Our Health At Risk

Why Are Millions of Americans Still Breathing Unhealthy Air?

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Contents

Executive Summary

Despite decades of progress under the Clean Air Act, Americans across the country continue to breathe unhealthy air, leading to increased risk of premature death, asthma attacks and other adverse health impacts.

In 2015, communities in 49 states plus the District of Columbia experienced at least one day of elevated ozone smog pollution, while many Americans who live in close proximity to industrial facilities and highways are exposed to health-threatening air pollution on a daily basis.

To protect public health, the nation needs to protect the gains made under the Clean Air Act and the Clean Cars Standards, and pursue additional pollution cuts through programs such as the Regional Greenhouse Gas Initiative, which reduces pollution from coal and natural gas power plants. These programs not only cut air pollution now but can also help reduce the health threats posed by air pollution in the future by curbing global warming emissions that will make air pollution worse.

Burning fossil fuels like coal, diesel, gasoline or natural gas creates air pollution in the form of smog, particulate matter and other toxic combustion products. There is no safe level of exposure to some of these pollutants.[1]

- Smog, or ground-level ozone, causes a host of respiratory consequences, ranging from coughing, wheezing and throat irritation, to asthma, increased risk of infection, and permanent damage to lung tissue.[2]
- Particulate matter can cause similar adverse respiratory consequences and also trigger a range of cardiovascular problems, including heart attacks, strokes, congestive heart failure, and reduced blood supply to the heart.[3] These problems can result in increased hospital admissions or premature death. Particulate matter can also trigger premature birth, raise the risk of autism, stunt lung development in children, and increase the risk that they develop asthma.[4] Recent studies also implicate particulate matter in an increased risk of dementia.[5]

Elevated smog pollution – pollution that is above the level that the EPA has determined to pose "little to no risk" – affects people living in hundreds of communities across the U.S.

- Of the 10 cities with the most days of elevated smog pollution, seven were in California, along with the Denver, Phoenix and Las Vegas metropolitan areas. (See Table ES-1.)
- Residents of 34 metropolitan areas experienced more than 100 days in 2015 with elevated smog pollution. The Los Angeles, Salt Lake City, Albuquerque and Dallas-Fort Worth metropolitan areas were among those that faced elevated levels of smog for more than three months of the year.

In densely populated Northeastern states, communities experienced frequent smog pollution in 2015, an indication that stronger measures are still needed to help curb air pollution in the region, despite recent progress.

Table ES-1. Metropolitan areas with the most days of elevated smog pollution, 2015

Metropolitan area	Total days with elevated smog pollution
Riverside-San Bernardino-Ontario, CA	233
Bakersfield, CA	218
Los Angeles-Long Beach-Anaheim, CA	213
Visalia-Porterville, CA	195
Fresno, CA	190
Denver-Aurora-Lakewood, CO	176
Phoenix-Mesa-Scottsdale, AZ	176
San Diego-Carlsbad, CA	167
Las Vegas-Henderson-Paradise, NV	160
Sacramento–Roseville–Arden-Arcade, CA	158

Table ES-2. Northeastern cities with the most days of elevated smog pollution, 2015

Metropolitan area	Total days with elevated smog pollution
Washington-Arlington-Alexandria, DC-VA-MD-WV	99
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	97
Pittsburgh, PA	93
New York-Newark-Jersey City, NY-NJ-PA	92
Baltimore-Columbia-Towson, MD	89
York-Hanover, PA	72
Bridgeport-Stamford-Norwalk, CT	68
Berlin, NH-VT	66
Trenton, NJ	65

- Residents of the Washington, Philadelphia, Pittsburgh, New York City and Baltimore metropolitan areas all experienced 89 or more days in 2015 of elevated levels of smog. (See Table ES-2.)

- Residents of smaller communities, such as York, Pennsylvania, and the Berlin area of New Hampshire and Vermont, also experienced frequent elevated smog levels.

Particulate matter pollution affected people living in a broad range of cities in 2015. Multiple metropolitan areas in California and Pennsylvania are among the communities that experienced chronic particulate matter pollution in 2015. (See Table ES-3.) Hilo, Hawaii, tops the list because of pollution from volcanic activity.

Millions of Americans may be exposed to air pollution even more severe than described here

Table ES-3. Metropolitan areas with the most days of elevated particulate pollution, 2015

Metropolitan area	Total days with elevated particulate matter pollution
Hilo, HI	293
Riverside-San Bernardino-Ontario, CA	272
Pittsburgh, PA	220
Fresno, CA	218
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	212
St. Louis, MO-IL	202
Los Angeles-Long Beach-Anaheim, CA	201
Harrisburg-Carlisle, PA	199
Weirton-Steubenville, WV-OH	196

because they live in local pollution "hotspots," such as near freeways, airports and industrial facilities.[6] Studies have shown that people living close to these sources of pollution face greater health impacts than do residents across the region as a whole. For example, people who live near highly traveled roads are at increased risk of developing lung cancer, and at greater risk of death from stroke, lung disease and heart disease.[7]

Communities may endure worse air pollution in the future as global warming creates conditions conducive to increased smog and particulate pollution.[8] Higher temperatures will facilitate formation of smog, and altered wind patterns may increase the number of days with stagnant air that prevents dilution of contaminants.[9] Wildfires, which generate particulate pollution and smog precursors that can travel hundreds of miles, will become more frequent and intense.[10]

To address the air pollution problems affecting people in communities across the country, and to avoid global warming-related increases in air pollution in the future, the nation should:

- **Defend and build upon improvements in air quality through the Clean Air Act**. Pollution reductions achieved under the Clean Air Act helped prevent more than 160,000 early deaths, 130,000 non-fatal heart attacks, and 41,000 hospital admissions in 2010 alone.[11] Maintaining the gains already achieved under the Clean Air Act and seeking greater emission reductions are crucial for ensuring that Americans can breathe cleaner air.

- **Strengthen the Regional Greenhouse Gas Initiative** and other programs to reduce global warming pollution and improve air quality. From 2009 to 2014, improved air quality due to the program avoided up to 830 premature deaths, 390 non-fatal heart attacks, and 47,000 lost work days from Virginia to Maine.[12] Participating states should double the strength of the program to achieve greater cuts in power plant pollution that would bring about short- and long-term improvements in air quality. New Jersey should rejoin the program.

- Pursue other measures to **reduce the use of coal and natural gas for electricity generation**, such as increasing energy efficiency and boosting the use of wind and solar energy, with the goal of ultimately obtaining all of our energy from clean, renewable sources.

- **Maintain existing standards and requirements in the Clean Cars Standards**

– the strong program of tailpipe emissions standards for cars adopted by California and other states, and eventually implemented nationwide beginning in 2009. The program has allowed states that suffer from elevated pollution to dramatically reduce pollution from cars and light trucks, and also spurred development of hybrid and zero-emission vehicles.

- **Transition other forms of transportation to zero-carbon technologies.** Freight trucks, airplanes, locomotives and other fossil fuel-powered engines are major sources of air pollution. These sources of air pollution can be better controlled as these forms of transportation are eventually transitioned to carbon-free modes.

How Air Pollution Threatens the Health of Millions of Americans

Air pollution is a threat to public health. Ground-level ozone and particulate matter, mixed with other toxic air pollutants, are the by-products of burning fossil fuels like gasoline, diesel, coal and natural gas. Wildfires, agricultural activity and volcanoes also contribute to air pollution. When inhaled, these pollutants cause respiratory and cardiovascular harm.

Smog

Burning fossil fuels creates oxides of nitrogen (NO_x). Volatile organic compounds (VOCs) result from combustion of or evaporation from gasoline, diesel and other petroleum fuels and from chemical solvents used in a variety of products such as cleaners or paints. NO_x can also react with VOCs released by plants.[13]

When NO_x and VOCs mix in the presence of sunlight, they form ozone – a powerfully reactive gas that is a principal component of smog. A natural layer of "good" ozone exists high in the atmosphere that protects us from exposure to ultraviolet radiation, but when pollutants create ozone near the ground it becomes a threat to public health. As the impacts of global warming become more pronounced, smog pollution likely will become worse. (See "Global Warming May Make Air Pollution Worse," p. 20.)

Ground-level ozone quickly reacts with airway tissues and produces inflammation analogous to a sunburn on the inside of the lungs. This inflammation makes lung tissues less elastic, more sensitive to allergens, and less able to ward off infections.[14]

Minor exposure to ozone can cause coughing, wheezing and throat irritation. Frequent exposure to ozone over time permanently damages lung tissues, decreases the ability to breathe normally, and exacerbates or even causes chronic diseases like asthma.[15]

Children, adults who are active outdoors, and people with existing respiratory system ailments suffer most from ozone's effects. Children's vulnerability to air pollution is the result of several factors: their lungs are not yet fully developed; they spend more time outside; relative to their size, they breathe more air than adults do; and they are more likely to have asthma.[16]

On days with elevated levels of ozone pollution:

- Hospitals admit increased numbers of patients for respiratory and cardiovascular disease.[17] Scientists have estimated that typical summertime smog pollution is responsible for up to half of all respiratory hospital admissions on bad air days.[18]
- More people visit hospital emergency rooms for asthma, pneumonia and upper respiratory infections.[19]
- Children and adults suffer more asthma attacks, increased respiratory difficulty, and reduced lung function.[20]
- More adults miss work and more children miss school due to illness.[21]

Children are especially vulnerable to ozone's effects. Credit: KristyFaith/Flickr CC BY-NC-ND 2.0

Particulate Matter

Particulate matter consists of extremely small and practically invisible particles that can contain hundreds of toxic chemicals. Fine particles, those of 2.5 micrometers or less, present the greatest health risk because such small contaminants can be inhaled deeper into the lungs and even enter the bloodstream.[22] Both short-term and long-term exposure to elevated levels of particulate matter can harm health.

Exposure to particulate matter can cause many of these same respiratory problems as exposure to ozone, along with a range of cardiovascular problems, including heart attacks, strokes, congestive heart failure, and reduced blood supply to the heart.[23] These problems can result in increased hospital admissions or premature death.

Particulate matter can also cause coughing, shortness of breath, asthma attacks, and increased emergency room visits.[24]

Children are particularly at risk from exposure to fine particulates. For example:

- A pregnant woman's exposure to elevated levels of particulate pollution increases her risk of having her baby early. More than 15,000 pre-term births in the U.S. in 2010 likely were the result of particulate pollution.[25]
- Exposure in utero to fine particulates raises the risk that a child will have an autism spectrum disorder.[26] The higher the mother's exposure to particulate matter, the higher the autism risk for her child.
- Children who are exposed to elevated levels of particulates may experience irreversible damage as particulate matter interferes with lung growth and development.[27] Particulate matter exposure may also cause children to be less able to fully inhale and more likely to develop asthma.[28]

Older people are also vulnerable to neurological damage from particulate matter pollution. Older women who live in areas with higher levels of fine particulate pollution are more likely to develop dementia.[29] Another study that looked at both older men and women exposed to elevated ozone and particulate matter pollution also found elevated Alzheimer's disease risk.[30]

Air Toxics

Fossil fuel combustion releases toxic air contaminants such as benzene, formaldehyde and 1,3-butadiene that contribute to smog and particulate matter, and that are also hazardous on their own. At sufficient levels of exposure, these pollutants can irritate airways and lungs, cause asthma, worsen asthma symptoms, and cause leukemia and other types of cancers.[31]

Outdoor air pollution, whether smog, particulate matter or air toxics, also influences indoor air quality. That means that exposure to air pollutants continues even when people go inside.[32]

Air Pollution Harms People Throughout the United States

Poor air quality affects residents of almost every state in the country. In the summer, ozone pollution is a widespread problem, while in the winter, hundreds of communities suffer from spiking particulate pollution. There is no safe or healthy level of exposure to these pollutants. And even a single day of elevated air pollution represents an unacceptable threat to public health.

