AMERICAN LUNG ASSOCIATION®

STATE OF THE AIR 2010

State Table Notes

A full explanation of the sources of data and methodology is in the Appendix: Methodology.

Notes for all state data tables

1. **Total Population** is based on 2008 US Census and represents the at-risk populations in counties with ozone or $PM_{2.5}$ pollution monitors; it does not represent the entire state's sensitive populations.
2. Those **18 & under** and **65 & over** are vulnerable to ozone and $PM_{2.5}$. Do not use them as population denominators for disease estimates—that will lead to incorrect estimates.
3. **Pediatric asthma** estimates are for those under 18 years of age and represent the estimated number of people who had asthma in 2008 based on national rates (NHIS) applied to county population estimates (US Census).
4. **Adult asthma** estimates are for those 18 years and older and represent the estimated number of people who had asthma during 2008 based on state rates (BRFSS) applied to county population estimates (US Census).
5. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed within 2008 based on national rates (NHIS) applied to county population estimates (US Census).
6. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime based on national rates (NHIS) applied to county population estimates (US Census).
7. **CV disease** estimates are for adults 18 and over, based on national rates (2005 NHANES, provided by NHLBI) applied to county population estimates (US Census). CV disease includes coronary heart disease, hypertension, stroke, and heart failure.
8. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime based on state rates (BRFSS) applied to county population estimates (US Census).
9. **Poverty** estimates include all ages and come from the U.S. Census Bureau's Small Area Estimates Branch, 2008.
10. Adding across rows does not produce valid estimates. For example, because of differences in the surveys used to gather the information, adding pediatric and adult asthma does not produce an accurate estimate of total population with asthma. Adding emphysema and chronic bronchitis will double-count people with both diseases.

Notes for all state grades tables

1. Not all counties have monitors for either ozone or particle pollution. If a county does not have a monitor, that county's name is not on the list in these tables. The decision about monitors in the county is made by the state and the U.S. Environmental Protection Agency, not by the American Lung Association.
2. **Asterisk (*)** indicates that monitoring is underway for that pollutant in that county, but that the data are incomplete for all three years. Those counties are not graded or received an Incomplete.
3. **DNC (Data Not Collected)** indicates that data on that particular pollutant is not collected in that county.
4. The **Weighted Average (Wgt. Avg)** was derived by adding the three years of individual level data (2006-2008), multiplying the sums of each level by the assigned standard weights (i.e. 1=orange, 1.5=red, 2.0=purple and 2.5=maroon) and calculating the average. Grades are assigned based on the weighted averages as follows: A=0.0, B=0.3-0.9, C=1.0-2.0, D=2.1-3.2, F=3.3+.
5. The **Design Value** is the calculated concentration of a pollutant based on the form of the National Ambient Air Quality Standard, and is used by EPA to determine whether the air quality in a county meets the standard. Design values for the annual $PM_{2.5}$ concentrations by county were collected from data previously summarized by the U.S. Environmental Protection Agency (EPA) and were downloaded on December 1, 2009 from EPA's website at http://www.epa.gov/air/airtrends/values.html. The numbers refer to micrograms per cubic meter, or $\mu g/m^3$. Counties with design values of 15 or lower received a grade of "Pass." Counties with design values of 15.1 or higher received a grade of "Fail."

NEW YORK

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AT-RISK GROUPS

County	Total Population	Under 18	65 & Over	Lung Diseases: Pediatric Asthma	Lung Diseases: Adult Asthma	Lung Diseases: Chronic Bronchitis	Lung Diseases: Emphysema	Cardio-vascular Disease	Diabetes	Poverty Estimate All Ages
Albany	298,130	59,938	40,881	5,642	20,772	10,380	4,046	86,801	20,106	34,703
Bronx	1,391,903	388,071	148,116	36,532	87,811	42,381	15,198	340,437	77,682	367,883
Chautauqua	133,789	28,235	21,351	2,658	9,164	4,692	1,970	40,646	9,510	22,604
Chemung	87,813	18,933	13,467	1,782	5,986	3,059	1,268	26,350	6,159	13,254
Dutchess	292,878	64,400	37,654	6,062	19,950	10,021	3,881	83,663	19,408	23,978
Erie	909,845	195,594	141,691	18,412	62,054	31,878	13,340	275,942	64,621	118,925
Essex	37,826	6,939	6,435	653	2,679	1,378	586	12,013	2,816	4,572
Franklin	50,521	9,286	6,792	874	3,599	1,775	674	14,642	3,373	7,179
Hamilton	5,021	817	1,110	77	362	197	95	1,831	437	526
Herkimer	62,200	13,039	10,065	1,227	4,267	2,199	932	19,149	4,490	8,562
Jefferson	118,046	28,538	13,506	2,686	7,823	3,735	1,331	29,859	6,784	15,999
Kings	2,556,598	641,638	314,368	60,401	167,139	82,356	31,204	678,947	156,373	532,939
Madison	69,766	14,423	9,277	1,358	4,829	2,414	935	20,137	4,664	8,049
Monroe	732,762	164,904	99,525	15,523	49,507	25,048	9,949	211,570	49,234	92,057
Nassau	1,351,625	306,021	202,778	28,808	90,953	47,494	20,028	413,661	97,371	64,667
New York	1,634,795	277,378	210,296	26,111	118,596	57,267	20,841	462,720	105,661	267,745
Niagara	214,464	45,783	33,035	4,310	14,662	7,549	3,152	65,312	15,304	25,504
Oneida	231,590	48,818	37,349	4,596	15,861	8,113	3,414	70,342	16,454	30,851

AT-RISK GROUPS

County	Total Population	Under 18	65 & Over	Lung Diseases: Pediatric Asthma	Lung Diseases: Adult Asthma	Lung Diseases: Chronic Bronchitis	Lung Diseases: Emphysema	Cardio-vascular Disease	Diabetes	Poverty Estimate All Ages
Onondaga	452,633	103,313	62,222	9,726	30,438	15,373	6,125	129,970	30,231	51,683
Orange	379,647	100,082	38,266	9,421	24,510	12,032	4,316	97,007	22,272	35,826
Oswego	121,395	26,827	14,579	2,525	8,270	4,108	1,542	33,796	7,803	18,429
Putnam	99,244	22,977	11,520	2,163	6,678	3,421	1,321	28,629	6,683	4,800
Queens	2,293,007	491,620	305,926	46,279	157,128	78,352	30,375	653,456	151,227	278,546
Rensselaer	155,261	33,256	20,328	3,131	10,649	5,339	2,070	44,578	10,335	15,555
Richmond	487,407	113,910	59,168	10,723	32,644	16,322	6,220	135,264	31,315	49,544
Saratoga	217,191	47,244	26,806	4,447	14,856	7,436	2,834	61,633	14,274	15,661
Schenectady	151,427	34,203	23,426	3,220	10,182	5,232	2,195	45,342	10,620	17,072
St. Lawrence	109,701	22,008	15,011	2,072	7,645	3,778	1,454	31,359	7,233	16,865
Steuben	96,573	21,315	15,010	2,007	6,538	3,365	1,413	29,182	6,839	12,844
Suffolk	1,512,224	366,574	197,500	34,508	99,949	50,952	20,294	431,465	100,656	83,346
Ulster	181,670	36,728	25,327	3,457	12,639	6,421	2,559	54,348	12,665	21,001
Wayne	91,564	21,410	12,372	2,015	6,118	3,140	1,268	26,773	6,262	8,922
Westchester	953,943	228,123	135,833	21,475	63,180	32,478	13,358	279,142	65,352	78,557
Totals	**17,482,459**	**3,982,345**	**2,310,990**	**374,881**	**1,177,437**	**589,685**	**230,188**	**4,935,966**	**1,144,215**	**2,348,648**

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	HIGH OZONE DAYS 2006–2008					HIGH PARTICLE POLLUTION DAYS 2006–2008						
						24 Hour					Annual	
County	**Orange**	**Red**	**Purple**	**Wgt. Avg**	**Grade**	**Orange**	**Red**	**Purple**	**Wgt. Avg**	**Grade**	**Design Value**	**Pass/ Fail**
Albany	10	0	0	3.3	F	5	0	0	1.7	C	*	INC
Bronx	16	1	0	5.8	F	21	0	0	7.0	F	14.3	PASS
Chautauqua	35	0	0	11.7	F	1	0	0	0.3	B	8.7	PASS
Chemung	3	0	0	1.0	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Dutchess	14	0	0	4.7	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Erie	24	0	0	8.0	F	8	0	0	2.7	D	11.1	PASS
Essex	18	2	0	7.0	F	1	0	0	0.3	B	5.1	PASS
Franklin	5	0	0	1.7	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Hamilton	3	0	0	1.0	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Herkimer	4	0	0	1.3	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Jefferson	11	0	0	3.7	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Kings	DNC	DNC	DNC	DNC	DNC	6	0	0	2.0	C	12.9	PASS
Madison	8	0	0	2.7	D	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Monroe	17	0	0	5.7	F	1	0	0	0.3	B	9.5	PASS
Nassau	DNC	DNC	DNC	DNC	DNC	3	0	0	1.0	C	10.9	PASS
New York	*	*	*	*	*	12	0	0	4.0	F	*	INC
Niagara	19	0	0	6.3	F	2	0	0	0.7	B	10.3	PASS
Oneida	3	0	0	1.0	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC

	HIGH OZONE DAYS 2006–2008					HIGH PARTICLE POLLUTION DAYS 2006–2008						
						24 Hour					Annual	
County	Orange	Red	Purple	Wgt. Avg	Grade	Orange	Red	Purple	Wgt. Avg	Grade	Design Value	Pass/ Fail
Onondaga	9	0	0	3.0	D	0	0	0	0.0	A	8.7	PASS
Orange	16	3	0	6.8	F	4	0	0	1.3	C	10.0	PASS
Oswego	10	0	0	3.3	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Putnam	19	0	0	6.3	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Queens	14	0	0	4.7	F	12	0	0	4.0	F	11.3	PASS
Rensselaer	10	0	0	3.3	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Richmond	17	4	0	7.7	F	5	0	0	1.7	C	12.4	PASS
Saratoga	20	0	0	6.7	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Schenectady	4	0	0	1.3	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC
St. Lawrence	DNC	DNC	DNC	DNC	DNC	0	0	0	0.0	A	6.0	PASS
Steuben	4	0	0	1.3	C	3	0	0	1.0	C	8.1	PASS
Suffolk	34	6	1	15.0	F	1	0	0	0.3	B	10.5	PASS
Ulster	6	0	0	2.0	C	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Wayne	11	0	0	3.7	F	DNC	DNC	DNC	DNC	DNC	DNC	DNC
Westchester	28	5	0	11.8	F	4	0	0	1.3	C	11.2	PASS

We will breathe easier when the air over every
American city is clean and pure.
We will breathe easier when the air in our public spaces,
workplaces and children's homes is free of secondhand smoke.
We will breathe easier when Americans are free from the addictive grip
of tobacco and the debilitating effects of lung disease.
We will breathe easier when our nation's children no longer battle
airborne poisons or the fear of an asthma attack.
Until then, we are fighting for air.

