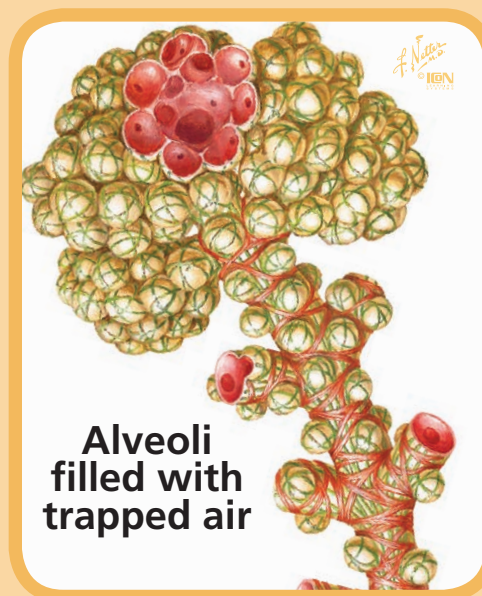
Increased sickness and premature death from:

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

Development of new disease

- Chronic bronchitis
- Premature aging of the lungs

How Pollutants Cause Symptoms

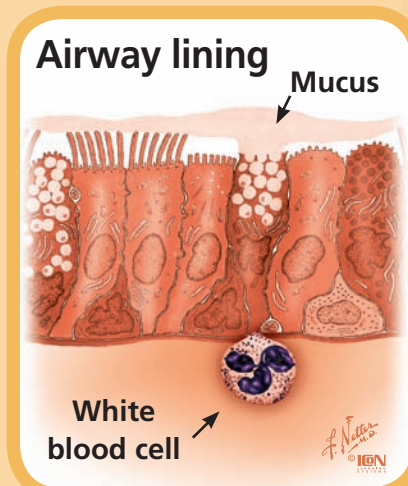


Effects on Lung Function

- 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

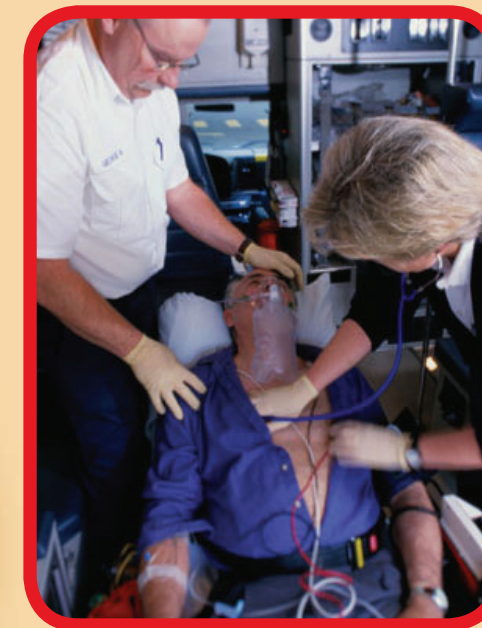


Normal



Lung with respiratory infection

CARDIOVASCULAR EFFECTS



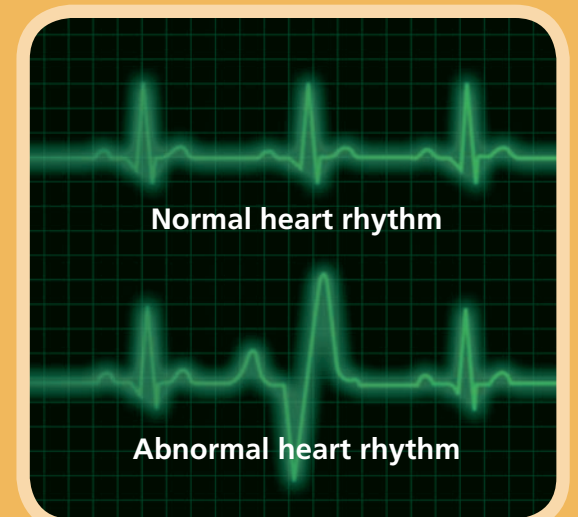
Symptoms:

- 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

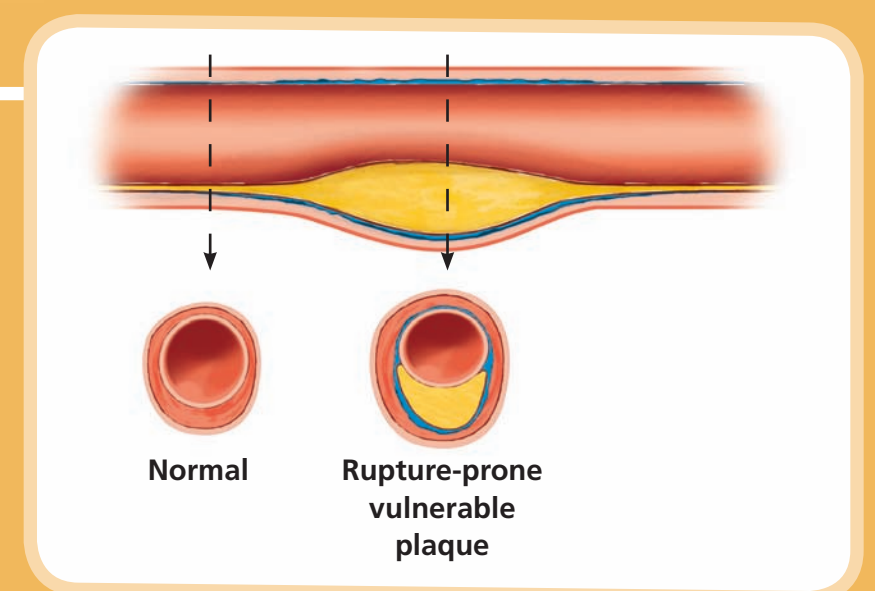


Effects on Cardiovascular Function

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

Vascular Inflammation

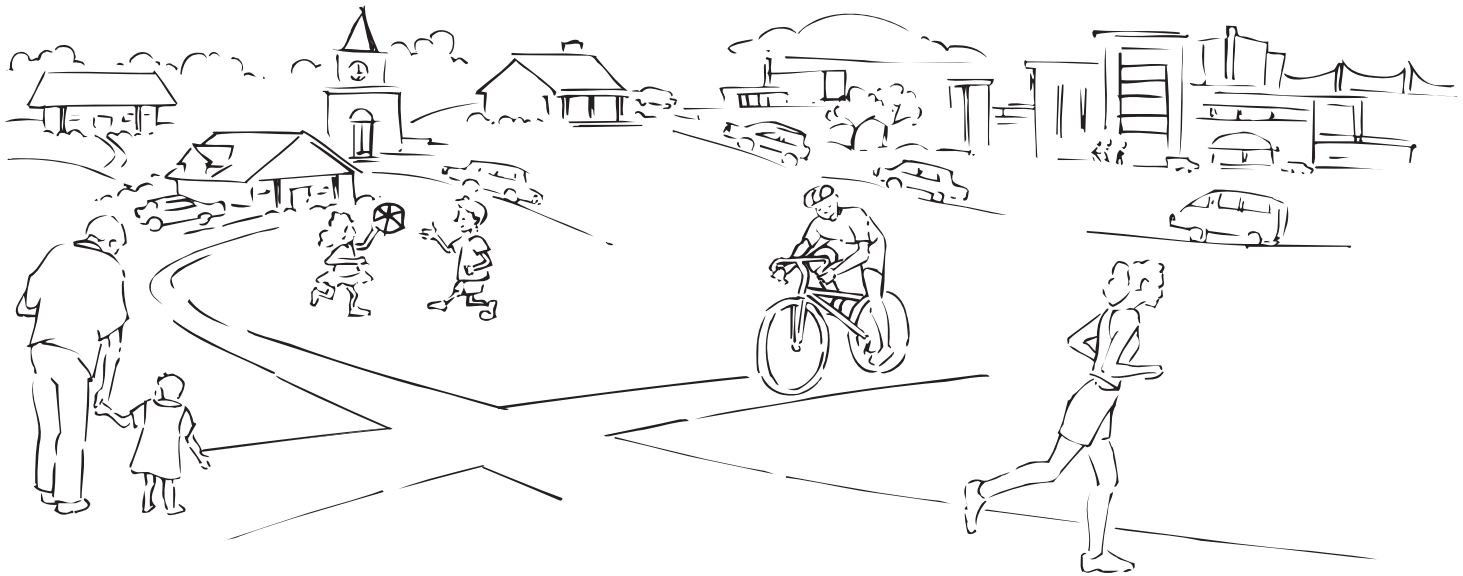
- Increased risk of blood clot formation
- Narrowing of vessels (vasoconstriction)
- Increased risk of atherosclerotic plaque rupture



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 Ozone: People with lung disease, children and older adults and people who are active outdoors Particle Pollution: People with heart or lung disease (including diabetics), 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

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 a 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.
- *Particle 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.