Air Pollution Indicators

Thousands of air quality monitors in both urban and rural areas across the nation sample air pollution levels multiple times each hour. Based on this information, the U.S. Environmental Protection Agency (EPA) identifies potentially harmful air quality conditions. To communicate potential health risks to the public, EPA has designed an Air Quality Index (AQI) that classifies pollutant levels into different risk categories. (See Table 1.) The categories are:

- "Good" (green), which means air quality poses "little or no risk," according to the EPA.[33]
- "Moderate" (yellow), a level at which air quality is "acceptable."
- "Unhealthy for sensitive groups" (orange), such as children, older adults and people with heart or lung disease, who may experience health problems at this level of air pollution.
- "Unhealthy" (red), which means air is unhealthy for all people in the area, and health impacts may increase for sensitive people.
- "Very unhealthy" (purple), meaning health impacts will be more severe.
- "Hazardous" (maroon), which means air pollution is severe and presents a risk to the entire population.

Table 1. Air Quality Index Values and Colors[34]

Air Quality Category	Air Quality Index Values	Color
Good	0-50	Green
Moderate	51-100	Yellow
Unhealthy for Sensitive Groups	101-150	Orange
Unhealthy	151-200	Red
Very Unhealthy	201-300	Purple
Hazardous	301-500	Maroon

The pollution categories within the air quality index provide a tool for communicating relative risk, and different individuals may experience health impacts at lower or higher levels than the AQI suggests. The AQI is linked to the National Ambient Air Quality Standards, which are periodically reviewed and lowered.

For example, currently EPA has concluded that ozone levels above 70 parts per billion for eight hours or more are unhealthy for sensitive people, and when ozone exceeds that level EPA warns that children, older adults and people with lung disease should consider limiting their exposure.[35] However, these vulnerable groups are not the only ones at risk from this level of air pollution.

There does not appear to be a safe level of ozone exposure. Researchers can detect negative health impacts for people exposed to very low concentrations of ozone. Even when concentrations of smog are at levels considered by EPA to be "good" or "moderate," a modest increase in smog pollution results in more premature deaths.[36] Similarly, there is no safe level of exposure to particulate matter.[37]

In addition, the effects of exposure to ozone pollution may be understated by a single air quality index reading, because repeated exposure to unsafe levels of ozone increases the risk of health impacts, especially in children.[38] Finally, averaging pollution data over eight hours, as is the case for the AQI data used in this report, may mask short-term spikes in pollution that can damage health.[39]

Communities with Smog Pollution

In 2015, communities in 49 states plus the District of Columbia experienced at least one day of "elevated" ozone smog pollution – pollution that is beyond the level that the EPA has determined to pose "little to no risk." The only state that did not suffer from elevated levels of smog pollution was Hawaii. (See Appendix A for a state by state list of smog pollution.)

Of the ten cities with the most days of elevated smog pollution, seven were in California, along with the Denver, Phoenix and Las Vegas metropolitan areas. (See Table 2.)

Residents of 34 metropolitan areas experienced more than 100 days in 2015 with elevated smog pollution. More than half of those communities were in California, where cities in Southern California and the state's Central Valley face

Table 2. Metropolitan areas with the most days of elevated smog pollution, 2015

Metropolitan area	Number of days when air was:				Total days with elevated smog pollution
	Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Riverside-San Bernardino-Ontario, CA	110	79	39	5	233
Bakersfield, CA	137	60	20	1	218
Los Angeles-Long Beach-Anaheim, CA	105	76	31	1	213
Visalia-Porterville, CA	115	67	13		195
Fresno, CA	112	63	14	1	190
Denver-Aurora-Lakewood, CO	153	21	2		176
Phoenix-Mesa-Scottsdale, AZ	141	35			176
San Diego-Carlsbad, CA	132	35			167
Las Vegas-Henderson-Paradise, NV	139	20	1		160
Sacramento–Roseville–Arden-Arcade, CA	122	31	5		158

Air pollution over Los Angeles, 2014.

chronic pollution. The Denver, Phoenix, Las Vegas, Salt Lake City and Albuquerque metropolitan areas along with two regions in Texas – Houston and Dallas-Fort Worth – were also among the cities that faced frequent exposure to elevated levels of smog.

Though metropolitan areas in western states dominate the list of cities with the highest number of days of elevated smog pollution, communities both large and small across the heavily populated Northeastern states also frequently suffered from elevated levels of pollution. (See Table 3.) The Washington, D.C., Philadelphia, Pittsburgh, New York City and Baltimore metropolitan areas all experienced 89 or more days in 2015 of elevated levels of smog. Residents of smaller communities, like those in Berlin area of New Hampshire and Vermont, and in Portland, Maine, also experienced frequent elevated smog pollution.

In addition to experiencing frequent smog pollution, a number of these communities also are on the list of areas with the most severe pollution, days when smog-related health risks are especially high. Bridgeport-Stamford-Norwalk, Connecticut, for example, experienced six days in 2015 where smog reached unhealthy (red) levels.

Less populated areas also experience smog pollution, often when the wind carries pollution from urban centers. That's why Mariposa County, California, home to Yosemite National Park, experienced 118 days in 2015 with elevated levels of ozone. Similarly, Kent County, Maryland, encountered 54 days of elevated ozone pollution carried from upwind metropolitan areas in the region.

Table 3. Northeastern cities with the most days of elevated smog pollution, 2015

Metropolitan area	Number of days when air was:			Total days with elevated smog pollution
	Moderate	Unhealthy for sensitive groups	Unhealthy	
Washington-Arlington-Alexandria, DC-VA-MD-WV	85	13	1	99
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	72	23	2	97
Pittsburgh, PA	78	15		93
New York-Newark-Jersey City, NY-NJ-PA	57	32	3	92
Baltimore-Columbia-Towson, MD	74	14	1	89
York-Hanover, PA	65	7		72
Bridgeport-Stamford-Norwalk, CT	38	24	6	68
Berlin, NH-VT	59	7		66
Trenton, NJ	55	10		65
New Haven-Milford, CT	39	13	3	55

Preliminary data on 2016 ozone pollution are available for some states. Thirty-five states have submitted at least 90 percent of their daily smog monitoring reports to EPA as of early February 2017, enabling preliminary calculations of the number of days with elevated smog pollution.[40] Some of the states with significant air pollution in 2015 – including California, Texas and New Jersey – have not yet reported enough data to allow any analysis of 2016 pollution levels. States that have already submitted data may still revise that information.

In the states that have reported preliminary 2016 data, some communities show large jumps in smog pollution. Such year-to-year variation can result from higher temperatures, more sunny days, or less wind, and does not necessarily indicate a long-term trend. The Atlanta, Georgia; Elkhart-Goshen, Indiana; and Jacksonville, Florida, metropolitan areas all reported at least 29 more days of elevated smog pollution in 2016 than in 2015. (See Table 4.)

Communities with Particulate Matter Pollution

Particulate pollution afflicts communities in every state. Whereas major urban areas dominate the list of places affected by smog, smaller cities and even rural areas routinely suffer from particulate pollution. See Appendix B for a state-by-state list of particulate pollution.

A community in Hawaii, which is the only state with no smog pollution, tops the particulate pollution list because of volcanic activity. Many of the California communities that suffered from smog pollution in 2015 also dealt with frequently elevated levels of particulate matter pollution, the result of fossil fuel combustion, wood burning, and stagnant air that prevents pollution from mixing with cleaner air.[41] The Pittsburgh and Philadelphia metropolitan areas also each experienced more than 200 days of elevated particulate matter pollution. (See Table 5.) Nationally, residents in 72 metropolitan areas breathed elevated levels of particulate pollution on at least 100 days in 2015.

Table 4. Metropolitan areas with notable increases in smog pollution from 2015 to 2016 (preliminary data based on reports from 35 states)

County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution 2016	Total days with elevated smog pollution 2015	Increase from 2015 to 2016
	Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy			
Atlanta-Sandy Springs-Roswell, GA	92	26	3		121	89	32
Elkhart-Goshen, IN	32	6			38	7	31
Jacksonville, FL	44				44	15	29
Gadsden, AL	46				46	19	27
Athens-Clarke County, GA	42	1			43	17	26
Wilmington, OH	54	4			58	32	26
Fort Wayne, IN	39	3			42	17	25
Birmingham-Hoover, AL	66	8	1	1	76	53	23
Muncie, IN	27	1			28	6	22
Huntington, IN	23	1			24	3	21

Table 5. Metropolitan areas with the most days of elevated particulate matter pollution, 2015

Metropolitan area	Number of days when air was:			Total days with elevated particulate matter pollution
	Moderate	Unhealthy for sensitive groups	Unhealthy	
Hilo, HI	293			293
Riverside-San Bernardino-Ontario, CA	247	24	1	272
Pittsburgh, PA	211	8	1	220
Fresno, CA	197	14	7	218
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	207	5		212
St. Louis, MO-IL	197	4	1	202
Los Angeles-Long Beach-Anaheim, CA	185	14	2	201
Harrisburg-Carlisle, PA	195	4		199
Weirton-Steubenville, WV-OH	193	3		196
Atlanta-Sandy Springs-Roswell, GA	195			195

Table 6. Counties with the most days of elevated particulate matter pollution, 2015

County	Number of days when air was:				Total days with elevated smog pollution
	Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Lincoln County, MT	139	7	12	1	159
Shoshone County, ID	134	14	3		151
Aroostook County, ME	82				82
Harney County, OR	75	2			77
Lemhi County, ID	59	8	3		70
Kent County, MD	68				68
Tioga County, PA	63				63
Ravalli County, MT	37	8	11	2	58
Plumas County, CA	46	10	1		57
Caswell County, NC	56				56

The counties that experienced the most frequent particulate pollution often were downwind from major wildfires. In addition to causing a high number of total days with elevated particulate pollution, fires caused spikes in air pollution that reached "very unhealthy" levels for two Montana counties and a day of "hazardous" levels for Calaveras County, California.

Particulate matter pollution also was a problem in counties that experience stagnant air in the winter, which traps pollution from cars, industrial sources and wood burning near the ground, limiting dilution by cleaner air. Nationally, one third of days with elevated particulate matter pollution occurred from January through March, versus five percent of smog days.[42]

Many Americans Are Exposed to Worse Air Pollution than Regional Measures Indicate

Measurements of smog and particulate matter pollution reported here are broadly indicative of air conditions across a region. However, regional-level smog and particulate matter classifications do not tell the full story of air pollution's health impacts.

Air pollution levels may be higher than levels indicated by currently installed air quality monitors. Because of the locations of these monitors, they may not provide data about the most polluted areas in a region, such as near pollution sources like highways, airports and industrial facilities. In addition, smog and particulate matter are not the only pollutants of concern. Carbon monoxide, air toxics and oxides of nitrogen are among the other pollutants that can harm public health.