AMERICAN LUNG ASSOCIATION®
Fighting for Air

Acknowledgments

The American Lung Association State of the Air 2010 is the result of the hard work of many people:

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Finally, we dedicate this report to a colleague and long-time advocate for clean, healthy air who passed away in February: A. Blakeman Early. Blake's dedication, knowledge, and sense of humor are sorely missed.

The American Lung Association assumes sole responsibility for the content of the *American Lung Association State of the Air 2010*.

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Fighting for Air

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State of the Air 2010 shows that

cleaning up air pollution produces healthier air

across the nation.

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The number of cities reporting their lowest levels of year-round particle pollution ever.

The *State of the Air 2010* shows that the air quality in many places has improved, but that over 175 million people—roughly 58 percent—still suffer pollution levels that are too often dangerous to breathe. Unhealthy air remains a threat to the lives and health of millions of people in the United States, despite great progress. Even as the nation explores the complex challenges of global warming and energy, air pollution lingers as a widespread and dangerous reality.

The *State of the Air 2010* report looks at levels of ozone and particle pollution found in monitoring sites across the United States in 2006, 2007, and 2008. The report uses the most current quality-assured nationwide data available for these analyses. For particle pollution, the report examines fine particulate matter ($PM_{2.5}$) in two different ways: averaged year-round (annual average) and over short-term levels (24-hour). For both ozone and short-term particle pollution, the analysis used a weighted average number of days that allows recognition of places with higher levels of pollution. For the year-round particle pollution rankings, the report uses averages calculated and reported by the U.S. Environmental Protection Agency. For comparison, the *State of the Air 2009* report covered data from 2005, 2006 and 2007.[1]

The strongest improvement came in the year-round (annual) particle pollution levels, but most of the cities with the highest ozone and short-term particle levels improved as well. These results show that cleaning up major sources of air pollution produces healthier air. However, the continuing problem demonstrates that more remains to be done, especially in cleaning up coal-fired power plants and existing diesel engines. The results also show the need for stronger limits on national air pollution levels—a fight that the American Lung Association has long led as a key to healthier air.

For the first time, the *State of the Air 2010* report includes population estimates for another at-risk group, people living in poverty. As discussed under Health Effects, people who have low incomes face higher risk of harm from air pollution. The population estimates here are based in the poverty definition used by the U.S. Census Bureau.

Year-round particle pollution

The *State of the Air 2010* finds great progress in cutting year-round particle pollution, compared to the 2009 report. Thanks to reductions in emissions from coal-fired power plants and the transition to cleaner diesel fuels and engines, cleaner air shows up repeatedly in the monitoring data, especially in the eastern U.S.

Twenty of the 25 metropolitan areas with the worst year-round pollution reported much lower levels of particle pollution in *State of the Air 2010* compared to the 2009 report. Sixteen metropolitan areas reported their lowest levels ever: Pittsburgh-New Castle, PA; Cincinnati-Middletown-Wilmington, OH-KY-IN; St Louis-St. Charles-Farmington, MO-IL; Charleston, WV; Detroit-Warren-Flint, MI; Weirton-Steubenville, WV-OH; Louisville-Jefferson County-Elizabethtown-Scottsburg, KY-IN; Atlanta-Sandy Springs-Gainesville, GA-AL; Huntington-Ashland, WV-KY-OH; Cleveland-Akron-Elyria, OH; Macon-Warner Robins-Fort Valley, GA; Hagerstown-Martinsburg, MD-WV; Knoxville-Sevierville-La Follette, TN; Indianapolis-Anderson-Columbus, IN; Parkersburg-Marietta, WV-OH; and York-Hanover-Gettysburg, PA.

1 A complete discussion of the sources of data and the methodology is included in Appendix: Methodology.

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The number of cities averaging fewer days of unhealthy particle pollution from 2006 to 2008.

The other cities that improved over the 2009 report were: Birmingham-Hoover-Cullman, AL (which equaled its lowest level ever); Hanford-Corcoran, CA; Houston-Baytown-Huntsville, TX; and Augusta-Richmond County, GA.

A new city moved to the top of the most-polluted by year-round particle levels list. Phoenix-Mesa-Scottsdale, AZ, moved up after new monitoring data in Pinal County reported the highest readings in the nation. Pinal County and Maricopa County comprise the Phoenix-Mesa-Scottsdale, AZ metropolitan area.

Some cities on this list had higher levels of pollution compared to the 2009 report. Most of the areas with worse year-round levels of particle pollution were in California, with even Los Angeles showing a slightly higher level. Those cities include: Phoenix-Mesa-Scottsdale, AZ; Bakersfield, CA; Los Angeles-Long Beach-Riverside, CA; Visalia-Porterville, CA; Fresno-Madera, CA; and Modesto, CA.

For the first time, six cities on the most-polluted list received passing grades, meaning they met the current, but inadequate, standard for year-round particulate matter, set at 15 micrograms per cubic meter. Those cities are: Hagerstown-Martinsburg, MD-WV; Knoxville-Sevierville-La Follette, TN; Augusta-Richmond County, GA; Indianapolis-Anderson-Columbus, IN; Parkersburg-Marietta, WV-OH; and York-Hanover-Gettysburg, PA. The EPA is reviewing the substantial evidence that the standard is much too lenient and, consequently, fails to provide adequate protection for public health. The Lung Association won a court decision in 2009 requiring EPA to review that evidence. EPA is promising to propose a standard in November 2010.

Short-term particle pollution

Seventeen of the 25 metropolitan areas on this list of the most polluted experienced fewer days of unhealthy levels of particle pollution on average in the *State of the Air 2010* report compared to the 2009 report. Improvements occurred all across the nation. Improving were: Pittsburgh-New Castle, PA; Los Angeles-Long Beach-Riverside, CA; Birmingham-Hoover-Cullman, AL; Sacramento-Arden-Arcade-Yuba City, CA-NV; Salt Lake City-Ogden-Clearfield, UT; Hanford-Corcoran, CA; Merced, CA; Chicago-Naperville-Michigan City, IL-IN-WI; San Diego-Carlsbad-San Marcos, CA; Washington-Baltimore-Northern VA, DC-MD-VA; New York City-Newark-Bridgeport, NY-NJ-CT-PA; Logan, UT-ID; Eugene-Springfield, OR; Harrisburg-Carlisle-Lebanon, PA; San Jose-San Francisco-Oakland, CA; Indianapolis-Anderson-Columbus, IN; and Allentown-Bethlehem-Easton, PA-NJ.

Seven of the most polluted cities reported more days of unhealthy levels on average than in the previous report, while one—Philadelphia-Camden-Vineland, PA-NJ-DE-MD—remained unchanged. The metro areas with worse pollution scores were: Bakersfield, Fresno-Madera, Visalia-Porterville, Modesto, and Stockton—all in California—as well as Provo-Orem, UT and Phoenix-Mesa-Scottsdale, AZ.

Bakersfield, CA ranked as the city most polluted by short-term levels of particle pollution, its first time atop this list. Last year's previous number one—Pittsburgh—improved enough to drop to third place.

Ozone

Fourteen of the 25 most polluted metropolitan areas reported fewer days of unhealthy ozone levels on average in the 2010 report compared to the 2009 report. Ten metropolitan areas had higher averages and one remained unchanged.

Improving were cities across the nation: Sacramento-Arden-Arcade-Yuba City, CA-NV; Houston-Baytown-Huntsville, TX; Charlotte-Gastonia-Salisbury, NC; Phoenix-Mesa-Scottsdale, AZ; Dallas-Fort Worth, TX; El Centro, CA; New York City-Newark-Bridgeport, NY-NJ-CT-PA; Washington-Baltimore-Northern VA, DC-MD-VA; Cincinnati-Middletown-Wilmington, OH-KY-IN; Atlanta-Sandy Springs-Gainesville, GA-AL; Birmingham-Hoover-Cullman, AL; Las Vegas-Paradise-

175.3 Million
The number of people in the US who live in counties where the outdoor air got an F.

Pahrump, NV; Philadelphia-Camden-Vineland, PA-NJ-DE-MD; and Baton Rouge-Pierre Part, LA.

All of the cities seeing a higher average number of days were all in California, including; Los Angeles-Long Beach-Riverside; Bakersfield; Visalia-Porterville; Fresno-Madera; Hanford-Corcoran; San Diego-Carlsbad-San Marcos; San Luis Obispo-Paso Robles; Merced; Modesto; and Chico.