► **Plan activities when and where pollution levels are lower.** Regular exercise is important for staying healthy, especially for people with asthma. By adjusting when and where you exercise, you can lead a healthy lifestyle and help reduce your asthma symptoms when the air is polluted. In summer, plan your most vigorous activities for the morning. Try to exercise away from busy roads or industrial areas. On hot, smoggy days when ozone levels are high, think about exercising indoors.

► **Change your activity level.** When the air is polluted, try to take it easier if you are active outdoors. This will reduce how much pollution you breathe. Even if you can't change your schedule, you might be able to change your activity so it is less intense. For example, go for a walk instead of a jog. Or, spend less time on the activity. For example, jog for 20 minutes instead of 30.

► **Listen to your body.** If you get asthma symptoms when the air is polluted, stop your activity. Find another, less intense activity.

► **Keep your quick-relief medicine on hand when you're active outdoors.** That way, if you do have symptoms, you'll be prepared. This is especially important if you're starting a new activity that is more intense than you are used to.

► **Consult your health care provider.** If you have asthma symptoms when the air is polluted, talk with your health care provider.

- If you will be exercising more than usual, discuss this with your health care provider. Ask whether you should use medicine before you start outdoor activities.

- If you have symptoms during a certain type of activity, ask your health care provider if you should follow an asthma action plan.

3 Get up-to-date information about your local air quality:

Sometimes you can tell that the air is polluted—for example, on a smoggy or hazy day. But often you can't. In many areas, you can find air quality forecasts and reports on local TV or radio. These reports use the Air Quality Index, or AQI, a simple color scale, to tell you how clean or polluted the air is. You can also find these reports on the Internet at: www.epa.gov/airnow. You can use the AQI to plan your activities each day to help reduce your asthma symptoms.

4 For more information:

Air quality and health:

- EPA's AIRNow website at www.epa.gov/airnow
- Call 1-800-490-9198 to request free EPA brochures on: *Ozone and Your Health*, *Particle Pollution and Your Health*, and *Air Quality Index: A Guide to Air Quality and Your Health*.

Asthma:

- Centers for Disease Control and Prevention (CDC) Web site at www.cdc.gov/asthma

Indoor air and asthma:

- EPA's asthma website at www.epa.gov/asthma



United States
Environmental Protection Agency
EPA-452-F-04-002



Final Updates to the Air Quality Index (AQI) for Particulate Matter Fact Sheet and Common Questions

Summary

- On February 7, 2024, the U.S. Environmental Protection Agency (EPA) announced a final rule to strengthen the nation’s National Ambient Air Quality Standards (NAAQS) for fine particle pollution, also known as fine particulate matter (PM_{2.5}) or soot. EPA is setting the level of the primary (health-based) annual PM_{2.5} standard at 9.0 micrograms per cubic meter (µg/m³) to provide increased public health protection, consistent with the available health science.
- In addition, after considering public comments, EPA is changing some breakpoints in the U.S. [Air Quality Index \(AQI\)](#) to reflect the revised level of the primary annual PM_{2.5} standard and to reflect recent health science on PM_{2.5}. The AQI is EPA’s color-coded tool for communicating air quality to the public.
- EPA is also updating AQI reporting requirements to reflect current reporting practices.
- EPA sets AQIs for the following common pollutants: particulate matter (also called particle pollution, soot, or PM), ozone, carbon monoxide, nitrogen dioxide, and sulfur dioxide.
- The AQI updates will become effective May 6, 2024. EPA will update its tools for communicating the AQI to reflect the changes. This includes the [AirNow](#) website.

What’s New in the AQI for PM

- The table below shows the previous and updated AQI for particle pollution. EPA bases each category on a range of particle pollution concentrations in the air. The Agency measures particle pollution in micrograms per cubic meter of air. Sometimes, you will see micrograms per cubic meter written as “µg/m³.”
- The table on the next page shows the color code and index values for each category. EPA converts pollution concentrations to index values to make AQI categories consistent across pollutants. Together, the category color and the index values help you quickly know what your air quality is like.