People who spend more time near busy thoroughfares – whether they live, work, or go to school there – suffer from more pollution-related health problems. The air near high-traffic roads often contains elevated levels of benzene, nitrogen dioxide and other pollutants. Pregnant women who live closer to traffic-related air pollution are more likely to give birth to small babies.[43] Children directly exposed to traffic pollution develop respiratory problems, including

An apartment building has been built above the Trans-Manhattan Expressway in New York City. Living near a highway raises the risk of developing lung cancer, and of dying from stroke, lung disease and heart disease. Credit: Jim Henderson/Wikimedia Commons.

cough, wheezing, runny nose and asthma.[44] People living near highways or highly traveled roads face an increased risk of developing lung cancer, and a greater risk of death from stroke, lung disease and heart disease.[45] More than 11 million Americans live within 500 feet of a major highway.[46]

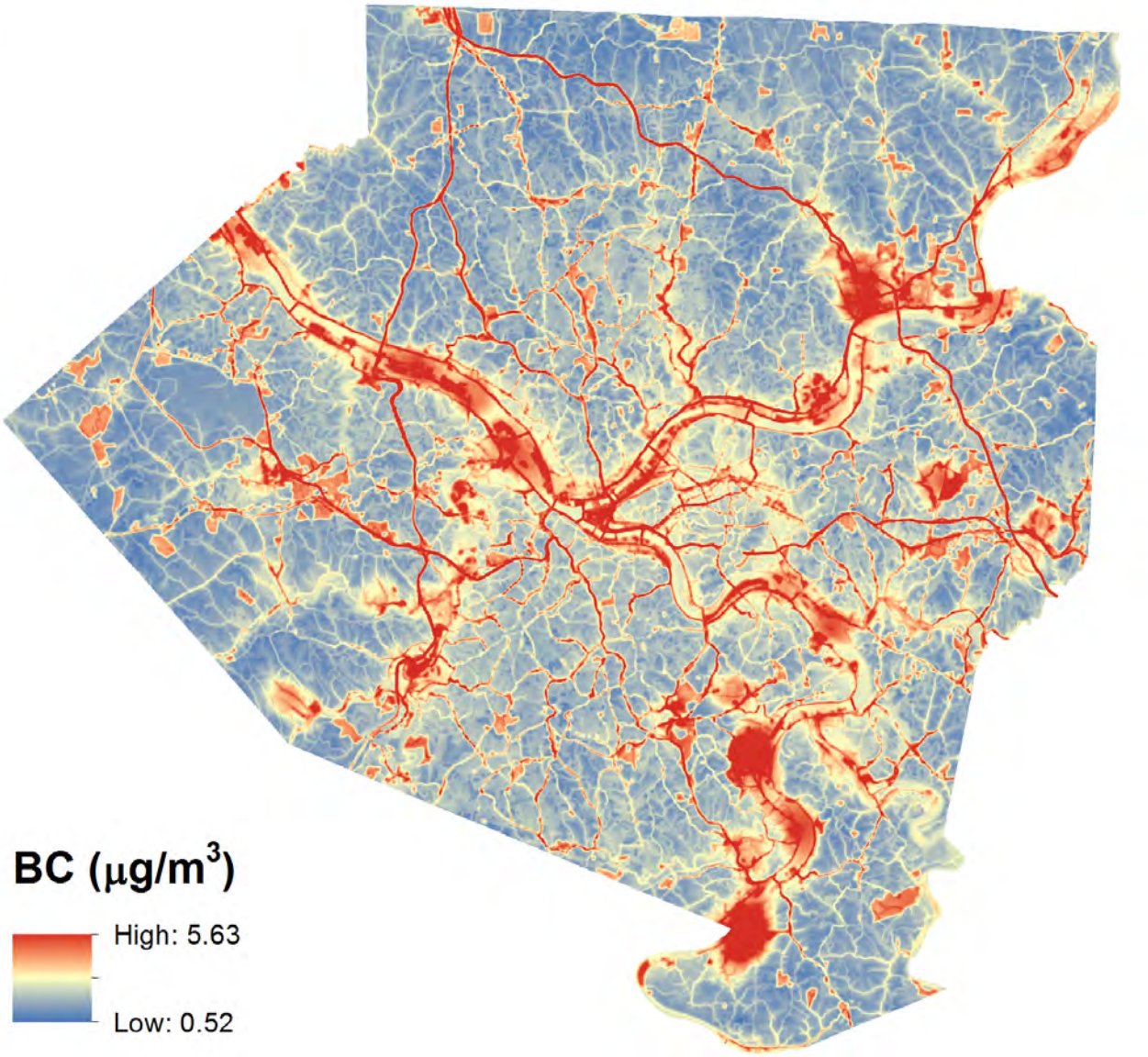
People who spend time downwind of airports may experience more health problems than would be expected based on regional air pollution data. For example, on days with higher air pollution from major California airports, more people living nearby go to the hospital for care.[47] Airplane exhaust includes carbon monoxide, oxides of nitrogen, oxides of sulfur, volatile organic compounds and particulate matter, all of which can cause respiratory problems. Researchers observed that when many aircraft were delayed and thus spent more time with their engines idling, adults downwind within approximately a six-mile radius were more likely to go to the emergency room or be admitted to the hospital for respiratory and heart problems.[48] The researchers identified high carbon monoxide levels as the biggest trigger of health issues.

In Pittsburgh, industrial facilities and major roadways, especially those carrying diesel vehicles, create areas of elevated pollution. Researchers at Carnegie Mellon University repeatedly sampled air quality at 70 sites across Allegheny County, in the heart of the Pittsburgh metropolitan area, and detected large variations

People who spend time downwind of airports, such as those who live in the neighborhoods surrounding Los Angeles International Airport, may experience more health problems than would be expected based on regional air pollution data. Credit: D Ramey Logan & Taylor Mullin/Wikimedia Commons CC BY-SA 4.0.

in levels of nitrogen dioxide and black carbon, a type of particulate matter.[49] Figure 1 shows a map of how black carbon concentrations differ across the county. If all areas of Allegheny County had black carbon pollution at the lowest levels currently found in the county, the number of premature deaths would decline by 151 per year.[50]

Figure 1. Variation in Black Carbon Pollution in Allegheny County, Pennsylvania[51]



Case Study: Hotspots and Toxic Air Pollution in Allegheny County, Pennsylvania

Residents of Allegheny County regularly breathe some of the most polluted air in the nation. The Pittsburgh metropolitan area experienced 220 days with high levels of fine particulate pollution – the worst of any area east of the Mississippi – and 93 days with elevated levels of ozone pollution in 2015.[68]

However, the impact of air pollution on Allegheny County residents is even greater than these data suggest, because regional air pollution data do not account for pollution "hot spots," where smog and particulate pollution may be worse than is measured at installed regional air pollution monitors. In addition, emissions of air toxics from the county's industrial facilities expose residents to elevated risk of cancer and other health problems.

Air Pollution Hotspots and Spikes

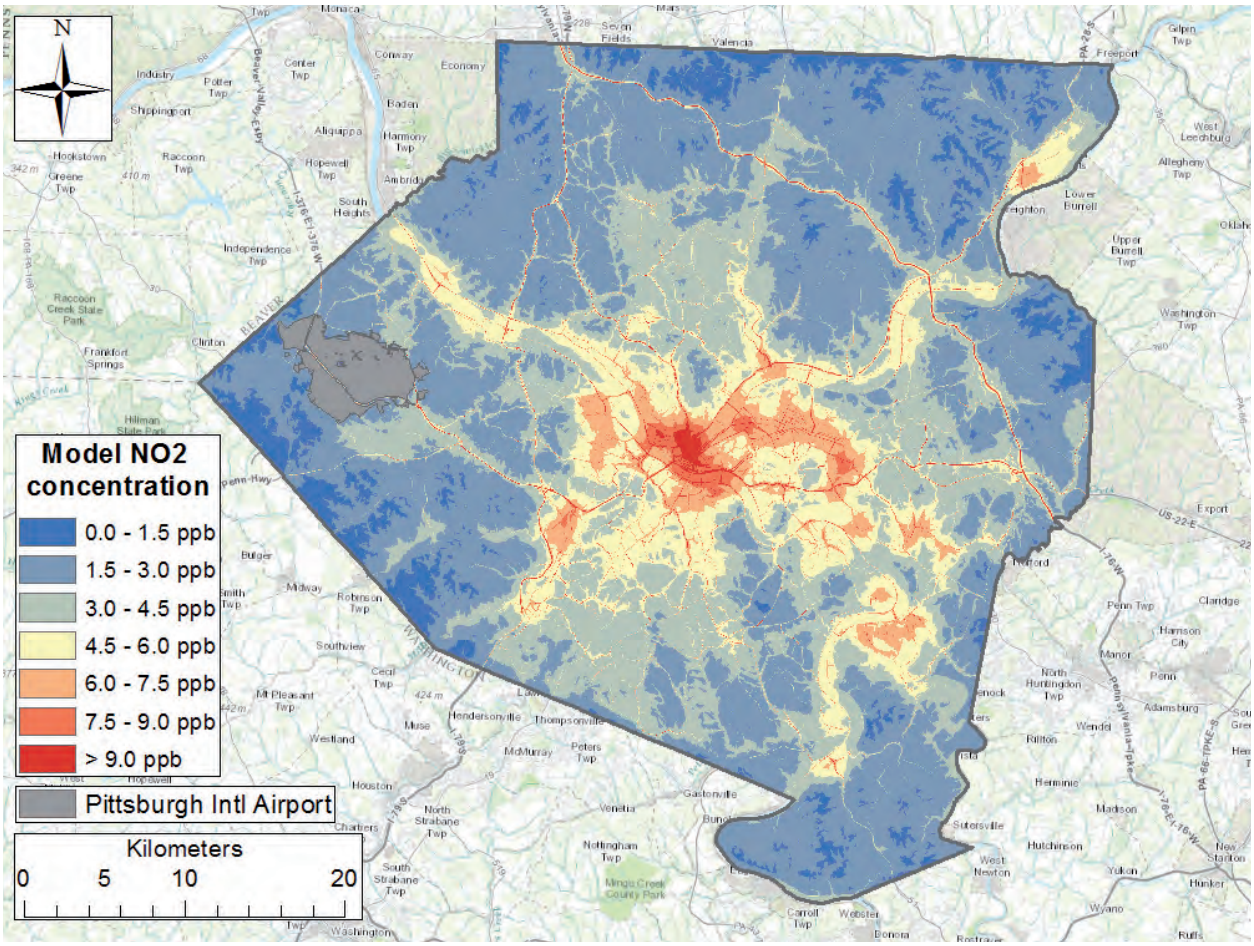
Residents of Allegheny County may be exposed to higher levels of air pollution than indicated by the air quality monitoring data reported to the federal EPA, because there are relatively few monitors, located in just a few areas in the county, that provide the data. This incomplete coverage means that varying levels of proximity to pollution generators such as industrial facilities and high-traffic roads, combined with Pittsburgh's complex topography, may result in pockets of elevated pollution. In addition, air quality measurements averaged over days or weeks may underreport short-term spikes in pollution, which, if repeated, can have long-term health consequences.

For example, more localized air sampling data has revealed pockets of elevated nitrogen dioxide pollution in Allegheny County. Nitrogen dioxide – which can inflame airways, aggravate asthma, and increase hospital emergency room visits and hospital admissions – is produced by burning gasoline, diesel and other fossil fuels. In one such recent study, Carnegie Mellon University researchers repeatedly tested air at 70 locations and detected localized variations in nitrogen dioxide pollution.[69] Some of their data is shown in Figure 2, documenting hotspots of nitrogen dioxide pollution in downtown Pittsburgh, near busy roads, and close to industrial zones.

The researchers also found hotspots of black carbon pollution. Those results are discussed on p. 17.

Acute air pollution problems may be masked by regional air sampling data that is averaged over hours, days or weeks. Often, air quality data are aggregated over time to provide an estimate of long-term average exposure that is important for assessing some health endpoints, such as cancer and chronic cardiovascular diseases. However, this approach may miss short-term spikes in pollution. Especially dirty diesel trucks, for example, may cause a short-lived jump in air toxics and black carbon pollution.[71] Industrial sources can produce multi-hour increases in air toxic concentrations.[72] These exposures come with their own health risks.