Los Angeles-Long Beach-Riverside, CA remains firmly atop the list of cities most polluted by ozone pollution. Los Angeles experienced a slight increase in the weighted average number of days, though still marked its second-best level since the first *State of the Air* reported on ozone levels for 1996 to 1999.

Cleanest cities

Fargo-Wahpeton, ND-MN and Lincoln, NE, emerged as the cleanest cities in the U.S, the only cities to appear on all three lists of cleanest cities. Twelve cities ranked cleanest for both particle pollution measures, though not for ozone: Amarillo, TX; Bangor, ME; Billings, MT; Cape Coral-Ft. Myers, FL; Cheyenne, WY; Ft. Collins-Loveland, CO; Pueblo, CO; Salinas, CA; San Luis Obispo-Paso Robles, CA; Santa Fe-Espanola, NM; Sarasota-Bradenton-Punta Gorda, FL; and Tucson, AZ. Five were among the cleanest cities for ozone and for one of the two particle pollution measures: Bismarck, ND; Brownsville-Harlingen-Raymondville, TX; Duluth, MN-WI; Honolulu, HI; and Port St. Lucie-Sebastian-Vero Beach, FL.

23.8 Million
The number of people in the US who live in counties where the outdoor air failed all three tests.

People at risk

Looking at the nation as a whole, the ***American Lung Association State of the Air 2010*** finds—

- **Nearly six of ten people (58%) in the United States lives in counties that have unhealthful levels of either ozone or particle pollution.**

  Almost 175.3 million Americans live in the 445 counties where they are exposed to unhealthful levels of air pollution in the form of either ozone or short-term or year-round levels of particles.

- **Over half the people in the United States (56%) live in areas with unhealthful levels of ozone.**
  Counties that were graded F for ozone levels have a combined population of almost 167.3 million. These people live in the 414 counties where the monitored air quality places them at risk for decreased lung function, respiratory infection, lung inflammation and aggravation of respiratory illness. The actual number who breathe unhealthy levels of ozone is likely much larger, since this number does not include people who live in adjacent counties in metropolitan areas where no monitors exist.

- **Nearly one-quarter (23%) of people in the United States live in an area with unhealthful short-term levels of particle pollution.**

  Nearly 70.4 million Americans live in 94 counties that experienced too many days with unhealthy spikes in particle pollution, a decrease from the last report. Short-term spikes in particle pollution can last from hours to several days and can increase the risk of heart attacks, strokes and emergency-room visits for asthma and cardiovascular disease, and most importantly, can increase the risk of early death.

- **Roughly one in ten (9.6%) people in the United States live in an area with unhealthful year-round levels of particle pollution.**

  Almost 28.9 million U.S. residents live in areas where chronic levels are regularly a threat to their health. Even when levels are fairly low, exposure to particles over time can increase risk of hospitalization for asthma, damage to the lungs and, significantly, increase the risk of premature death.

- **Roughly one in 13 people—some 23.8 million in the United States—live in 18 counties with unhealthful levels of all three: ozone and short-term and year-round particle pollution.**

With the risks from airborne pollution so great, the American Lung Association seeks to inform people who may be in danger. Many people are at greater risk because of their age or because they have asthma or other chronic lung, cardiovascular disease or diabetes. Here are the numbers of people in each at-risk group.

- **People with Asthma**—Approximately 3.9 million children and over 10.7 million adults with asthma live in parts of the United States with very high levels of ozone. Nearly 4.6 million adults and nearly 1.7 million children with asthma live in areas with high levels of short-term particle pollution. Nearly 1.8 million adults and over 721,000 children with asthma live in counties with unhealthful levels of year-round particle pollution.
- **Older and Younger**—Over 19.8 million adults age 65 and over and nearly 41.7 million children age 18 and under live in counties with unhealthful ozone levels. Nearly 8.2 million seniors and over 17.6 million children live in counties with unhealthful short-term levels of particle pollution. Over 3.1 million seniors and nearly 7.7 million children live in counties with unhealthful levels of year-round particle pollution.
- **Chronic Bronchitis and Emphysema**—Over 5.4 million people with chronic bronchitis and nearly 2.1 million with emphysema live in counties with unhealthful ozone levels. Nearly 2.3 million people with chronic bronchitis and over 845,000 with emphysema live in counties with unhealthful levels of short-term particle pollution. Nearly 1.0 million people with chronic bronchitis and more than 330,000 with emphysema live in counties with unhealthful year-round levels of particle pollution.
- **Cardiovascular Disease**—Nearly 18.6 million people with cardiovascular diseases live in counties with unhealthful levels of short-term particle pollution; nearly 7.4 million live in counties with unhealthful levels of year-round particle pollution. Cardiovascular diseases include coronary heart disease, heart attacks, strokes, hypertension and angina pectoris.
- **Diabetes**—Nearly 4.5 million people with diabetes live in counties with unhealthful levels of short-term particle pollution; nearly 1.9 million live in counties with unhealthful levels of year-round particle pollution. Research indicates that because diabetics are already at higher risk of cardiovascular disease, they may face increased risk due to the impact of particle pollution on their cardiovascular systems.
- **Poverty**—Over 20.8 million people with incomes meeting the federal poverty definition live in counties with unhealthful levels of ozone. Over 9.8 million people in poverty live in counties with unhealthful levels of short-term particle pollution, and nearly 4.4 million live in counties with unhealthful year-round levels of particle pollution. Evidence shows that people who have low incomes may face higher risk from air pollution.

What needs to be done to get healthy air

Many major challenges require the Administration and Congress to take steps to protect the health of the public. Here are a few that the American Lung Association calls for to improve the air we all breathe.

- **Clean up dirty power plants.** Coal-fired power plants are among the largest contributors to particulate pollution, ozone, mercury, and global warming. The EPA should immediately take action to reduce emissions and expand clean-up requirements for power plants nationwide. Congress should also pass the Clean Air Act Amendments of 2010, S. 2995, a bill that will cut life-threatening emissions from power plants.
- **Clean up the existing fleet of dirty diesel** vehicles and heavy equipment. Rules EPA put in effect over the past several years mean that new diesel vehicles and equipment must be much cleaner. Still, the vast majority of diesel trucks, buses and heavy equipment (such as bulldozers) will likely be in use for thousands more miles, spewing dangerous diesel exhaust into communities and

neighborhoods. The good news is that affordable technology exists to cut emissions by 90 percent. Congress needs to fund EPA's diesel cleanup ("retrofit") program. Congress should also require that clean diesel equipment should be used in federally-funded construction programs.

- **Strengthen the ozone standards.** The Lung Association urges the EPA to adopt a much tighter, more protective national air quality standard for ozone, set at 60 parts per billion. The EPA is currently considering strengthening the standard adopted in March 2008, which they now believe was not strong enough to protect health against the widespread harm from ozone smog. The 2008 decision set 75 ppb as the standard, despite the unanimous recommendations of EPA's official science advisors that such a level would allow too much ozone to meet the requirements of the Clean Air Act. The American Lung Association challenged the 2008 decision in court, along with several states, public health and environmental groups. In January 2010, the EPA proposed a range for the new standard that met the earlier recommendations of the expert panel and the nation's leading public health organizations. EPA will announce the decision on the new standard in August 2010.
- **Strengthen the particle pollution standards.** In 2006, EPA failed to strengthen the annual standard for fine particles, despite the near unanimous recommendation by their official science advisors. EPA lowered the 24-hour standard, though not to the level the Lung Association recommended. EPA can save thousands of lives each year by dramatically strengthening the annual average and the 24-hour standards. In 2009, the Lung Association challenged that 2006 standard in the U.S. Circuit Court and won. EPA will issue a new proposal for the particle pollution standards in November 2010.
- **Clean up harmful emissions from tailpipes in cars.** EPA needs to set new pollution standards for cars and automobile fuels to reduce nitrogen oxides, hydrocarbons, and particle pollution emissions.

What you can do

Individual citizens can do a great deal to help reduce air pollution outdoors as well. Simple, but effective ways include—

- **Drive less.** Combine trips, walk, bike, carpool or vanpool, and use buses, subways or other alternatives to driving. Vehicle emissions are a major source of air pollution. Support community plans that provide ways to get around that don't require a car, such as more sidewalks, bike trails and transit systems.
- **Don't burn wood or trash.** Burning firewood and trash are among the largest sources of particles in many parts of the country. If you must use a fireplace or stove for heat, convert your woodstoves to natural gas, which has far fewer polluting emissions. Compost and recycle as much as possible and dispose of other waste properly; don't burn it. Support efforts in your community to ban outdoor burning of construction and yard wastes. Avoid the use of outdoor hydronic heaters, also called outdoor wood boilers, which are often much more polluting than woodstoves.
- **Make sure your local school system requires clean school buses,** which includes replacing or retrofitting old school buses with filters and other equipment to reduce emissions. Make sure your local schools don't idle their buses, a step that can immediately reduce emissions.
- **Get involved.** Participate in your community's review of its air pollution plans and support state and local efforts to clean up air pollution. To find your local air pollution control agency, go to www.4cleanair.org.
- **Use less electricity.** Turn out the lights and use energy-efficient appliances. Generating electricity is one of the biggest sources of pollution, particularly in the eastern United States.
- **Send a message to decision makers.** Send an email or fax to urge Congress to support the steps to strengthen the Clean Air Act to clean up power plants. Log on at www.lungusa.org to see how easy that can be.