2024 AQI for Fine Particle Pollution
(Breakpoints are in micrograms per cubic meter)

AQI Category and Index Value	Previous AQI Category Breakpoints	Updated AQI Category Breakpoints	What changed?
Good (0 – 50)	0.0 to 12.0	0.0 to 9.0	EPA updated the breakpoint between Good and Moderate to reflect the updated annual standard of 9 micrograms per cubic meter
Moderate (51 – 100)	12.1 to 35.4	9.1 to 35.4	
Unhealthy for Sensitive Groups (101 – 150)	35.5 to 55.4	35.5 to 55.4	No change, because EPA retained the 24-hour fine PM standard of 35 micrograms per cubic meter.
Unhealthy (151 – 200)	55.5 to 150.4	55.5 to 125.4	EPA updated the breakpoints at the upper end of the unhealthy, very unhealthy, and hazardous categories based on scientific evidence about particle pollution and health. The Agency also combined two sets of breakpoints for the Hazardous category into one.
Very Unhealthy (201 – 300)	150.5 to 250.4	125.5 to 225.4	
Hazardous (301+)	250.5 to 350.4 and 350.5 to 500	225.5+	

- About the columns in the table:

- The first column shows the color-coded AQI categories, which range from “Good” to “Hazardous.”
- The second column shows the previous AQI category breakpoints for particle pollution, which were set in 2012. The term “breakpoint” refers to the particle pollution concentration where the AQI category changes.
- The third column shows the new AQI category breakpoints for fine particle pollution.
- The fourth column explains why EPA changed breakpoints.

Changes to AQI Reporting Requirements

- The daily AQI must be reported for metropolitan areas with more than 350,000 people. The final rule requires that the daily AQI be reported seven days a week. EPA made this change, because many states are already doing this. The updated reporting requirement applies for all AQI pollutants.
- The previous requirement was issued in 1999. It required the daily AQI to be reported five days a week. Since then, technology has made it easier for state, local and tribal air agencies to automatically report the AQI. Today, most air quality agencies report the AQI every day.
- Technology also makes it possible for EPA to estimate a near-real time AQI, called the “NowCast AQI.” Using automated processes, state, local and Tribal air quality agencies provide hourly air quality monitoring information to the AirNow program for nearly 900 areas across the country. The agencies provide this information as a public service.
- AirNow converts the monitoring data to the NowCast AQI and displays it on the AirNow website and app. AirNow and the air quality agencies provide this information to help people make decisions about their outdoor activities based on the most recent monitoring data. Many agencies also report the NowCast AQI on their own websites and applications.
- The final rule recommends that air quality agencies report the AQI in near real time, but the rule does not require this. Similarly, the final rule recommends that agencies continue submitting hourly air quality monitoring data to EPA’s air quality database but does not require them to do so.

Common Questions about Changes to the AQI

Did EPA update the AQI because my air quality is getting worse?

- No. EPA updated the AQI because it has learned more about the health impacts of breathing air containing particle pollution. The changes to the AQI reflect the latest science on particle pollution and health, and the updates EPA has made to the annual standard for fine particle pollution.

Will I see more Code Orange or Code Red days in my community because of the AQI changes?

- Many areas can expect to see more days in the Moderate (Code Yellow) category because of the changes in the AQI breakpoints. The Moderate category now begins when fine particle pollution concentrations reach 9 micrograms per cubic meter of air (the level of the updated annual air quality standard). Previously, the Moderate category began at 12 micrograms per cubic meter.
- The Agency does not expect significant increases in days in the other AQI categories as a result of the updates to the category breakpoints. However, when events like wildfires affect air quality, the revised breakpoints in the upper AQI categories may shift some days from Unhealthy to Very Unhealthy, or from Very Unhealthy to Hazardous.

When will the updated AQI show up on AirNow or other air quality applications?

- EPA anticipates updating its AirNow products when the changes to the AQI breakpoints take effect on May 6, 2024. The AirNow products include the [AirNow](#) website, the AirNow app, and the AirNow API, which is the application EPA uses to share data with other agencies and application developers. The [AirNow Fire and Smoke Map](#), which is a partnership project between EPA and the U.S. Forest Service, will also use the updated breakpoints.