Figure 2. Variation in Nitrogen Dioxide Pollution in Allegheny County, Pennsylvania[70]



Toxic Air Pollution

Major industrial and electricity generating facilities in Allegheny County, such as Carpenter Powder Products in Bridgeville, the Cheswick Power Plant in Springdale, and the U.S. Steel Clairton Plant in Clairton, release toxic substances into the air, which can include:

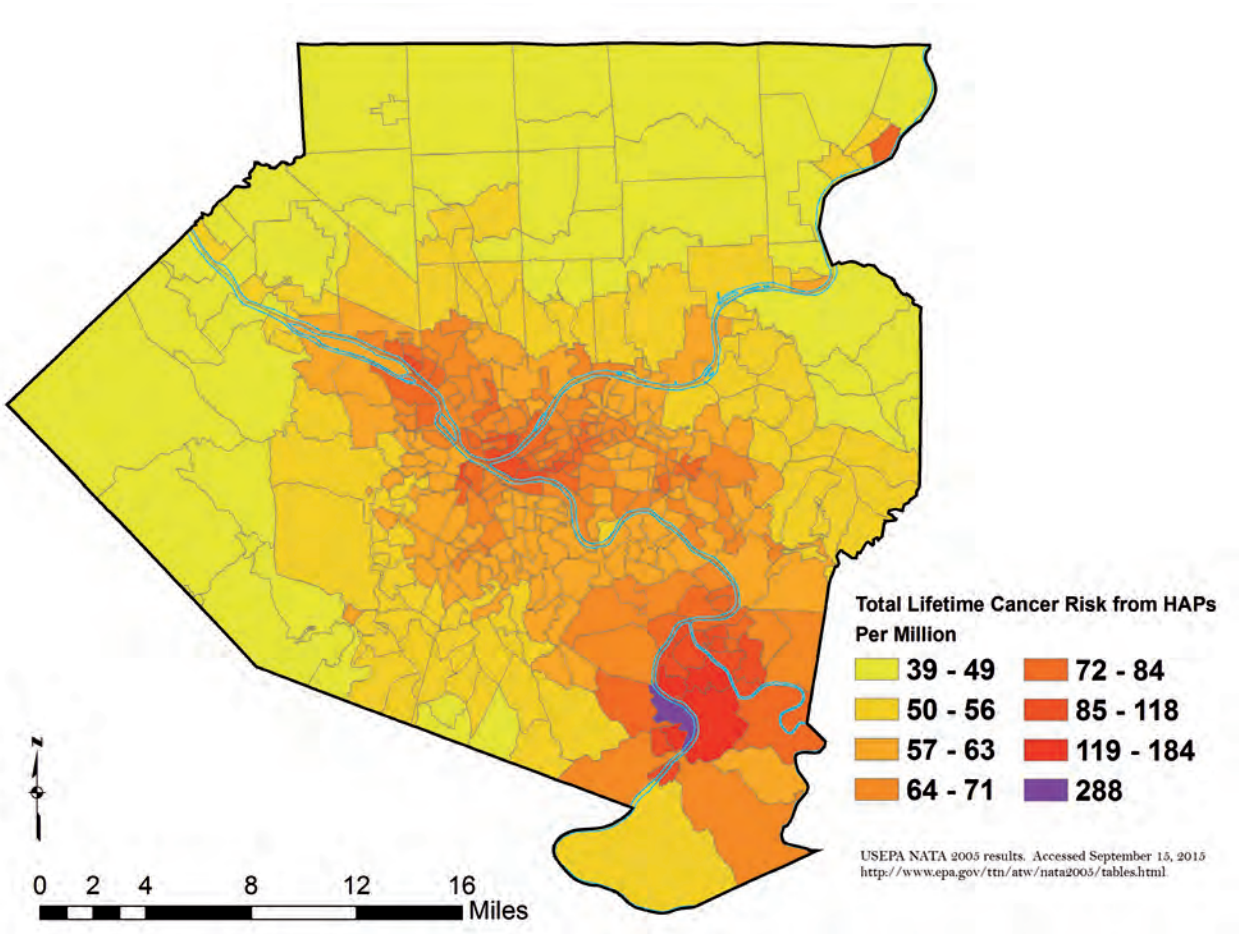
- **Toxic metals**, such as chromium, cobalt, copper, lead, manganese, mercury, nickel and zinc, which can be inhaled directly from the air, but can also accumulate in the soil and surface water.[73] Humans exposed to these metals can develop a variety of medical conditions, including cancer, cardiovascular problems, respiratory problems, and nervous system damage.[74]
- **Volatile organic compounds (VOCs),** which are a class of chemicals that cause a range of health problems, including cancer; irritation to the eyes, skin, nose and throat; headaches and nausea; liver and kidney damage; and nervous system damage.[75]
- **Other air toxics**, including hydrochloric and sulfuric acid, ammonia, and organic chemicals such as styrene and pyridine, which can also cause cancer and cardiovascular, nervous and respiratory system damage.[76]

The cumulative effects of these exposures may be greater than the health effects caused by individual pollutants. Relatively little is known about their combined effects.

In 2013, 10 industrial polluters in Allegheny County emitted a total of 1.4 million pounds of toxic pollutants into the air, according to data the facilities reported to the U.S. Environmental Protection Agency, as analyzed by PennEnvironment Research & Policy Center.[77]

Allegheny County residents live with more than twice the cancer risk from air toxics than do residents of nearby rural areas, according to a University of Pittsburgh study.[78] In some areas, residents face as much as 20 times greater risk of contracting cancer from exposure to hazardous air pollutants from industry and other sources. (See Figure 3.)

Figure 3. Total Lifetime Cancer Risk from All Hazardous Air Pollutants (HAPs) in Allegheny County as Predicted by National-Scale Air Toxics Assessment (2005)[79]



Global Warming May Make Air Pollution Worse

Air pollution may become a greater problem in the future, as climate change warms the planet, alters weather patterns, and triggers other shifts that will create more air pollution. 2016 was the hottest year on record, the third year in a row of record-breaking heat and the 40th consecutive year in which annual temperatures exceeded the 20th century average.[52]

Changes caused by global warming may worsen smog and potentially particulate pollution.[53] For example:

- Temperatures will rise, speeding up the chemical reactions that create smog.[54] In addition, with increased temperatures throughout the year, communities may experience more spring and fall days with unhealthy levels of ozone, in addition to the summer ozone problems that are common today.[55]

- Changed wind patterns may increase the number of days with stagnant air, keeping pollution from being diluted. Decreased air circulation may already be worsening air quality by trapping pollution precursors and pollution near the ground.[56] Multiple days of stagnant air can lead to especially high levels of pollution.

- Wildfires, already increasing in intensity and frequency due to drought and higher temperatures, create particulate matter and other air pollution that can travel for hundreds of miles.[57]

- Evaporative emissions of volatile organic compounds, precursors to ozone, could increase.[58]

Nationally, by 2050, global warming-related increases in smog and particulate pollution may cause up to 4,300 additional premature deaths each year.[59] The U.S. Global Change Research Program has concluded that global warming will make it more difficult to control smog pollution, and that maintaining current pollution levels in a warmer world will require reduced emissions of the chemicals that form smog.[60]

In many cases, the activities that cause air pollution also contribute to global warming. Efforts to reduce our reliance on fossil fuels, which contribute to global warming, have the potential to help reduce smog pollution as well.

Global warming will increase the intensity and frequency of wildfires, which create particulate matter and other air pollution that can travel for hundreds of miles. Credit: Nerval/Wikimedia Commons.

Recommendations

Air pollution remains a problem for communities across the country. There is no healthy or safe level of exposure to many air pollutants, and even a single day of exposure to elevated air pollution creates an unacceptable risk to public health. The elevated levels of smog and particulate matter pollution quantified in this report threaten the health of vulnerable people – children, older adults and those with respiratory problems – as well as otherwise healthy adults. People who live, study or work near sources of pollution like freeways, airports or industrial facilities face greater health risks. In the coming years, global warming may further exacerbate air pollution problems.

Such threats to public health are unacceptable. As long as we continue to rely on fossil fuels for electricity and transportation, air pollution will remain a problem. The nation should move as quickly as possible to clean, renewable sources of energy to supply 100 percent of our electricity and transportation needs, and at the same time seek to better control pollution from burning fossil fuels.

At the national level, we should **defend and build upon improvements in air quality through the Clean Air Act,** which has reduced air pollution and improved public health across the nation since its enactment more than four decades ago. In 2010, air quality improvements achieved by the Clean Air Act helped prevent more than 160,000 early deaths, 130,000 non-fatal heart attacks, and 41,000 hospital admissions.[61] Better air quality enabled adults to go to work an additional 13 million days and children to attend school an additional 3.2 million days. Yet, as the elevated levels of smog and particulate pollution that continue to be experienced by Americans demonstrate, the problem of air pollution is far from solved. Maintaining the gains already achieved under the Clean Air Act and seeking greater protections are crucial for ensuring Americans can breathe cleaner air. EPA's continued adherence to science-based standards will be critical for protecting public health.

On a regional level, programs like the **Regional Greenhouse Gas Initiative** – the agreement among nine northeastern and mid-Atlantic states to limit carbon pollution from power plants – can be strengthened.[62] Since 2009, states participating in the program have cut carbon pollution from power plants by 37 percent, in part by reducing reliance on burning coal and oil for generating electricity.[63] In addition to helping to reduce the future severity of global warming and its potential air quality impacts, the program has directly improved air quality in the region. From 2009 to 2014, improved air quality due to the program avoided up to 830 premature deaths, 390 non-fatal heart attacks, and 47,000 lost work days in the nine participating states, plus New Jersey, Pennsylvania, Virginia and Washington, D.C.[64]

Participating states should double the strength of the Regional Greenhouse Gas Initiative, accelerating the rate of decline of the emissions cap from its current level of 2.5 percent per year to 5 percent of 2020 cap levels per year between 2020 and 2030. This would make the cap more closely match the overall pace of pollution

cuts the region has achieved since 2005, when pollution levels were twice as high as today. States should also act to close loopholes that could undermine the effectiveness of the program, such as retiring excess pollution permits that have built up over time.

Communities that are on the frontlines of the impacts of pollution and climate change should have a say in how the program is implemented and how funds are distributed to ensure broad and equal opportunities to benefit.

Finally, additional states – including New Jersey – should join the program to accelerate progress in cleaning up dangerous pollution from power plants and fighting climate change.

Other measures to **reduce the use of coal and natural gas for electricity generation** can help improve air quality, now and in the future. Energy efficiency requirements and growth in power generation from wind, solar and other clean energy sources can help curtail use of fossil fuels, with their attendant air pollution. Ultimately, the nation should obtain all of its energy for all purposes from clean, renewable sources.

The Clean Cars Standards should be maintained. Cars, light trucks and other passenger vehicles are 99 percent cleaner than vehicles sold in the 1960s.[65] That's thanks in large part to the Clean Cars Standards, a series of policies pioneered by states that suffer from air pollution to reduce emissions from passenger vehicles and spur a transition to zero-emission vehicles. However, with so many vehicles on the road, their emissions continue to create significant pollution, and the Clean Cars Standards remain critical for reducing pollution. Light-duty vehicle pollution should be reduced further by tightening standards for gasoline- and diesel-powered vehicles and by hastening adoption of zero-emission vehicles.

Transition other forms of transportation to zero-carbon technologies. Pollution from medium- and heavy-duty vehicles, airplanes, locomotives and other mobile sources should also be reduced. Transportation is a major source of global warming pollution, and transitioning to zero-carbon transportation is an essential part of addressing the public health threat presented by global warming.

Reduce smog-forming emissions from smaller engines, such as lawnmowers and leafblowers. Lax emission controls on small engines mean that they are responsible for a growing share of smog-forming pollution.[66] Stronger standards could help curb this source of pollution.

Methodology

Air pollution data for 2015 are from U.S. Environmental Protection Agency, Air Data, Pre-Generated Files, accessed at https://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/download_files.html, 18 and 19 January 2017. We used daily summary data for ozone and daily summary data for PM2.5 measured with FRM/FEM mass methods. Those files include a daily EPA-calculated Air Quality Index (AQI) score from 0 to 500 for each monitoring station and for each pollutant. All the AQI scores in the pre-generated files are based on the current EPA ozone and particulate matter standards; when a standard is tightened, EPA retroactively adjusts the AQI scores for past years.

We grouped air quality monitors by core-based statistical area (CBSA) (metropolitan and micropolitan urban areas identified by the federal Office of Management and Budget) and identified the highest AQI score for each day for each pollutant. Per EPA, an AQI score of 51 to 100 is moderate (yellow), 101 to 150 is unhealthy for sensitive groups (orange), a score of 151 to 200 is unhealthy (red), a score of 201 to 300 is very healthy (purple), and a score of 301 to 500 is hazardous (maroon).[67] We counted the number of maximum AQI scores in each category for each CBSA, meaning that if one monitor in a CBSA showed "moderate" or higher pollution and other monitors in the same CBSA did not, we counted the CBSA as having unsafe air that day. Monitors that are not located in a CBSA were grouped by county.

Preliminary 2016 smog pollution calculations are based on a version of the pre-generated files for 2016, provided by EPA staff on 13 February 2017. We analyzed data for states where at least 90 percent of air quality monitoring records were available. We followed the same methodology as for the 2015 data.

Appendix A.
Smog Pollution for all Areas, by State, 2015

Listed in order by state. Metropolitan areas that extend into more than one state are listed multiple times, once for each state.