People at Risk from Short-term Particle Pollution (24-Hour $PM_{2.5}$)

In Counties where the Grades were:	Chronic Diseases: Adult Asthma	Pediatric Asthma	Chronic Bronchitis	Emphysema	CV Disease	Diabetes	Poverty	Age Groups: Under 18	65 and Over	Total Population	Number of Counties
Grade A (0.0)	1,431,045	538,770	753,544	288,600	6,250,128	1,512,821	3,228,313	5,723,307	2,860,846	23,087,491	114
Grade B (0.3-0.9)	2,691,951	960,511	1,362,344	524,175	11,332,037	2,660,422	4,596,285	10,203,451	5,128,559	41,428,716	174
Grade C (1.0-2.0)	3,147,072	1,098,267	1,644,294	643,300	13,785,258	3,259,333	5,798,918	11,666,775	6,391,419	49,173,334	145
Grade D (2.1-3.2)	1,424,175	539,427	747,274	279,599	6,136,573	1,558,701	2,972,611	5,730,283	2,651,199	22,976,485	46
Grade F (3.3+)	4,563,627	1,659,325	2,270,972	845,600	18,591,429	4,451,899	9,817,153	17,626,836	8,160,951	70,364,400	94
National Population in Counties with $PM_{2.5}$ Monitors	13,732,816	4,976,063	7,033,360	2,683,455	58,254,368	13,977,830	27,511,690	52,860,236	26,265,620	214,763,357	644

People at Risk from Year-Round Particle Pollution (Annual $PM_{2.5}$)

In Counties where the Grades were:	Chronic Diseases: Adult Asthma	Pediatric Asthma	Chronic Bronchitis	Emphysema	CV Disease	Diabetes	Poverty	Age Groups: Under 18	65 and Over	Total Population	Number of Counties
Pass	9,769,611	3,461,755	4,994,517	1,924,368	41,564,886	9,851,469	18,406,379	36,773,916	18,930,906	151,315,340	483
Fail	1,789,925	721,700	907,245	330,935	7,357,186	1,884,302	4,387,525	7,666,525	3,133,109	28,856,635	23
National Population in Counties with $PM_{2.5}$ Monitors	13,732,816	4,976,063	7,033,360	2,683,455	58,254,368	13,977,830	27,511,690	52,860,236	26,265,620	214,763,357	644

People at Risk from Ozone

		Chronic Diseases: Adult Asthma	Pediatric Asthma	Chronic Bronchitis	Emphysema	Poverty	Age Groups: Under 18	65 and Over	Total Population	Number of Counties
Grade A	(0.0)	536,586	186,444	282,356	110,483	967,871	1,980,576	1,111,564	8,440,255	49
Grade B	(0.3-0.9)	590,051	229,608	317,863	123,585	1,243,600	2,439,097	1,239,771	9,729,598	60
Grade C	(1.0-2.0)	1,094,162	385,679	596,341	240,468	2,200,951	4,097,001	2,504,508	17,649,385	111
Grade D	(2.1-3.2)	646,298	222,060	341,007	136,108	1,193,926	2,358,921	1,393,883	10,116,082	56
Grade F	(3.3+)	10,749,030	3,924,615	5,442,903	2,053,967	20,809,913	41,690,791	19,815,294	167,254,009	414
National Population in Counties with Ozone Monitors		14,126,196	5,108,044	7,239,827	2,765,142	27,436,753	54,262,212	27,076,958	220,847,465	749

Note: The State of the Air 2010 covers the period 2006-2008. The Appendix provides a full discussion of the methodology.

People at Risk In 25 U.S. Cities Most Polluted by Short-term Particle Pollution (24-hour $PM_{2.5}$)

2010 Rank[1]	Metropolitan Statistical Areas	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,8]	Adult Asthma[5,8]	Chronic Bronchitis[6,8]	Emphysema[7,8]	CV Disease[9]	Diabetes[10]	Poverty[11]
1	Bakersfield, CA	800,458	238,789	71,678	22,479	46,597	23,265	7,790	181,207	44,207	156,128
2	Fresno-Madera, CA	1,057,486	311,788	104,922	29,351	62,100	31,280	10,965	248,680	60,964	222,540
3	Pittsburgh-New Castle, PA	2,441,464	500,897	420,508	47,153	178,047	88,152	38,601	780,756	180,882	285,428
4	Los Angeles-Long Beach-Riverside, CA	17,786,419	4,695,757	1,900,610	442,040	1,094,827	556,680	200,338	4,484,079	1,104,703	2,394,160
5	Birmingham-Hoover-Cullman, AL	1,198,932	290,401	157,265	27,338	70,565	39,978	15,778	336,620	102,410	151,234
6	Sacramento--Arden-Arcade--Yuba City, CA-NV	2,417,404	591,377	293,951	55,670	153,359	78,640	29,653	647,176	160,164	285,352
7	Salt Lake City-Ogden-Clearfield, UT	1,717,261	518,277	150,699	48,788	100,197	50,204	16,978	393,363	74,859	141,927
8	Visalia-Porterville, CA	426,276	135,427	40,821	12,749	24,202	12,169	4,249	96,539	23,644	90,369
9	Modesto, CA	510,694	145,476	53,728	13,695	30,520	15,491	5,581	124,778	30,713	72,561
10	Hanford-Corcoran, CA	149,518	40,715	11,487	3,833	8,930	4,349	1,308	32,288	7,759	22,566
11	Merced, CA	246,117	76,722	24,433	7,222	14,091	7,080	2,490	56,327	13,791	52,005
12	Philadelphia-Camden-Vineland, PA-NJ-DE-MD	6,398,896	1,528,290	846,470	143,868	443,728	214,554	84,875	1,808,716	412,970	712,300
13	Provo-Orem, UT	540,820	188,783	34,748	17,771	29,278	13,810	3,948	100,258	18,511	62,642
14	Phoenix-Mesa-Scottsdale, AZ	4,281,899	1,168,524	493,850	110,000	304,097	133,169	49,604	1,089,057	234,900	564,558
15	Stockton, CA	672,388	194,385	68,391	18,299	39,916	20,227	7,204	162,098	39,865	108,919
16	Chicago-Naperville-Michigan City, IL-IN-WI	9,793,036	2,504,341	1,087,551	235,751	580,310	314,388	115,977	2,564,659	605,408	1,139,254
17	San Diego-Carlsbad-San Marcos, CA	3,001,072	744,470	337,004	70,082	188,661	95,863	34,760	774,396	190,719	364,576
18	Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	8,249,194	1,984,957	894,778	186,856	585,428	271,393	99,323	2,208,468	520,827	624,420
18	New York-Newark-Bridgeport, NY-NJ-CT-PA	22,154,752	5,178,014	2,889,985	487,436	1,472,232	743,282	290,311	6,225,658	1,409,941	2,585,219
18	Logan, UT-ID	125,070	39,979	10,051	3,764	7,117	3,411	1,065	25,688	4,849	14,174
21	Eugene-Springfield, OR	346,560	69,455	49,662	6,538	23,760	12,190	4,864	103,115	19,293	53,423
22	Harrisburg-Carlisle-Lebanon, PA	660,042	145,638	97,953	13,710	47,390	22,934	9,456	197,208	45,243	59,172
23	San Jose-San Francisco-Oakland, CA	7,354,555	1,657,339	889,331	156,016	480,165	248,277	93,911	2,050,091	509,263	662,858
23	Indianapolis-Anderson-Columbus, IN	2,035,327	532,625	232,310	50,140	137,759	65,257	24,517	537,022	142,759	234,047
23	Allentown-Bethlehem-Easton, PA-NJ	808,210	182,515	120,493	17,181	57,072	27,849	11,508	239,635	55,042	72,641

Notes:
1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. **Total Population** represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
3. Those **18 & under** and **65 & over** are vulnerable to $PM_{2.5}$ and are, therefore, included. They should not be used as population denominators for disease estimates.
4. **Pediatric asthma** estimates are for those under 18 years of age and represent the estimated number of people who had asthma in 2008 based on national rates (NHIS) applied to county population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the estimated number of people who had asthma during 2008 based on state rates (BRFSS) applied to county population estimates (U.S. Census).
6. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed in 2008, based on national rates (NHIS) applied to county population estimates (U.S. Census).
7. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on national rates (NHIS) applied to county population estimates (U.S. Census).
8. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma and/or emphysema and chronic bronchitis.
9. **CV disease** estimates are based on National Heart Lung and Blood Institute (NHLBI) estimates of cardiovascular disease applied to county population estimates (U.S. Census).
10. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to county population estimates (U.S. Census).
11. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk In 25 U.S. Cities Most Polluted by Year-Round Particle Pollution (Annual $PM_{2.5}$)

2010 Rank[1]	Metropolitan Statistical Areas	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,8]	Adult Asthma[5,8]	Chronic Bronchitis[6,8]	Emphysema[7,8]	CV Disease[9]	Diabetes[10]	Poverty[11]
1	Phoenix-Mesa-Scottsdale, AZ	4,281,899	1,168,524	493,850	110,000	304,097	133,169	49,604	1,089,057	234,900	564,558
2	Bakersfield, CA	800,458	238,789	71,678	22,479	46,597	23,265	7,790	181,207	44,207	156,128
3	Los Angeles-Long Beach-Riverside, CA	17,786,419	4,695,757	1,900,610	442,040	1,094,827	556,680	200,338	4,484,079	1,104,703	2,394,160
3	Visalia-Porterville, CA	426,276	135,427	40,821	12,749	24,202	12,169	4,249	96,539	23,644	90,369
5	Pittsburgh-New Castle, PA	2,441,464	500,897	420,508	47,153	178,047	88,152	38,601	780,756	180,882	285,428
6	Fresno-Madera, CA	1,057,486	311,788	104,922	29,351	62,100	31,280	10,965	248,680	60,964	222,540
7	Birmingham-Hoover-Cullman, AL	1,198,932	290,401	157,265	27,338	70,565	39,978	15,778	336,620	102,410	151,234
8	Hanford-Corcoran, CA	149,518	40,715	11,487	3,833	8,930	4,349	1,308	32,288	7,759	22,566
9	Cincinnati-Middletown-Wilmington, OH-KY-IN	2,198,337	549,333	264,870	51,712	157,199	72,080	27,598	598,538	159,753	244,738
9	St. Louis-St. Charles-Farmington, MO-IL	2,903,894	697,769	378,775	65,686	183,117	97,327	38,410	819,824	200,971	327,896
11	Charleston, WV	303,944	66,579	47,792	6,267	22,796	10,760	4,586	94,143	28,970	47,793
11	Detroit-Warren-Flint, MI	5,354,225	1,308,684	656,566	123,194	395,818	178,282	69,051	1,489,633	371,145	742,617
11	Weirton-Steubenville, WV-OH	122,054	23,865	23,413	2,247	9,324	4,528	2,075	41,043	11,747	18,869
14	Louisville-Jefferson County-Elizabethtown-Scottsburg, KY-IN	1,380,591	334,788	174,598	31,519	100,030	46,144	18,053	387,276	104,392	175,744
14	Modesto, CA	510,694	145,476	53,728	13,695	30,520	15,491	5,581	124,778	30,713	72,561
16	Atlanta-Sandy Springs-Gainesville, GA-AL	5,729,304	1,539,475	489,978	144,921	352,973	177,744	59,961	1,394,748	405,484	677,521
16	Houston-Baytown-Huntsville, TX	5,829,620	1,636,150	485,730	154,019	305,885	177,361	59,438	1,387,414	399,750	790,893
16	Huntington-Ashland, WV-KY-OH	284,234	61,064	45,266	5,749	21,366	9,953	4,194	86,407	24,878	51,840
19	Cleveland-Akron-Elyria, OH	2,887,492	674,060	415,419	63,454	210,320	99,014	40,752	851,201	228,028	370,946
19	Macon-Warner Robins-Fort Valley, GA	390,674	101,778	46,661	9,580	24,200	12,584	4,808	104,349	30,300	63,795
21	Hagerstown-Martinsburg, MD-WV	263,753	62,949	34,072	5,925	19,009	8,708	3,366	72,491	19,603	26,016
21	Knoxville-Sevierville-La Follette, TN	1,041,955	229,952	154,126	21,647	72,575	35,954	14,714	307,808	86,888	151,230
23	Augusta-Richmond County, GA-SC	534,218	135,645	65,742	12,769	33,240	17,488	6,776	146,046	41,759	91,978
24	Indianapolis-Anderson-Columbus, IN	2,035,327	532,625	232,310	50,140	137,759	65,257	24,517	537,022	142,759	234,047
25	Parkersburg-Marietta, WV-OH	160,678	34,222	26,995	3,221	12,066	5,742	2,499	50,725	14,845	25,740
25	York-Hanover-Gettysburg, PA	525,702	119,487	73,383	11,248	37,477	18,007	7,258	153,182	35,016	40,986

Notes:
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6. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed in 2008, based on national rates (NHIS) applied to county population estimates (U.S. Census).
7. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on national rates (NHIS) applied to county population estimates (U.S. Census).
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10. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to county population estimates (U.S. Census).
11. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk In 25 Most Ozone-Polluted Cities

2010 Rank[1]	Metropolitan Statistical Areas	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,8]	Adult Asthma[5,8]	Chronic Bronchitis[6,8]	Emphysema[7,8]	Poverty[9]
1	Los Angeles-Long Beach-Riverside, CA	17,786,419	4,695,757	1,900,610	442,040	1,094,827	556,680	200,338	2,394,160
2	Bakersfield, CA	800,458	238,789	71,678	22,479	46,597	23,265	7,790	156,128
3	Visalia-Porterville, CA	426,276	135,427	40,821	12,749	24,202	12,169	4,249	90,369
4	Fresno-Madera, CA	1,057,486	311,788	104,922	29,351	62,100	31,280	10,965	222,540
5	Sacramento--Arden-Arcade--Yuba City, CA-NV	2,417,404	591,377	293,951	55,670	153,359	78,640	29,653	285,352
6	Hanford-Corcoran, CA	149,518	40,715	11,487	3,833	8,930	4,349	1,308	22,566
7	Houston-Baytown-Huntsville, TX	5,829,620	1,636,150	485,730	154,019	305,885	177,361	59,438	790,893
8	San Diego-Carlsbad-San Marcos, CA	3,001,072	744,470	337,004	70,082	188,661	95,863	34,760	364,576
9	San Luis Obispo-Paso Robles, CA	265,297	49,431	38,323	4,653	18,160	9,359	3,670	30,243
10	Charlotte-Gastonia-Salisbury, NC-SC	2,338,289	597,972	247,933	56,291	133,010	75,049	27,301	281,161
11	Phoenix-Mesa-Scottsdale, AZ	4,281,899	1,168,524	493,850	110,000	304,097	133,169	49,604	564,558
12	Merced, CA	246,117	76,722	24,433	7,222	14,091	7,080	2,490	52,005
13	Dallas-Fort Worth, TX	6,622,032	1,831,927	579,393	172,450	348,930	201,876	68,125	820,338
14	Knoxville-Sevierville-La Follette, TN	1,041,955	229,952	154,126	21,647	72,575	35,954	14,714	151,230
15	El Centro, CA	163,972	47,801	17,493	4,500	9,663	4,855	1,732	32,833
16	New York-Newark-Bridgeport, NY-NJ-CT-PA	22,154,752	5,178,014	2,889,985	487,436	1,472,232	743,282	290,311	2,585,219
16	Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	8,249,194	1,984,957	894,778	186,856	585,428	271,393	99,323	624,420
18	Cincinnati-Middletown-Wilmington, OH-KY-IN	2,198,337	549,333	264,870	51,712	157,199	72,080	27,598	244,738
19	Atlanta-Sandy Springs-Gainesville, GA-AL	5,729,304	1,539,475	489,978	144,921	352,973	177,744	59,961	677,521
19	Birmingham-Hoover-Cullman, AL	1,198,932	290,401	157,265	27,338	70,565	39,978	15,778	151,234
21	Las Vegas-Paradise-Pahrump, NV	1,910,121	501,919	207,091	47,248	119,491	60,364	22,013	212,098
22	Modesto, CA	510,694	145,476	53,728	13,695	30,520	15,491	5,581	72,561
22	Philadelphia-Camden-Vineland, PA-NJ-DE-MD	6,398,896	1,528,290	846,470	143,868	443,728	214,554	84,875	712,300
24	Chico, CA	220,337	45,934	33,068	4,324	14,641	7,514	2,996	44,569
25	Baton Rouge-Pierre Part, LA	797,208	202,763	82,256	19,088	48,156	25,357	9,029	122,432

Notes:
1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. Total Population represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
3. Those **18 & under** and **65 & over** are vulnerable to $PM_{2.5}$ and are, therefore, included. They should not be used as population denominators for disease estimates.
4. **Pediatric asthma** estimates are for those under 18 years of age and represent the estimated number of people who had asthma in 2008 based on national rates (NHIS) applied to county population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the estimated number of people who had asthma during 2008 based on state rates (BRFSS) applied to county population estimates (U.S. Census).
6. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed in 2008, based on national rates (NHIS) applied to county population estimates (U.S. Census).
7. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on national rates (NHIS) applied to county population estimates (U.S. Census).
8. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma and/or emphysema and chronic bronchitis.
9. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk in 25 Counties Most Polluted by Short-term Particle Pollution (24-hour $PM_{2.5}$)

				At-Risk Groups									High $PM_{2.5}$ Days in Unhealthy Ranges, 2006–2008	
2010 Rank[1]	County	ST	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,8]	Adult Asthma[5,8]	Chronic Bronchitis[6,8]	Emphysema[7,8]	CV Disease[9]	Diabetes[10]	Poverty[11]	Weighted Avg.[12]	Grade[13]
1	Kern	CA	800,458	238,789	71,678	22,479	46,597	23,265	7,790	181,207	44,207	156,128	55.2	F
2	Fresno	CA	909,153	270,512	89,615	25,465	53,191	26,798	9,390	213,027	52,230	197,265	53.3	F
3	Allegheny	PA	1,215,103	250,672	204,705	23,597	88,545	43,690	18,952	385,161	89,099	145,977	45.5	F
4	Riverside	CA	2,100,516	583,297	241,428	54,909	126,317	63,620	23,196	513,861	125,986	260,109	27.3	F
5	Jefferson	AL	659,503	157,990	89,377	14,873	38,956	22,217	8,909	188,555	57,398	88,637	25.0	F
6	Los Angeles	CA	9,862,049	2,549,168	1,054,932	239,969	611,881	311,413	112,035	2,508,754	618,355	1,482,051	19.7	F
7	Sacramento	CA	1,394,154	362,492	158,340	34,124	86,442	44,138	16,274	359,465	88,749	182,573	19.5	F
8	Salt Lake	UT	1,022,651	302,184	89,440	28,446	60,222	30,200	10,192	236,479	44,953	89,216	18.2	F
9	Tulare	CA	426,276	135,427	40,821	12,749	24,202	12,169	4,249	96,539	23,644	90,369	15.3	F
10	Stanislaus	CA	510,694	145,476	53,728	13,695	30,520	15,491	5,581	124,778	30,713	72,561	13.0	F
11	Kings	CA	149,518	40,715	11,487	3,833	8,930	4,349	1,308	32,288	7,759	22,566	12.7	F
12	San Bernardino	CA	2,015,355	590,810	170,130	55,617	118,301	59,184	19,520	458,534	111,974	288,756	11.2	F
12	Merced	CA	246,117	76,722	24,433	7,222	14,091	7,080	2,490	56,327	13,791	52,005	11.2	F
14	Philadelphia	PA	1,447,395	361,859	185,962	34,064	100,391	46,961	18,156	390,839	88,611	331,349	11.0	F
15	Utah	UT	530,837	185,393	33,761	17,452	28,728	13,536	3,851	98,073	18,088	61,648	10.7	F
16	Pinal	AZ	327,301	85,283	42,819	8,028	23,791	10,272	3,936	84,882	18,309	43,350	10.2	F
17	San Joaquin	CA	672,388	194,385	68,391	18,299	39,916	20,227	7,204	162,098	39,865	108,919	9.2	F
18	Cook	IL	5,294,664	1,313,534	624,187	123,651	311,719	171,660	64,274	1,408,857	329,408	767,182	8.7	F
19	San Diego	CA	3,001,072	744,470	337,004	70,082	188,661	95,863	34,760	774,396	190,719	364,576	8.5	F
20	Union	NJ	523,249	129,721	65,627	12,211	33,748	17,336	6,769	145,343	33,320	45,220	8.3	F
20	Baltimore City	MD	636,919	153,154	75,404	14,417	45,370	20,875	7,808	171,278	41,126	116,585	8.3	F
20	Cache	UT	112,616	35,915	8,563	3,381	6,381	3,047	922	22,639	4,237	13,020	8.3	F
23	Orange	CA	3,010,759	765,649	342,841	72,075	188,534	96,726	35,888	790,757	195,691	294,758	8.2	F
24	Lane	OR	346,560	69,455	49,662	6,538	23,760	12,190	4,864	103,115	19,293	53,423	8.0	F
25	Dauphin	PA	256,562	59,937	35,138	5,642	18,135	8,797	3,564	75,118	17,200	27,090	7.3	F
25	Washington	PA	206,407	41,852	35,648	3,940	15,099	7,464	3,264	66,055	15,299	20,690	7.3	F
25	Plumas	CA	20,275	3,525	4,041	332	1,440	778	360	7,082	1,791	2,408	7.3	F