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Alabama	Birmingham-Hoover, AL	47	6			53
	Columbus, GA-AL	20	1			21
	Daphne-Fairhope-Foley, AL	18	1			19
	Decatur, AL	23				23
	Dothan, AL	15				15
	Florence-Muscle Shoals, AL	9				9
	Fort Payne, AL	25	1			26
	Gadsden, AL	19				19
	Huntsville, AL	28				28
	Mobile, AL	33	1			34
	Montgomery, AL	20	2			22
	Sumter County, AL	9				9
	Tuscaloosa, AL	22				22
Alaska	Denali County, AK	3				3
Arizona	Flagstaff, AZ	98	3			101
	La Paz County, AZ	82	3			85
	Payson, AZ	93	5			98
	Phoenix-Mesa-Scottsdale, AZ	141	35			176
	Prescott, AZ	66				66
	Show Low, AZ	51				51
	Sierra Vista-Douglas, AZ	71				71
	Tucson, AZ	85	1			86
	Yuma, AZ	56	9			65

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Arkansas	Arkadelphia, AR	15				15
	Fayetteville-Springdale-Rogers, AR-MO	25				25
	Fort Smith, AR-OK	18				18
	Harrison, AR	17				17
	Little Rock-North Little Rock-Conway, AR	43				43
	Memphis, TN-MS-AR	57	4			61
	Polk County, AR	27	1			28
California	Amador County, CA	73	8			81
	Bakersfield, CA	137	60	20	1	218
	Bishop, CA	106	4			110
	Calaveras County, CA	74	17	1		92
	Chico, CA	93	8			101
	Clearlake, CA	12				12
	Colusa County, CA	31				31
	El Centro, CA	98	19			117
	Fresno, CA	112	63	14	1	190
	Glenn County, CA	46				46
	Hanford-Corcoran, CA	107	40	2		149
	Los Angeles-Long Beach-Anaheim, CA	105	76	31	1	213
	Madera, CA	111	33	2		146
	Mariposa County, CA	111	7			118
	Merced, CA	90	27	2		119
	Modesto, CA	85	26	3		114
	Napa, CA	13				13
	Oxnard-Thousand Oaks-Ventura, CA	108	13			121
	Red Bluff, CA	99	16			115
	Redding, CA	85	8			93
	Riverside-San Bernardino-Ontario, CA	110	79	39	5	233
	Sacramento-Roseville-Arden-Arcade, CA	122	31	5		158
	Salinas, CA	16				16
	San Diego-Carlsbad, CA	132	35			167
	San Francisco-Oakland-Hayward, CA	42	10			52
	San Jose-Sunnyvale-Santa Clara, CA	52	6			58
	San Luis Obispo-Paso Robles Arroyo Grande, CA	84	4			88

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Santa Cruz-Watsonville, CA	5				5
	Santa Maria-Santa Barbara, CA	67	1			68
	Santa Rosa, CA	8				8
	Siskiyou County, CA	19				19
	Sonora, CA	89	11			100
	Stockton-Lodi, CA	75	17	2		94
	Truckee-Grass Valley, CA	114	29	2		145
	Ukiah, CA	2				2
	Vallejo-Fairfield, CA	26	1			27
	Visalia-Porterville, CA	115	67	13		195
	Yuba City, CA	73	7			80
Colorado	Boulder, CO	83	7			90
	Chaffee County, CO	39	1			40
	Colorado Springs, CO	78	1			79
	Craig, CO	4				4
	Denver-Aurora-Lakewood, CO	153	21	2		176
	Durango, CO	92	2			94
	Fort Collins, CO	122	14			136
	Glenwood Springs, CO	83	8			91
	Grand Junction, CO	78	3			81
	Greeley, CO	105	9			114
	Gunnison County, CO	78	3			81
	Jackson County, CO	16				16
	Montezuma County, CO	83				83
	Rio Blanco County, CO	51				51
	San Miguel County, CO	39	1			40
Connecticut	Bridgeport-Stamford-Norwalk, CT	38	24	6		68
	Hartford-West Hartford-East Hartford, CT	36	16			52
	New Haven-Milford, CT	39	13	3		55
	Norwich-New London, CT	30	11	1		42
	Torrington, CT	38	6			44
	Worcester, MA-CT	30	3			33
Delaware	Dover, DE	40				40
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	72	23	2		97
	Salisbury, MD-DE	46	3			49
District of Columbia	Washington-Arlington-Alexandria DC-VA-MD-WV	85	13	1		99

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Florida	Cape Coral-Fort Myers, FL	7				7
	Crestview-Fort Walton Beach-Destin, FL	9				9
	Deltona-Daytona Beach-Ormond Beach, FL	11				11
	Gainesville, FL	7				7
	Holmes County, FL	10				10
	Jacksonville, FL	15				15
	Lake City, FL	10				10
	Lakeland-Winter Haven, FL	18	1			19
	Liberty County, FL	7				7
	Miami-Fort Lauderdale-West Palm Beach, FL	18	1			19
	Naples-Immokalee-Marco Island, FL	4				4
	North Port-Sarasota-Bradenton, FL	33	1			34
	Ocala, FL	11				11
	Orlando-Kissimmee-Sanford, FL	28	1			29
	Palm Bay-Melbourne-Titusville, FL	15				15
	Panama City, FL	11				11
	Pensacola-Ferry Pass-Brent, FL	30				30
	Port St. Lucie, FL	10				10
	Sebastian-Vero Beach, FL	13				13
	Sebring, FL	11				11
	Tallahassee, FL	14				14
	Tampa-St. Petersburg-Clearwater, FL	55	1			56
Georgia	Americus, GA	8				8
	Athens-Clarke County, GA	17				17
	Atlanta-Sandy Springs-Roswell, GA	73	14	2		89
	Augusta-Richmond County, GA-SC	36	1			37
	Brunswick, GA	5				5
	Chattanooga, TN-GA	30	3			33
	Columbus, GA-AL	20	1			21
	Dalton, GA	19		1		20
	Macon, GA	23				23
	Savannah, GA	9				9
	Summerville, GA	18				18
Idaho	Boise City, ID	40	2			42
	Idaho Falls, ID	33				33
	Jackson, WY-ID	34				34
	Logan, UT-ID	29	2			31

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Illinois	Bloomington, IL	29				29
	Champaign-Urbana, IL	28				28
	Chicago-Naperville-Elgin, IL-IN-WI	60	9	1		70
	Clark County, IL	28				28
	Davenport-Moline-Rock Island, IA-IL	23	1			24
	Decatur, IL	32				32
	Effingham, IL	19				19
	Jo Daviess County, IL	18				18
	Mount Vernon, IL	26				26
	Paducah, KY-IL	36	1			37
	Peoria, IL	30				30
	Quincy, IL-MO	21				21
	Randolph County, IL	25				25
	Rockford, IL	26	1			27
	Springfield, IL	25				25
	St. Louis, MO-IL	60	9			69
Indiana	Bloomington, IN	33	2			35
	Chicago-Naperville-Elgin, IL-IN-WI	60	9	1		70
	Cincinnati, OH-KY-IN	79	8	1		88
	Columbus, IN	35	2			37
	Elkhart-Goshen, IN	7				7
	Evansville, IN-KY	41	6			47
	Fort Wayne, IN	17				17
	Huntington, IN	3				3
	Indianapolis-Carmel-Anderson, IN	54	2			56
	Lafayette-West Lafayette, IN	28				28
	Louisville/Jefferson County, KY-IN	55	8	3		66
	Michigan City-La Porte, IN	25	3			28
	Muncie, IN	6				6
	Perry County, IN	34	2			36
	Seymour, IN	25	1			26
	South Bend-Mishawaka, IN-MI	44	2			46
	Terre Haute, IN	37				37
	Vincennes, IN	35				35
	Wabash, IN	28	2			30
Iowa	Ames, IA	11				11
	Cedar Rapids, IA	20				20
	Clinton, IA	18				18
	Des Moines-West Des Moines, IA	16				16
	Montgomery County, IA	10				10
	Omaha-Council Bluffs, NE-IA	41	1			42
	Palo Alto County, IA	14				14

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Sioux City, IA-NE-SD	22				22
	Van Buren County, IA	17				17
	Waterloo-Cedar Falls, IA	14				14
Kansas	Kansas City, MO-KS	63	3			66
	Neosho County, KS	19	1			20
	St. Joseph, MO-KS	29				29
	Topeka, KS	29	1			30
	Trego County, KS	47				47
	Wichita, KS	56				56
Kentucky	Bowling Green, KY	24				24
	Carter County, KY	15				15
	Cincinnati, OH-KY-IN	79	8	1		88
	Clarksville, TN-KY	32				32
	Elizabethtown-Fort Knox, KY	35	1			36
	Evansville, IN-KY	41	6			47
	Huntington-Ashland, WV-KY-OH	49	4			53
	Lexington-Fayette, KY	41	4			45
	Louisville/Jefferson County, KY-IN	55	8	3		66
	Middlesborough, KY	15				15
	Morgan County, KY	31				31
	Owensboro, KY	38	6			44
	Paducah, KY-IL	36	1			37
	Perry County, KY	12				12
	Pike County, KY	12				12
	Simpson County, KY	28	1			29
	Somerset, KY	20				20
	Washington County, KY	26	1			27
Louisiana	Baton Rouge, LA	61	17	2		80
	Houma-Thibodaux, LA	22				22
	Lafayette, LA	34				34
	Lake Charles, LA	37	3	1		41
	Monroe, LA	13				13
	New Orleans-Metairie, LA	41	3			44
	Shreveport-Bossier City, LA	29	1			30
Maine	Aroostook County, ME	4				4
	Augusta-Waterville, ME	13				13
	Bangor, ME	13				13
	Hancock County, ME	24	3			27
	Lewiston-Auburn, ME	10				10
	Oxford County, ME	3				3

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Portland-South Portland, ME	19	3			22
	Rockland, ME	13	1			14
	Washington County, ME	12				12
Maryland	Baltimore-Columbia-Towson, MD	74	14	1		89
	Cambridge, MD	52	1			53
	Garrett County, MD	43				43
	Hagerstown-Martinsburg, MD-WV	54	1			55
	Kent County, MD	47	7			54
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	72	23	2		97
	Salisbury, MD-DE	46	3			49
	Washington-Arlington-Alexandria, DC-VA-MD-WV	85	13	1		99
Massachusetts	Barnstable Town, MA	17	4			21
	Boston-Cambridge-Newton, MA-NH	37	3	1		41
	Greenfield Town, MA	12				12
	Providence-Warwick, RI-MA	38	9	1		48
	Springfield, MA	24	6			30
	Vineyard Haven, MA	9	2			11
	Worcester, MA-CT	30	3			33
Michigan	Adrian, MI	26				26
	Ann Arbor, MI	32				32
	Cadillac, MI	22	2			24
	Detroit-Warren-Dearborn, MI	48	12			60
	Flint, MI	29	2			31
	Grand Rapids-Wyoming, MI	36	2			38
	Holland, MI	39	4			43
	Huron County, MI	18	2			20
	Kalamazoo-Portage, MI	29	1			30
	Lansing-East Lansing, MI	24				24
	Ludington, MI	23	1			24
	Manistee County, MI	20	2			22
	Muskegon, MI	34	5	1		40
	Niles-Benton Harbor, MI	46	4			50
	Sault Ste. Marie, MI	9				9
	Schoolcraft County, MI	24	3			27
	South Bend-Mishawaka, IN-MI	44	2			46
	Traverse City, MI	21	2			23
	Tuscola County, MI	19				19

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Minnesota	Becker County, MN	23				23
	Brainerd, MN	12				12
	Duluth, MN-WI	11	1			12
	Fargo, ND-MN	10				10
	La Crosse-Onalaska, WI-MN	16				16
	Lake County, MN	4				4
	Marshall, MN	22	2			24
	Minneapolis-St. Paul-Bloomington, MN-WI	27	1			28
	Red Wing, MN	12				12
	Rochester, MN	16				16
	St. Cloud, MN	9				9
Mississippi	Cleveland, MS	19				19
	Gulfport-Biloxi-Pascagoula, MS	39	2			41
	Jackson, MS	19				19
	Meridian, MS	5				5
	Tupelo, MS	8				8
	Yalobusha County, MS	4				4
Missouri	Branson, MO	7				7
	Cedar County, MO	18				18
	Columbia, MO	17				17
	Fayetteville-Springdale-Rogers, AR-MO	25				25
	Jefferson City, MO	28				28
	Joplin, MO	21				21
	Kansas City, MO-KS	63	3			66
	Memphis, TN-MS-AR	57	4			61
	Monroe County, MO	10				10
	Perry County, MO	35	1			36
	Quincy, IL-MO	21				21
	Sainte Genevieve County, MO	27				27
	Springfield, MO	20				20
	St. Joseph, MO-KS	29				29
	St. Louis, MO-IL	60	9			69
Montana	Fergus County, MT	6				6
	Helena, MT	15				15
	Kalispell, MT	6				6
	Missoula, MT	5				5
	Phillips County, MT	11				11
	Powder River County, MT	8				8

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Richland County, MT	15				15
	Rosebud County, MT	11				11
Nebraska	Knox County, NE	27				27
	Lincoln, NE	17				17
	Omaha-Council Bluffs, NE-IA	41	1			42
	Sioux City, IA-NE-SD	22				22
Nevada	Carson City, NV	68				68
	Elko, NV	33				33
	Fallon, NV	50	2			52
	Fernley, NV	64	4			68
	Las Vegas-Henderson-Paradise, NV	139	20	1		160
	Reno, NV	92	10			102
	White Pine County, NV	60	2			62
New Hampshire	Berlin, NH-VT	59	7			66
	Boston-Cambridge-Newton, MA-NH	37	3	1		41
	Claremont-Lebanon, NH-VT	3				3
	Concord, NH	7	1			8
	Keene, NH	8				8
	Laconia, NH	4				4
	Manchester-Nashua, NH	25	2			27
New Jersey	Allentown-Bethlehem-Easton, PA-NJ	49	4			53
	Atlantic City-Hammonton, NJ	35	2			37
	New York-Newark-Jersey City, NY-NJ-PA	57	32	3		92
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	72	23	2		97
	Trenton, NJ	55	10			65
	Vineland-Bridgeton, NJ	43	2			45
New Mexico	Albuquerque, NM	109	4			113
	Carlsbad-Artesia, NM	94				94
	Espanola, NM	61				61
	Farmington, NM	99	2			101
	Hobbs, NM	68				68
	Las Cruces, NM	105	7			112
	Santa Fe, NM	53				53
New York	Albany-Schenectady-Troy, NY	24	1			25
	Buffalo-Cheektowaga-Niagara Falls, NY	39	4			43

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Corning, NY	11				11
	Essex County, NY	23				23
	Hamilton County, NY	18				18
	Ithaca, NY	19				19
	Jamestown-Dunkirk-Fredonia, NY	42	5			47
	Malone, NY	12	4			16
	New York-Newark-Jersey City, NY-NJ-PA	57	32	3		92
	Rochester, NY	16				16
	Syracuse, NY	21	1			22
	Utica-Rome, NY	9				9
	Watertown-Fort Drum, NY	19				19
North Carolina	Asheville, NC	55	1			56
	Avery County, NC	32				32
	Caswell County, NC	26				26
	Charlotte-Concord-Gastonia, NC-SC	85	11			96
	Cullowhee, NC	53				53
	Durham-Chapel Hill, NC	56				56
	Fayetteville, NC	34				34
	Graham County, NC	40				40
	Greensboro-High Point, NC	55	1			56
	Greenville, NC	29				29
	Hickory-Lenoir-Morganton, NC	42				42
	Kinston, NC	24				24
	Macon County, NC	17				17
	Martin County, NC	13				13
	Montgomery County, NC	18				18
	Morehead City, NC	18				18
	Oxford, NC	47				47
	Raleigh, NC	63	1			64
	Rocky Mount, NC	25				25
	Sanford, NC	32				32
	Swain County, NC	19				19
	Virginia Beach-Norfolk-Newport News, VA-NC	47				47
	Wilmington, NC	12				12
	Winston-Salem, NC	68	3			71
	Yancey County, NC	59				59
North Dakota	Bismarck, ND	28	1			29
	Burke County, ND	24				24
	Dickinson, ND	26				26
	Dunn County, ND	27	1			28

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Fargo, ND-MN	10				10
	McKenzie County, ND	31				31
	Mercer County, ND	24				24
	Williston, ND	21				21
Ohio	Akron, OH	22				22
	Ashtabula, OH	39	3			42
	Canton-Massillon, OH	49	6			55
	Cincinnati, OH-KY-IN	79	8	1		88
	Cleveland-Elyria, OH	58	10			68
	Columbus, OH	56	5			61
	Dayton, OH	43	7			50
	Huntington-Ashland, WV-KY-OH	49	4			53
	Lima, OH	31	1			32
	Marietta, OH	32	1			33
	Mount Vernon, OH	28	4			32
	Noble County, OH	40	1			41
	Springfield, OH	40	4			44
	Toledo, OH	43				43
	Washington Court House, OH	30	3			33
	Weirton-Steubenville, WV-OH	42	2			44
	Wheeling, WV-OH	41	2			43
	Wilmington, OH	29	3			32
	Youngstown-Warren-Boardman, OH-PA	67	4			71
Oklahoma	Adair County, OK	26				26
	Caddo County, OK	15				15
	Dewey County, OK	47				47
	Fort Smith, AR-OK	18				18
	Johnston County, OK	8	1			9
	Lawton, OK	46				46
	Mayes County, OK	21	1			22
	McAlester, OK	19				19
	Miami, OK	6				6
	Oklahoma City, OK	70	2			72
	Ponca City, OK	31				31
	Tahlequah, OK	22				22
	Tulsa, OK	61	2			63
Oregon	Bend-Redmond, OR	24	1			25
	Eugene, OR	19	4			23
	Hermiston-Pendleton, OR	28	3			31
	Medford, OR	29	1	1		31

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Portland-Vancouver-Hillsboro, OR-WA	26	2			28
	Salem, OR	15	1			16
Pennsylvania	Allentown-Bethlehem-Easton, PA-NJ	49	4			53
	Altoona, PA	33	2			35
	Chambersburg-Waynesboro, PA	19				19
	DuBois, PA	45				45
	East Stroudsburg, PA	36	1			37
	Erie, PA	27	2			29
	Gettysburg, PA	52	1			53
	Greene County, PA	57	4			61
	Harrisburg-Carlisle, PA	49	4			53
	ndiana, PA	59	4			63
	Johnstown, PA	34				34
	Lancaster, PA	59	4			63
	Lebanon, PA	58	9			67
	New Castle, PA	30	1			31
	New York-Newark-Jersey City, NY-NJ-PA	57	32	3		92
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	72	23	2		97
	Pittsburgh, PA	78	15			93
	Reading, PA	55	5			60
	Sayre, PA	13				13
	Scranton–Wilkes-Barre–Hazleton, PA	38	3			41
	Somerset, PA	19				19
	St. Marys, PA	22	1			23
	State College, PA	35	2			37
	Tioga County, PA	31				31
	Williamsport, PA	23				23
	York-Hanover, PA	65	7			72
	Youngstown-Warren-Boardman, OH-PA	67	4			71
Rhode Island	Providence-Warwick, RI-MA	38	9	1		48
South Carolina	Augusta-Richmond County, GA-SC	36	1			37
	Charleston-North Charleston, SC	6				6
	Charlotte-Concord-Gastonia, NC-SC	85	11			96
	Chesterfield County, SC	13				13
	Columbia, SC	28				28
	Florence, SC	15				15

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Gaffney, SC	43				43
	Greenville-Anderson-Mauldin, SC	65	1			66
	Greenwood, SC	5				5
	Seneca, SC	18				18
	Spartanburg, SC	62				62
	Walterboro, SC	4				4
South Dakota	Brookings, SD	16	1			17
	Jackson County, SD	10				10
	Rapid City, SD	17				17
	Sioux City, IA-NE-SD	22				22
	Sioux Falls, SD	25	1			26
Tennessee	Chattanooga, TN-GA	30	3			33
	Claiborne County, TN	22				22
	Clarksville, TN-KY	32				32
	DeKalb County, TN	17				17
	Kingsport-Bristol-Bristol, TN-VA	43				43
	Knoxville, TN	57	2			59
	Memphis, TN-MS-AR	57	4			61
	Morristown, TN	61	1			62
	Nashville-Davidson-Murfreesboro-Franklin, TN	51	1			52
	Sevierville, TN	61	1			62
Texas	Amarillo, TX	56				56
	Austin-Round Rock, TX	51	10			61
	Beaumont-Port Arthur, TX	45	9	1		55
	Brewster County, TX	35				35
	Brownsville-Harlingen, TX	6				6
	Corpus Christi, TX	25	2			27
	Corsicana, TX	32	1			33
	Dallas-Fort Worth-Arlington, TX	63	39	5		107
	El Paso, TX	97	7			104
	Houston-The Woodlands-Sugar Land, TX	59	27	14	1	101
	Killeen-Temple, TX	51	5			56
	Laredo, TX	6				6
	Longview, TX	39	2			41
	Marshall, TX	20				20
	McAllen-Edinburg-Mission, TX	8				8
	Polk County, TX	17				17
	San Antonio-New Braunfels, TX	48	11	3		62
	Tyler, TX	45	1			46

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
	Victoria, TX	33	1			34
	Waco, TX	42	3			45
Utah	Duchesne County, UT	56	2			58
	Garfield County, UT	63	2			65
	Logan, UT-ID	29	2			31
	Ogden-Clearfield, UT	91	10			101
	Price, UT	91	2			93
	Provo-Orem, UT	82	9			91
	Salt Lake City, UT	118	21			139
	San Juan County, UT	76	1			77
	St. George, UT	78	3			81
	Vernal, UT	104	2			106
Vermont	Bennington, VT	20				20
	Berlin, NH-VT	59	7			66
	Burlington-South Burlington, VT	14				14
	Claremont-Lebanon, NH-VT	3				3
Virginia	Blacksburg-Christiansburg-Radford, VA	33				33
	Charlottesville, VA	17				17
	Harrisonburg, VA	20				20
	Kingsport-Bristol-Bristol, TN-VA	43				43
	Madison County, VA	47				47
	Page County, VA	22				22
	Prince Edward County, VA	10				10
	Richmond, VA	53	3			56
	Roanoke, VA	31				31
	Rockbridge County, VA	9				9
	Virginia Beach-Norfolk-Newport News, VA-NC	47				47
	Washington-Arlington-Alexandria, DC-VA-MD-WV	85	13	1		99
	Winchester, VA-WV	27				27
	Wythe County, VA	16				16
Washington	Kennewick-Richland, WA	28	4			32
	Olympia-Tumwater, WA	11				11
	Port Angeles, WA	1				1
	Portland-Vancouver-Hillsboro, OR-WA	26	2			28
	Seattle-Tacoma-Bellevue, WA	38	5			43
	Spokane-Spokane Valley, WA	39	1			40

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
West Virginia	Charleston, WV	28	1			29
	Gilmer County, WV	8				8
	Greenbrier County, WV	8				8
	Hagerstown-Martinsburg, MD-WV	54	1			55
	Huntington-Ashland, WV-KY-OH	49	4			53
	Morgantown, WV	41	2			43
	Parkersburg-Vienna, WV	40	4			44
	Tucker County, WV	17	1			18
	Washington-Arlington-Alexandria, DC-VA-MD-WV	85	13	1		99
	Weirton-Steubenville, WV-OH	42	2			44
	Wheeling, WV-OH	41	2			43
	Winchester, VA-WV	27				27
Wisconsin	Appleton, WI	23				23
	Ashland County, WI	8				8
	Baraboo, WI	20				20
	Beaver Dam, WI	29	1			30
	Chicago-Naperville-Elgin, IL-IN-WI	60	9	1		70
	Door County, WI	22	5			27
	Duluth, MN-WI	11	1			12
	Eau Claire, WI	11				11
	Fond du Lac, WI	29				29
	Forest County, WI	10				10
	Green Bay, WI	29	3			32
	Janesville-Beloit, WI	27				27
	La Crosse-Onalaska, WI-MN	16				16
	Madison, WI	25				25
	Manitowoc, WI	27	5			32
	Milwaukee-Waukesha-West Allis, WI	32	5			37
	Minneapolis-St. Paul-Bloomington, MN-WI	27	1			28
	Racine, WI	30	1			31
	Sheboygan, WI	33	10	1		44
	Taylor County, WI	7				7
	Vilas County, WI	11				11
	Watertown-Fort Atkinson, WI	27				27
	Wausau, WI	13				13
	Whitewater-Elkhorn, WI	28	1			29

State	County or metropolitan area	Number of days when air was:				Total days with elevated smog pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	
Wyoming	Big Horn County, WY	22				22
	Carbon County, WY	32	1			33
	Casper, WY	30				30
	Cheyenne, WY	47				47
	Converse County, WY	38				38
	Evanston, WY	47	2			49
	Gillette, WY	27				27
	Jackson, WY-ID	34				34
	Laramie, WY	74				74
	Riverton, WY	57				57
	Rock Springs, WY	89	4			93
	Sheridan, WY	20				20
	Sublette County, WY	64	1			65
	Weston County, WY	33				33

Appendix B.
Particulate Matter Pollution for all Areas, by State, 2015

Listed in order by state. Metropolitan areas that extend into more than one state are listed multiple times, once for each state.