Notes:

1. Counties are ranked by weighted average. See note 12 below.
2. **Total Population** represents the at-risk populations in counties with $PM_{2.5}$ monitors.
3. Those **18 & under** and **65 & over** are vulnerable to $PM_{2.5}$ and are, therefore, included. They should not be used as population denominators for disease estimates.
4. **Pediatric asthma** estimates are for those under 18 years of age and represent the estimated number of people who had asthma in 2008 based on national rates (NHIS) applied to county population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the estimated number of people who had asthma during 2008 based on state rates (BRFSS) applied to county population estimates (U.S. Census).
6. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed in 2008, based on national rates (NHIS) applied to county population estimates (U.S. Census).
7. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on national rates (NHIS) applied to county population estimates (U.S. Census).
8. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma and/or emphysema and chronic bronchitis.
9. **CV disease** estimates are based on National Heart Lung and Blood Institute (NHLBI) estimates of cardiovascular disease applied to county population estimates (U.S. Census).
10. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to county population estimates (U.S. Census).
11. Poverty estimates come from the U.S. Census Bureau and are for all ages.
12. The **Weighted Average** was derived by counting the number of days in each unhealthful range (orange, red, purple, maroon) in each year (2006-2008), multiplying the total in each range by the assigned standard weights (i.e., 1 for orange, 1.5 for red, 2.0 for purple, 2.5 for maroon), and calculating the average.
13. **Grade** is assigned by weighted average as follows: A=0.0, B=0.3-0.9, C=1.0-2.0, D=2.1-3.2, F=3.3+.

People at Risk in 25 Counties Most Polluted by Year-Round Particle Pollution (Annual $PM_{2.5}$)

				At-Risk Groups									$PM_{2.5}$ Annual, 2006–2008	
2010 Rank[1]	County	ST	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,8]	Adult Asthma[5,8]	Chronic Bronchitis[6,8]	Emphysema[7,8]	CV Disease[9]	Diabetes[10]	Poverty[11]	Design Value[12]	Grade[13]
1	Pinal	AZ	327,301	85,283	42,819	8,028	23,791	10,272	3,936	84,882	18,309	43,350	21.6	FAIL
2	Kern	CA	800,458	238,789	71,678	22,479	46,597	23,265	7,790	181,207	44,207	156,128	21.5	FAIL
3	Riverside	CA	2,100,516	583,297	241,428	54,909	126,317	63,620	23,196	513,861	125,986	260,109	19.7	FAIL
3	Tulare	CA	426,276	135,427	40,821	12,749	24,202	12,169	4,249	96,539	23,644	90,369	19.7	FAIL
5	Allegheny	PA	1,215,103	250,672	204,705	23,597	88,545	43,690	18,952	385,161	89,099	145,977	18.3	FAIL
6	Fresno	CA	909,153	270,512	89,615	25,465	53,191	26,798	9,390	213,027	52,230	197,265	17.7	FAIL
7	Jefferson	AL	659,503	157,990	89,377	14,873	38,956	22,217	8,909	188,555	57,398	88,637	17.3	FAIL
7	San Bernardino	CA	2,015,355	590,810	170,130	55,617	118,301	59,184	19,520	458,534	111,974	288,756	17.3	FAIL
9	Kings	CA	149,518	40,715	11,487	3,833	8,930	4,349	1,308	32,288	7,759	22,566	17	FAIL
10	Hamilton	OH	851,494	206,018	114,701	19,394	61,384	28,595	11,457	242,599	64,838	113,411	15.7	FAIL
10	Madison	IL	268,078	61,931	37,811	5,830	16,217	9,045	3,628	76,653	18,072	32,953	15.7	FAIL
12	Los Angeles	CA	9,862,049	2,549,168	1,054,932	239,969	611,881	311,413	112,035	2,508,754	618,355	1,482,051	15.6	FAIL
13	Wayne	MI	1,949,929	507,861	234,544	47,808	141,145	63,463	24,562	529,981	131,973	393,147	15.4	FAIL
13	Kanawha	WV	191,018	41,029	31,892	3,862	14,381	6,848	2,991	60,630	18,639	29,656	15.4	FAIL
13	Brooke	WV	23,520	4,396	4,588	414	1,825	883	406	8,018	2,459	2,674	15.4	FAIL
16	Clark	IN	106,673	25,813	13,601	2,430	7,416	3,540	1,377	29,603	7,886	11,286	15.3	FAIL
16	Stanislaus	CA	510,694	145,476	53,728	13,695	30,520	15,491	5,581	124,778	30,713	72,561	15.3	FAIL
18	Clayton	GA	273,718	80,762	18,664	7,603	16,334	8,035	2,517	61,071	17,757	39,619	15.2	FAIL
18	Harris	TX	3,984,349	1,145,274	316,399	107,812	206,787	119,643	39,499	929,844	267,659	603,105	15.2	FAIL
18	Cabell	WV	94,631	19,658	15,551	1,851	7,157	3,313	1,396	28,724	8,822	18,725	15.2	FAIL
21	Cobb	GA	698,158	182,460	59,274	17,176	43,312	22,154	7,564	175,077	50,882	62,563	15.1	FAIL
21	Cuyahoga	OH	1,283,925	301,457	195,113	28,378	93,253	44,264	18,682	385,175	103,383	199,694	15.1	FAIL
21	Bibb	GA	155,216	41,727	20,251	3,928	9,484	4,994	1,990	42,225	12,257	32,923	15.1	FAIL
24	Loudon	TN	46,445	9,901	9,661	932	3,262	1,666	788	15,289	4,269	5,106	14.9	PASS
24	Beaver	PA	172,476	35,214	31,681	3,315	12,565	6,308	2,850	56,769	13,220	19,600	14.9	PASS
24	Berkeley	WV	102,044	26,497	11,108	2,494	7,294	3,261	1,199	26,568	8,215	11,253	14.9	PASS

Notes:

1. Counties are ranked by design value. See note 12 below.
2. **Total Population** represents the at-risk populations in counties with $PM_{2.5}$ monitors.
3. Those **18 & under** and **65 & over** are vulnerable to $PM_{2.5}$ and are, therefore, included. They should not be used as population denominators for disease estimates.
4. **Pediatric asthma** estimates are for those under 18 years of age and represent the estimated number of people who had asthma in 2008 based on national rates (NHIS) applied to county population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the estimated number of people who had asthma during 2008 based on state rates (BRFSS) applied to county population estimates (U.S. Census).
6. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed in 2008, based on national rates (NHIS) applied to county population estimates (U.S. Census).
7. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on national rates (NHIS) applied to county population estimates (U.S. Census).
8. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma and/or emphysema and chronic bronchitis.
9. **CV disease** estimates are based on National Heart Lung and Blood Institute (NHLBI) estimates of cardiovascular disease applied to county population estimates (U.S. Census).
10. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to county population estimates (U.S. Census).
11. Poverty estimates come from the U.S. Census Bureau and are for all ages.
12. The **Design Value** is the calculated concentration of a pollutant based on the form of the National Ambient Air Quality Standard, and is used by EPA to determine whether the air quality in a county meets the standard. Design values for the annual $PM_{2.5}$ concentrations by county were collected from data previously summarized by the EPA and were downloaded on December 1, 2009 from EPA's website at http://www.epa.gov/air/airtrends/values.html.
13. **Grades** are based on EPA's determination of meeting or failure to meet the NAAQS for annual PM2.5 levels during 2006-2008. Counties meeting the NAAQS received grades of Pass; counties not meeting the NAAQS received grades of Fail.