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
Alabama	Birmingham-Hoover, AL	129					129
	Clay County, AL	11					11
	Columbus, GA-AL	39					39
	Daphne-Fairhope-Foley, AL	17					17
	Decatur, AL	22					22
	Dothan, AL	10					10
	Florence-Muscle Shoals, AL	21					21
	Fort Payne, AL	20					20
	Gadsden, AL	21					21
	Huntsville, AL	19					19
	Mobile, AL	17					17
	Montgomery, AL	23					23
	Talladega-Sylacauga, AL	31					31
	Tuscaloosa, AL	20					20
Alaska	Anchorage, AK	67	8	1			76
	Fairbanks, AK	34	7	14			55
	Juneau, AK	55					55
Arizona	Nogales, AZ	64	3				67
	Phoenix-Mesa-Scottsdale, AZ	112	3				115
	Sierra Vista-Douglas, AZ	3					3
	Tucson, AZ	5					5
	Yuma, AZ	21					21
Arkansas	Arkansas County, AR	28					28
	Ashley County, AR	24					24
	El Dorado, AR	25					25

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Fayetteville-Springdale-Rogers, AR-MO	15					15
	Fort Smith, AR-OK	18					18
	Hot Springs, AR	23					23
	Jackson County, AR	23					23
	Little Rock-North Little Rock-Conway, AR	113					113
	Memphis, TN-MS-AR	68					68
	Polk County, AS	21					21
	Texarkana, TX-AR	32					32
California	Bakersfield, CA	138	30	7			175
	Bishop, CA	51	2	4			57
	Calaveras County, CA	33	1	1	1	1	37
	Chico, CA	68	2				70
	Clearlake, CA	0	1				1
	Colusa County, CA	33	3	1			37
	El Centro, CA	183	6	2			191
	Eureka-Arcata-Fortuna, CA	33					33
	Fresno, CA	197	14	7			218
	Hanford-Corcoran, CA	149	19	7			175
	Los Angeles-Long Beach-Anaheim, CA	185	14	2			201
	Madera, CA	155	10	2			167
	Merced, CA	125	15	2			142
	Modesto, CA	158	16	1			175
	Napa, CA	117	1				118
	Oxnard-Thousand Oaks-Ventura, CA	144					144
	Plumas County, CA	46	10	1			57
	Redding, CA	8		1			9
	Riverside-San Bernardino-Ontario, CA	247	24	1			272
	Sacramento–Roseville–Arden-Arcade, CA	100	8	1			109
	Salinas, CA	17	1				18
	San Diego-Carlsbad, CA	82					82
	San Francisco-Oakland-Hayward, CA	133	5				138
	San Jose-Sunnyvale-Santa Clara, CA	99	3				102
	San Luis Obispo-Paso Robles-Arroyo Grande, CA	149	1				150
	Santa Cruz-Watsonville, CA	40					40
	Santa Maria-Santa Barbara, CA	72					72

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Santa Rosa, CA	38					38
	Siskiyou County, CA	4	2				6
	Stockton-Lodi, CA	162	16	2			180
	Truckee-Grass Valley, CA	2					2
	Ukiah, CA	59	2	2			63
	Vallejo-Fairfield, CA	96	3				99
	Visalia-Porterville, CA	47	3	2			52
	Yuba City, CA	75	1				76
Colorado	Boulder, CO	13					13
	Colorado Springs, CO	5					5
	Denver-Aurora-Lakewood, CO	107	5				112
	Fort Collins, CO	38	1	1			40
	Glenwood Springs, CO	7					7
	Grand Junction, CO	40					40
	Greeley, CO	24					24
	Pueblo, CO	5					5
	Rio Blanco County, CO	21					21
Connecticut	Bridgeport-Stamford-Norwalk, CT	105					105
	Hartford-West Hartford-East Hartford, CT	106					106
	New Haven-Milford, CT	110					110
	Norwich-New London, CT	35					35
	Torrington, CT	5					5
	Worcester, MA-CT	41					41
Delaware	Dover, DE	52					52
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	207	5				212
	Salisbury, MD-DE	60					60
District of Columbia	Washington-Arlington-Alexandria, DC-VA-MD-WV	163					163
Florida	Cape Coral-Fort Myers, FL	4					4
	Deltona-Daytona Beach-Ormond Beach, FL	7					7
	Gainesville, FL	2					2
	Homosassa Springs, FL	1					1
	Jacksonville, FL	39	1				40
	Lakeland-Winter Haven, FL	4					4
	Miami-Fort Lauderdale-West Palm Beach, FL	40					40

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	North Port-Sarasota-Bradenton, FL	3					3
	Orlando-Kissimmee-Sanford, FL	23					23
	Palm Bay-Melbourne-Titusville, FL	3					3
	Pensacola-Ferry Pass-Brent, FL	10					10
	Tallahassee, FL	12					12
	Tampa-St. Petersburg-Clearwater, FL	86					86
Georgia	Albany, GA	134	1				135
	Athens-Clarke County, GA	21					21
	Atlanta-Sandy Springs-Roswell, GA	195					195
	Augusta-Richmond County, GA-SC	20					20
	Brunswick, GA	23					23
	Chattanooga, TN-GA	32					32
	Columbus, GA-AL	39					39
	Gainesville, GA	13					13
	Macon, GA	78					78
	Rome, GA	83					83
	Savannah, GA	34					34
	Valdosta, GA	13					13
	Warner Robins, GA	14					14
	Washington County, GA	12					12
	Wilkinson County, GA	25					25
Hawaii	Hilo, HI	293					293
	Kahului-Wailuku-Lahaina, HI	21					21
	Kapaa, HI	1					1
	Urban Honolulu, HI	36					36
Idaho	Benewah County, ID	13	2				15
	Boise City, ID	18	3				21
	Jackson, WY-ID	3					3
	Lemhi County, ID	59	8	3			70
	Logan, UT-ID	51	3	1			55
	Pocatello, ID	28	3	1			32
	Shoshone County, ID	134	14	3			151
	Twin Falls, ID	1					1
Illinois	Bloomington, IL	13					13
	Champaign-Urbana, IL	72					72

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Chicago-Naperville-Elgin, IL-IN-WI	146	3	2			151
	Davenport-Moline-Rock Island, IA-IL	98	2				100
	Decatur, IL	**14**					14
	Fort Madison-Keokuk, IA-IL-MO	20					20
	Mount Vernon, IL	18	1				19
	Paducah, KY-IL	24					24
	Peoria, IL	8					8
	Randolph County, IL	14					14
	Rockford, IL	27					27
	Springfield, IL	**16**					16
	St. Louis, MO-IL	197	4	1			202
Indiana	Bloomington, IN	59					59
	Chicago-Naperville-Elgin, IL-IN-WI	146	3	2			151
	Cincinnati, OH-KY-IN	134					134
	Columbus, IN	108					108
	Crawfordsville, IN	56					56
	Elkhart-Goshen, IN	113	3				116
	Evansville, IN-KY	145					145
	Fort Wayne, IN	141	1	1			143
	Indianapolis-Carmel-Anderson, IN	177	1	1			179
	Jasper, IN	32					32
	Kokomo, IN	185	1				186
	Lafayette-West Lafayette, IN	94					94
	Louisville/Jefferson County, KY-IN	181	1	1			183
	Michigan City-La Porte, IN	30					30
	Muncie, IN	27	1				28
	New Castle, IN	23					23
	South Bend-Mishawaka, IN-MI	121	1				122
	Spencer County, IN	32					32
	Terre Haute, IN	124		1			125
Iowa	Cedar Rapids, IA	67	1				68
	Clinton, IA	102	1				103
	Davenport-Moline-Rock Island, IA-IL	98	2				100
	Delaware County, IA	15					15
	Des Moines-West Des Moines, IA	46					46
	Fort Madison-Keokuk, IA-IL-MO	20					20
	Iowa City, IA	**53**	**1**				54

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Montgomery County, IA	11					11
	Muscatine, IA	81	1				82
	Omaha-Council Bluffs, NE-IA	77	1				78
	Palo Alto County, IA	8					8
	Sioux City, IA-NE-SD	52	2				54
	Van Buren County, IA	14					14
	Waterloo-Cedar Falls, IA	20					20
Kansas	Kansas City, MO-KS	96	3				99
	Neosho County, KS	18					18
	St. Joseph, MO-KS	97					97
	Topeka, KS	15					15
	Wichita, KS	21					21
Kentucky	Bowling Green, KY	21					21
	Carter County, KY	12					12
	Cincinnati, OH-KY-IN	134					134
	Clarksville, TN-KY	69					69
	Elizabethtown-Fort Knox, KY	27					27
	Evansville, IN-KY	145					145
	Huntington-Ashland, WV-KY-OH	32					32
	Lexington-Fayette, KY	21					21
	Louisville/Jefferson County, KY-IN	181	1	1			183
	Middlesborough, KY	10					10
	Owensboro, KY	34					34
	Paducah, KY-IL	24					24
	Perry County, KY	7					7
	Pike County, KY	16					16
	Richmond-Berea, KY	13					13
	Somerset, KY	19					19
Louisiana	Alexandria, LA	12					12
	Baton Rouge, LA	169					169
	Hammond, LA	12					12
	Houma-Thibodaux, LA	6					6
	Lafayette, LA	10					10
	Lake Charles, LA	13					13
	Monroe, LA	18					18
	New Orleans-Metairie, LA	33					33
	Shreveport-Bossier City, LA	42					42
Maine	Aroostook County, ME	82					82
	Augusta-Waterville, ME	2					2
	Bangor, ME	48					48

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Hancock County, ME	11					11
	Lewiston-Auburn, ME	57					57
	Oxford County, ME	46					46
	Portland-South Portland, ME	61					61
Maryland	Baltimore-Columbia-Towson, MD	143					143
	Cambridge, MD	53					53
	Garrett County, MD	15					15
	Hagerstown-Martinsburg, MD-WV	107					107
	Kent County, MD	68					68
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	207	5				212
	Washington-Arlington-Alexandria, DC-VA-MD-WV	163					163
Massachusetts	Boston-Cambridge-Newton, MA-NH	92					92
	Greenfield Town, MA	12					12
	Pittsfield, MA	31					31
	Providence-Warwick, RI-MA	111		1			112
	Springfield, MA	17					17
	Worcester, MA-CT	41					41
Michigan	Adrian, MI	20					20
	Ann Arbor, MI	27					27
	Bay City, MI	16					16
	Cadillac, MI	7					7
	Detroit-Warren-Dearborn, MI	158	2	1			161
	Flint, MI	17					17
	Grand Rapids-Wyoming, MI	31		1			32
	Holland, MI	21					21
	Kalamazoo-Portage, MI	24					24
	Lansing-East Lansing, MI	21					21
	Manistee County, MI	15					15
	Monroe, MI	25	1				26
	Niles-Benton Harbor, MI	21					21
	Sault Ste. Marie, MI	50					50
Minnesota	Becker County, MN	17	2				19
	Bemidji, MN	12	2				14
	Brainerd, MN	23	2				25
	Duluth, MN-WI	26	1				27
	Fargo, ND-MN	46	3				49
	La Crosse-Onalaska, WI-MN	15					15

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Lake County, MN	11	1				12
	Marshall, MN	20					20
	Minneapolis-St. Paul-Bloomington, MN-WI	102	3				105
	Rochester, MN	34	1				35
	South Bend-Mishawaka, IN-MI	121	1				122
	St. Cloud, MN	19		1			20
Mississippi	Grenada, MS	6					6
	Gulfport-Biloxi-Pascagoula, MS	29					29
	Hattiesburg, MS	28					28
	Jackson, MS	25					25
Missouri	Cedar County, MO	42					42
	Fayetteville-Springdale-Rogers, AR-MO	15					15
	Fort Madison-Keokuk, IA-IL-MO	20					20
	Kansas City, MO-KS	96	3				99
	Memphis, TN-MS-AR	68					68
	Springfield, MO	47					47
	St. Joseph, MO-KS	97					97
	St. Louis, MO-IL	197	4	1			202
Montana	Billings, MT	16	1				17
	Butte-Silver Bow, MT	66	4	6			76
	Fergus County, MT	10	6	3			19
	Helena, MT	53	8	5			66
	Kalispell, MT	71	3	9			83
	Lincoln County, MT	139	7	12	1		159
	Missoula, MT	100	3	9			112
	Phillips County, MT	13	4	4			21
	Powder River County, MT	37	4	1			42
	Ravalli County, MT	37	8	11	2		58
	Richland County, MT	22	3	3			28
	Rosebud County, MT	25	4	1			30
Nebraska	Grand Island, NE	6					6
	Lincoln, NE	10					10
	Omaha-Council Bluffs, NE-IA	77	1				78
	Scottsbluff, NE	8					8
	Sioux City, IA-NE-SD	52	2				54
Nevada	Carson City, NV	19	1				20
	Gardnerville Ranchos, NV	60	4	2			66

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Las Vegas-Henderson-Paradise, NV	105	1				106
	Reno, NV	60	2				62
New Hampshire	Boston-Cambridge-Newton, MA-NH	92					92
	Claremont-Lebanon, NH-VT	42					42
	Keene, NH	74		1			75
	Laconia, NH	2					2
	Manchester-Nashua, NH	22					22
New Jersey	Allentown-Bethlehem-Easton, PA-NJ	166	2				168
	Atlantic City-Hammonton, NJ	18					18
	New York-Newark-Jersey City, NY-NJ-PA	167	1				168
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	207	5				212
	Trenton, NJ	74					74
New Mexico	Albuquerque, NM	34					34
	Farmington, NM	1					1
	Hobbs, NM	7		1			8
	Las Cruces, NM	86					86
New York	Albany-Schenectady-Troy, NY	18					18
	Buffalo-Cheektowaga-Niagara Falls, NY	30					30
	Corning, NY	24					24
	Essex County, NY	1					1
	Jamestown-Dunkirk-Fredonia, NY	20					20
	New York-Newark-Jersey City, NY-NJ-PA	167	1				168
	Rochester, NY	50					50
	Syracuse, NY	44					44
North Carolina	Asheville, NC	15					15
	Boone, NC	18					18
	Burlington, NC	1					1
	Caswell County, NC	56					56
	Charlotte-Concord-Gastonia, NC-SC	105					105
	Cullowhee, NC	11					11
	Duplin County, NC	9					9

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Durham-Chapel Hill, NC	62					62
	Fayetteville, NC	5					5
	Goldsboro, NC	9					9
	Greensboro-High Point, NC	15					15
	Greenville, NC	6					6
	Hickory-Lenoir-Morganton, NC	93					93
	Marion, NC	19					19
	Martin County, NC	6					6
	Mitchell County, NC	9					9
	Montgomery County, NC	41					41
	Raleigh, NC	91	1				92
	Sanford, NC	101					101
	Swain County, NC	47					47
	Virginia Beach-Norfolk-Newport News, VA-NC	42					42
	Wilmington, NC	3					3
	Winston-Salem, NC	142					142
North Dakota	Bismarck, ND	20	5	1			26
	Burke County, ND	9	5	4			18
	Dickinson, ND	16	3	1			20
	Dunn County, ND	16	9	1			26
	Fargo, ND-MN	46	3				49
	McKenzie County, ND	11	4	2			17
	Mercer County, ND	16	4	2			22
	Williston, ND	12	5	2			19
Ohio	Akron, OH	187	1				188
	Athens, OH	7					7
	Canton-Massillon, OH	50	1				51
	Cincinnati, OH-KY-IN	134					134
	Cleveland-Elyria, OH	174	1				175
	Columbus, OH	103					103
	Dayton, OH	37					37
	Huntington-Ashland, WV-KY-OH	32					32
	Lima, OH	16					16
	Portsmouth, OH	22					22
	Springfield, OH	27					27
	Toledo, OH	39	1				40
	Weirton-Steubenville, WV-OH	193	3				196
	Wheeling, WV-OH	45					45
	Youngstown-Warren-Boardman, OH-PA	141		1			142

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
Oklahoma	Ardmore, OK	29		1			30
	Dewey County, OK	25					25
	Fort Smith, AR-OK	18					18
	Lawton, OK	38					38
	McAlester, OK	39					39
	Oklahoma City, OK	69					69
	Ponca City, OK	36	1				37
	Tulsa, OK	77					77
Oregon	Eugene, OR	33	1	1			35
	Grants Pass, OR	12					12
	Harney County, OR	75	2				77
	Hermiston-Pendleton, OR	21	4	2			27
	Klamath Falls, OR	23	3	1			27
	Lake County, OR	22	2				24
	Medford, OR	32	4	1			37
	Portland-Vancouver-Hillsboro, OR-WA	53	2	2			57
	Prineville, OR	16	2	1			19
Pennsylvania	Allentown-Bethlehem-Easton, PA-NJ	166	2				168
	Altoona, PA	119					119
	East Stroudsburg, PA	71					71
	Erie, PA	76					76
	Gettysburg, PA	95					95
	Harrisburg-Carlisle, PA	195	4				199
	Johnstown, PA	138					138
	Lancaster, PA	160	6				166
	Lebanon, PA	102	3				105
	New York-Newark-Jersey City, NY-NJ-PA	167	1				168
	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	207	5				212
	Pittsburgh, PA	211	8	1			220
	Reading, PA	141	1				142
	Scranton–Wilkes-Barre–Hazleton, PA	106					106
	State College, PA	88					88
	Tioga County, PA	63					63
	York-Hanover, PA	134	2				136
	Youngstown-Warren-Boardman, OH-PA	141		1			142
Rhode Island	Providence-Warwick, RI-MA	111		1			112

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
South Carolina	Augusta-Richmond County, GA-SC	20					20
	Charleston-North Charleston, SC	25	1				26
	Charlotte-Concord-Gastonia, NC-SC	105					105
	Chesterfield County, SC	10					10
	Columbia, SC	60					60
	Florence, SC	13					13
	Greenville-Anderson-Mauldin, SC	84	1				85
	Seneca, SC	20					20
	Spartanburg, SC	46					46
South Dakota	Aberdeen, SD	7					7
	Brookings, SD	31	1				32
	Jackson County, SD	19	2				21
	Pierre, SD	20	1	1			22
	Rapid City, SD	79	3				82
	Sioux City, IA-NE-SD	52	2				54
	Sioux Falls, SD	58	2				60
	Watertown, SD	34	1				35
Tennessee	Athens, TN	18					18
	Chattanooga, TN-GA	32					32
	Clarksville, TN-KY	69					69
	Cookeville, TN	16					16
	Dyersburg, TN	14					14
	Jackson, TN	16					16
	Kingsport-Bristol-Bristol, TN-VA	19					19
	Knoxville, TN	110					110
	Lawrenceburg, TN	8					8
	Memphis, TN-MS-AR	68					68
	Nashville-Davidson--Murfreesboro--Franklin, TN	92					92
Texas	Austin-Round Rock, TX	13					13
	Brownsville-Harlingen, TX	17					17
	Corpus Christi, TX	33					33
	Dallas-Fort Worth-Arlington, TX	98					98
	El Paso, TX	59					59
	Houston-The Woodlands-Sugar Land, TX	169	2				171
	Marshall, TX	17					17
	McAllen-Edinburg-Mission, TX	19					19

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	San Antonio-New Braunfels, TX	13					13
	Texarkana, TX-AR	32					32
Utah	Duchesne County, UT	34	1				35
	Logan, UT-ID	51	3	1			55
	Ogden-Clearfield, UT	53	8				61
	Provo-Orem, UT	55	2				57
	Salt Lake City, UT	59	4	1			64
	St. George, UT	6					6
	Vernal, UT	10					10
Vermont	Bennington, VT	29					29
	Burlington-South Burlington, VT	35					35
	Claremont-Lebanon, NH-VT	42					42
	Rutland, VT	85	3				88
Virginia	Charlottesville, VA	11					11
	Harrisonburg, VA	22					22
	Kingsport-Bristol-Bristol, TN-VA	19					19
	Lynchburg, VA	11					11
	Page County, VA	14					14
	Richmond, VA	96					96
	Roanoke, VA	49					49
	Virginia Beach-Norfolk-Newport News, VA-NC	42					42
	Washington-Arlington-Alexandria, DC-VA-MD-WV	163					163
	Winchester, VA-WV	22					22
Washington	Bellingham, WA	21					21
	Bremerton-Silverdale, WA	9					9
	Ellensburg, WA	22	1				23
	Mount Vernon-Anacortes, WA	25					25
	Portland-Vancouver-Hillsboro, OR-WA	53	2	2			57
	Seattle-Tacoma-Bellevue, WA	125	9	3			137
	Spokane-Spokane Valley, WA	39	3				42
	Wenatchee, WA	16	1				17
	Yakima, WA	89	3	1			93
West Virginia	Charleston, WV	24					24
	Clarksburg, WV	24					24
	Fairmont, WV	32					32
	Hagerstown-Martinsburg, MD-WV	107					107

State	County or metropolitan area	Number of days when air was:					Total days with elevated particulate matter pollution
		Moderate	Unhealthy for sensitive groups	Unhealthy	Very unhealthy	Hazardous	
	Huntington-Ashland, WV-KY-OH	32					32
	Morgantown, WV	17					17
	Parkersburg-Vienna, WV	24					24
	Washington-Arlington-Alexandria, DC-VA-MD-WV	163					163
	Weirton-Steubenville, WV-OH	193	3				196
	Wheeling, WV-OH	45					45
	Winchester, VA-WV	22					22
Wisconsin	Appleton, WI	13					13
	Ashland County, WI	3					3
	Baraboo, WI	9					9
	Beaver Dam, WI	17					17
	Chicago-Naperville-Elgin, IL-IN-WI	146	3	2			151
	Duluth, MN-WI	26	1				27
	Eau Claire, WI	6					6
	Forest County, WI	4					4
	Green Bay, WI	20					20
	La Crosse-Onalaska, WI-MN	15					15
	Madison, WI	27					27
	Milwaukee-Waukesha-West Allis, WI	38					38
	Minneapolis-St. Paul-Bloomington, MN-WI	102	3				105
	Platteville, WI	17					17
	Taylor County, WI	6					6
	Vilas County, WI	5					5
Wyoming	Big Horn County, WY	10					10
	Carbon County, WY	7					7
	Casper, WY	7					7
	Cheyenne, WY	15		1			16
	Converse County, WY	13	3				16
	Gillette, WY	26	1				27
	Goshen County, WY	13	2				15
	Jackson, WY-ID	3					3
	Laramie, WY	4					4
	Park County, WY	5					5
	Riverton, WY	24					24
	Rock Springs, WY	5					5
	Sheridan, WY	17	2				19
	Sublette County, WY	10					10
	Weston County, WY	11					11

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