People at Risk in 25 Most Ozone-Polluted Counties

				At-Risk Groups							High Ozone Days in Unhealthy Ranges, 2006–2008	
2010 Rank[1]	**County**	**ST**	**Total Population[2]**	**Under 18[3]**	**65 and Over[3]**	**Pediatric Asthma[4,8]**	**Adult Asthma[5,8]**	**Chronic Bronchitis[6,8]**	**Emphysema[7,8]**	**Poverty[9]**	**Weighted Avg.[10]**	**Grade[11]**
1	San Bernardino	CA	2,015,355	590,810	170,130	55,617	118,301	59,184	19,520	288,756	141.8	F
2	Riverside	CA	2,100,516	583,297	241,428	54,909	126,317	63,620	23,196	260,109	132.8	F
3	Kern	CA	800,458	238,789	71,678	22,479	46,597	23,265	7,790	156,128	115.7	F
4	Tulare	CA	426,276	135,427	40,821	12,749	24,202	12,169	4,249	90,369	110.2	F
5	Los Angeles	CA	9,862,049	2,549,168	1,054,932	239,969	611,881	311,413	112,035	1,482,051	92.3	F
6	Fresno	CA	909,153	270,512	89,615	25,465	53,191	26,798	9,390	197,265	66.2	F
7	El Dorado	CA	176,075	37,896	19,950	3,567	11,707	6,118	2,301	13,692	48.3	F
8	Nevada	CA	97,118	17,384	17,481	1,636	6,832	3,661	1,624	8,848	46.7	F
9	Sacramento	CA	1,394,154	362,492	158,340	34,124	86,442	44,138	16,274	182,573	44.7	F
10	Kings	CA	149,518	40,715	11,487	3,833	8,930	4,349	1,308	22,566	40.0	F
11	Placer	CA	341,945	74,348	52,148	6,999	22,569	11,699	4,776	22,873	39.3	F
12	Harris	TX	3,984,349	1,145,274	316,399	107,812	206,787	119,643	39,499	603,105	35.7	F
13	Mariposa	CA	17,976	3,112	3,377	293	1,265	669	296	2,388	34.2	F
14	San Diego	CA	3,001,072	744,470	337,004	70,082	188,661	95,863	34,760	364,576	33.8	F
15	San Luis Obispo	CA	265,297	49,431	38,323	4,653	18,160	9,359	3,670	30,243	32.0	F
16	Ventura	CA	797,740	206,833	91,279	19,470	49,794	25,737	9,699	68,486	31.3	F
17	Rowan	NC	139,225	32,568	19,841	3,066	8,067	4,711	1,911	21,042	30.0	F
18	Maricopa	AZ	3,954,598	1,083,241	451,031	101,972	280,306	122,897	45,668	521,208	29.0	F
19	Merced	CA	246,117	76,722	24,433	7,222	14,091	7,080	2,490	52,005	28.2	F
20	Tarrant	TX	1,750,091	493,382	149,164	46,445	91,590	53,034	17,837	208,934	27.5	F
21	Sevier	TN	84,835	18,967	12,886	1,785	5,887	2,933	1,219	11,097	26.3	F
22	Mecklenburg	NC	890,515	237,056	73,754	22,316	49,226	27,682	9,234	95,508	26.2	F
23	Imperial	CA	163,972	47,801	17,493	4,500	9,663	4,855	1,732	32,833	24.7	F
24	Fairfield	CT	895,030	223,180	118,119	21,009	57,917	29,990	12,062	71,553	24.2	F
24	Harford	MD	240,351	59,315	28,123	5,584	16,965	7,957	3,033	13,606	24.2	F

Notes:
1. Counties are ranked by weighted average. See note 10 below.
2. **Total Population** represents the at-risk populations in counties with ozone monitors.
3. Those **18 & under** and **65 & over** are vulnerable to ozone and are, therefore, included. They should not be used as population denominators for disease estimates.
4. **Pediatric asthma** estimates are for those under 18 years of age and represent the estimated number of people who had asthma in 2008 based on national rates (NHIS) applied to county population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the estimated number of people who had asthma during 2008 based on state rates (BRFSS) applied to county population estimates (U.S. Census).
6. **Chronic bronchitis** estimates are for adults 18 and over who had been diagnosed in 2008, based on national rates (NHIS) applied to county population estimates (U.S. Census).
7. **Emphysema** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on national rates (NHIS) applied to county population estimates (U.S. Census).
8. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma and/or emphysema and chronic bronchitis.
9. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.
10. The **Weighted Average** was derived by counting the number of days in each unhealthful range (orange, red, purple) in each year (2006-2008), multiplying the total in each range by the assigned standard weights (i.e., 1 for orange, 1.5 for red, 2.0 for purple), and calculating the average.
11. **Grade** is assigned by weighted average as follows: A=0.0, B=0.3-0.9, C=1.0-2.0, D=2.1-3.2, F=3.3+.

Cleanest U.S. Cities for Short-term Particle Pollution (24-hour $PM_{2.5}$)[1]

Metropolitan Statistical Area	Population
Alexandria, LA	153,105
Amarillo, TX	243,838
Athens-Clarke County, GA	189,264
Austin-Round Rock, TX	1,652,602
Bangor, ME	148,651
Billings, MT	152,005
Bloomington-Normal, IL	165,298
Brownsville-Harlingen-Raymondville, TX	413,336
Cape Coral-Fort Myers, FL	593,136
Champaign-Urbana, IL	224,191
Cheyenne, WY	87,542
Claremont-Lebanon, NH-VT	213,995
Colorado Springs, CO	617,714
Corpus Christi-Kingsville, TX	446,503
Fargo-Wahpeton, ND-MN	218,305
Farmington, NM	122,500
Fayetteville, NC	356,105
Fort Collins-Loveland, CO	292,825
Grand Junction, CO	143,171

Metropolitan Statistical Area	Population
Gulfport-Biloxi-Pascagoula, MS	387,725
Hattiesburg, MS	140,781
Jackson-Yazoo City, MS	565,749
Lafayette-Acadiana, LA	542,509
Lincoln, NE	295,486
Longview-Marshall, TX	268,340
McAllen-Edinburg-Pharr, TX	726,604
Oklahoma City-Shawnee, OK	1,275,758
Pueblo, CO	156,737
Salinas, CA	408,238
San Luis Obispo-Paso Robles, CA	265,297
Santa Fe-Espanola, NM	184,629
Sarasota-Bradenton-Punta Gorda, FL	837,883
Springfield, IL	207,389
Springfield, MO	426,144
St. Joseph, MO-KS	126,359
Syracuse-Auburn, NY	723,617
Topeka, KS	229,619
Tucson, AZ	1,012,018

Note:
1. This list represents cities with the lowest levels of short term $PM_{2.5}$ air pollution. Monitors in these cities reported no days with unhealthful $PM_{2.5}$ levels.

Top 25 Cleanest U.S. Cities for Year-Round Particle Pollution (Annual $PM_{2.5}$)[1]

Rank[2]	Design Value[3]	Metropolitan Statistical Area	Population
1	4.4	Cheyenne, WY	87,542
2	4.8	Santa Fe-Espanola, NM	184,629
3	5.2	Honolulu, HI	905,034
4	5.6	Anchorage, AK	364,701
4	5.6	Great Falls, MT	82,026
6	5.8	Tucson, AZ	1,012,018
7	6.3	Amarillo, TX	243,838
8	6.7	Albuquerque, NM	845,913
9	6.8	Flagstaff, AZ	128,558
10	6.9	Bismarck, ND	104,944
11	7.1	Salinas, CA	408,238
12	7.3	Fort Collins-Loveland, CO	292,825
13	7.6	Duluth, MN-WI	274,571
14	7.7	Pueblo, CO	156,737
15	7.8	Cape Coral-Fort Myers, FL	593,136
16	7.9	Palm Bay-Melbourne-Titusville, FL	536,521
16	7.9	Sarasota-Bradenton-Punta Gorda, FL	837,883
18	8.0	Billings, MT	152,005
18	8.0	Fargo-Wahpeton, ND-MN	218,305
18	8.0	Port St. Lucie-Sebastian-Vero Beach, FL	536,083
21	8.1	Lincoln, NE	295,486
21	8.1	San Luis Obispo-Paso Robles, CA	265,297
23	8.3	Bangor, ME	148,651
23	8.3	Burlington-South Burlington, VT	208,460
23	8.3	Midland-Odessa, TX	261,435

Notes:
1. This list represents cities with the lowest levels of annual $PM_{2.5}$ air pollution.
2. Cities are ranked by using the highest design value for any county within that metropolitan area.
3. The **Design Value** is the calculated concentration of a pollutant based on the form of the National Ambient Air Quality Standard, and is used by EPA to determine whether the air quality in a county meets the standard. Design values for the annual $PM_{2.5}$ concentrations by county were collected from data previously summarized by the EPA and were downloaded on December 1, 2009 from EPA's website at http://www.epa.gov/air/airtrends/values.html.

Cleanest U.S. Cities for Ozone Air Pollution[1]

Metropolitan Statistical Area	Population
Bismarck, ND	104,944
Brownsville-Harlingen-Raymondville, TX	413,336
Coeur d'Alene, ID	137,475
Duluth, MN-WI	274,571
Fargo-Wahpeton, ND-MN	218,305
Fayetteville-Springdale-Rogers, AR-MO	443,976
Honolulu, HI	905,034
Laredo, TX	236,941
Lincoln, NE	295,486
Port St. Lucie-Sebastian-Vero Beach, FL	536,083
Rochester, MN	182,924
Sioux Falls, SD	232,930

Note:
1. This list represents cities with no monitored ozone air pollution in unhealthful ranges using the Air Quality Index based on the 2008 ozone NAAQS.

Cleanest Counties for Short-term Particle Pollution (24-hour $PM_{2.5}$)[1]

COUNTY	ST
Anchorage Municipality	AK
Baldwin	AL
Arkansas	AR
Ashley	AR
Faulkner	AR
Polk	AR
Sebastian	AR
Cochise	AZ
Pima	AZ
Humboldt	CA
Mendocino	CA
Monterey	CA
San Luis Obispo	CA
Santa Cruz	CA
Boulder	CO
El Paso	CO
Elbert	CO
Larimer	CO
Mesa	CO
Pueblo	CO
Citrus	FL
Lee	FL
Sarasota	FL
Clarke	GA
Maui	HI
Montgomery	IA
Van Buren	IA
Adams	IL
Champaign	IL
Jersey	IL
Lake	IL
Lasalle	IL
Mclean	IL
Sangamon	IL
St. Clair	IL
Johnson	KS
Linn	KS
Shawnee	KS
Sumner	KS
Campbell	KY

COUNTY	ST
Lafayette Parish	LA
Rapides Parish	LA
Tangipahoa Parish	LA
Middlesex	MA
Aroostook	ME
Cumberland	ME
Hancock	ME
Kennebec	ME
Penobscot	ME
Genesee	MI
Manistee	MI
Missaukee	MI
Buchanan	MO
Cass	MO
Clay	MO
Greene	MO
Jackson	MO
Ste. Genevieve	MO
Bolivar	MS
Forrest	MS
Harrison	MS
Hinds	MS
Jackson	MS
Jones	MS
Lee	MS
Yellowstone	MT
Cumberland	NC
Duplin	NC
Haywood	NC
Orange	NC
Watauga	NC
Billings	ND
Cass	ND
Mercer	ND
Hall	NE
Lancaster	NE
Scotts Bluff	NE
Belknap	NH
Grafton	NH
Rockingham	NH

COUNTY	ST
Sullivan	NH
Grant	NM
Santa Fe	NM
Chaves	NM
Lea	NM
San Juan	NM
Onondaga	NY
St. Lawrence	NY
Medina	OH
Caddo	OK
Mayes	OK
Oklahoma	OK
Ottawa	OK
Josephine	OR
Umatilla	OR
Oconee	SC
Brown	SD
Roane	TN
Brewster	TX
Cameron	TX
Dallas	TX
Harrison	TX
Hidalgo	TX
Nueces	TX
Potter	TX
Travis	TX
Page	VA
Bennington	VT
Campbell	WY
Converse	WY
Fremont	WY
Laramie	WY
Sheridan	WY
Teton	WY

Notes:
1. This list represents counties with the lowest levels of short term $PM_{2.5}$ air pollution. Monitors in these counties reported no days with unhealthful $PM_{2.5}$ levels.

Top 25 Cleanest Counties for Year-Round Particle Pollution (Annual $PM_{2.5}$)[1]

2010 Rank[2]	County	ST	Design Value[3]
1	Elbert	CO	4.4
1	Laramie	WY	4.4
3	Santa Fe	NM	4.8
3	Billings	ND	4.8
3	Sandoval	NM	4.8
6	Maui	HI	4.9
7	Hancock	ME	5.1
7	Essex	NY	5.1
9	Honolulu	HI	5.2
10	Lake	CA	5.3
11	Jackson	SD	5.4
12	Custer	SD	5.5
13	Anchorage Municipality	AK	5.6
13	Cascade	MT	5.6
15	Pima	AZ	5.8
16	St. Lawrence	NY	6.0
17	Douglas	CO	6.3
17	Ashland	WI	6.3
17	Potter	TX	6.3
20	Inyo	CA	6.4
20	Chaves	NM	6.4
22	Mendocino	CA	6.5
22	Mercer	ND	6.5
22	Scotts Bluff	NE	6.5
25	Tooele	UT	6.7
25	Santa Cruz	CA	6.7
25	Bernalillo	NM	6.7

Notes:
1. This list represents counties with the lowest levels of monitored long term $PM_{2.5}$ air pollution.
2. Counties are ranked by design value.
3. The Design Value is the calculated concentration of a pollutant based on the form of the National Ambient Air Quality Standard, and is used by EPA to determine whether the air quality in a county meets the standard. Design values for the annual $PM_{2.5}$ concentrations by county were collected from data previously summarized by the EPA and were downloaded on December 1, 2009 from EPA's website at http://www.epa.gov/air/airtrends/values.html.

Cleanest Counties for Ozone Air Pollution[1]

County	State	
Washington	AR	Fayetteville-Springdale-Rogers, AR-MO
Humboldt	CA	
Lake	CA	
Marin	CA	San Jose-San Francisco-Oakland, CA
Mendocino	CA	
San Francisco	CA	San Jose-San Francisco-Oakland, CA
San Mateo	CA	San Jose-San Francisco-Oakland, CA
Santa Cruz	CA	San Jose-San Francisco-Oakland, CA
Siskiyou	CA	
Sonoma	CA	San Jose-San Francisco-Oakland, CA
St. Lucie	FL	Port St. Lucie-Sebastian-Vero Beach, FL
Honolulu	HI	Honolulu, HI
Palo Alto	IA	
Polk	IA	Des Moines-Newton-Pella, IA
Butte	ID	
Kootenai	ID	Coeur d'Alene, ID
Becker	MN	
Carlton	MN	Duluth, MN-WI
Lyon	MN	
Olmsted	MN	Rochester, MN
Scott	MN	Minneapolis-St. Paul-St. Cloud, MN-WI
St. Louis	MN	Duluth, MN-WI
Flathead	MT	
Swain	NC	
Billings	ND	

County	State	
Burke	ND	
Burleigh	ND	Bismarck, ND
Cass	ND	Fargo-Wahpeton, ND-MN
Dunn	ND	
Mckenzie	ND	
Mercer	ND	
Oliver	ND	
Douglas	NE	Omaha-Council Bluffs-Fremont, NE-IA
Lancaster	NE	Lincoln, NE
Grant	NM	
Luna	NM	
Columbia	OR	Portland-Vancouver-Beaverton, OR-WA
Jackson	SD	
Minnehaha	SD	Sioux Falls, SD
Brewster	TX	
Cameron	TX	Brownsville-Harlingen-Raymondville, TX
Webb	TX	Laredo, TX
San Juan	UT	
Clallam	WA	
Clark	WA	Portland-Vancouver-Beaverton, OR-WA
Ashland	WI	
Washington	WI	Milwaukee-Racine-Waukesha, WI
Waukesha	WI	Milwaukee-Racine-Waukesha, WI
Sweetwater	WY	

Note:
1. This list represents counties with no monitored ozone air pollution in unhealthful ranges using the Air Quality Index based on 2008 ozone NAAQS.

Health Effects of Ozone and Particle Pollution

Ozone and particle pollution are the most widespread air pollutants—and among the most dangerous. Recent research has revealed new insights into how they can harm the body—including taking the lives of infants and altering the lungs of children. All in all, the evidence shows that the risks are greater than we once thought.

Recent findings provide more evidence about the health impacts of these pollutants:

- **Reducing air pollution has extended life expectancy.** Thanks to a drop in particle pollution between 1980 and 2000, life expectancy in 51 U.S. cities increased by 5 months on average, according to a recent analysis.[1]
- **The annual death toll from particle pollution may be even greater than previously understood.** The California Air Resources Board recently tripled the estimate of premature deaths in California from particle pollution to 18,000 annually.[2]
- **Long term exposure to air pollution—especially from highway traffic—harms women, even while in their 50s.** Exposure to particle pollution appears to increase women's risk of lower lung function, developing chronic obstructive pulmonary disease (COPD), and dying prematurely.[3]
- **Busy highways are high risk zones.** Pollution from heavy highway traffic contributes to higher risks for heart attack, allergies, premature births and the death of infants around the time they are born.[4] New studies looking at the impact of traffic pollution, even in cities with generally "cleaner" air, expanded the concern over the health effects of chronic exposure to exhaust from heavy traffic.
- **Ozone pollution can shorten life, a conclusion confirmed by the latest scientific review by the National Research Council.**[5] New evidence appeared that some segments of the population may face higher risks from dying prematurely because of ozone pollution, including communities with high unemployment or high public transit use and large Black/African American populations.[6]
- **Truck drivers, dockworkers and railroad workers may face higher risk of death from lung cancer and COPD from breathing diesel emissions on the job.** Studies found that these workers who inhaled diesel exhaust on the job were much more likely to die from lung cancer, COPD and heart disease.[7]
- **Lower levels of ozone and particle pollution pose bigger threat than previously thought.** Lower levels of these all-too-common pollutants triggered asthma attacks and increased the risk of emergency room visits and hospital admissions for asthma in one study.[8] Another study found that low levels of these pollutants increased the risk of hospital treatment for pneumonia and COPD.[9]

Two types of air pollution dominate the problem in the U.S.: ozone and particle pollution. They aren't the only serious air pollutants: others include carbon monoxide, lead, nitrogen dioxide, and sulfur dioxide, as well as hundreds of toxic substances. However, ozone and particle pollution represent the most widespread.

Ozone

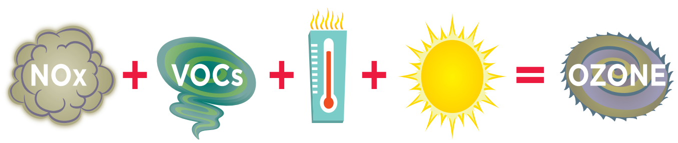
Ozone (O_3) is an extremely reactive gas molecule composed of three oxygen atoms. It is the primary ingredient of smog air pollution and is very harmful to breathe. Ozone attacks lung tissue by reacting chemically with it.

News about ozone can be confusing. Some days you hear that ozone levels are too high and other days that we need to prevent ozone depletion. Basically, the ozone layer found high in the upper atmosphere (the stratosphere) is beneficial because it shields us from much of the sun's ultraviolet radiation. However, ozone air pollution at ground level where we can breathe it (in the troposphere) is harmful. It causes serious health problems.

Where Does Ozone Come From?

What you see coming out of the tailpipe on a car or a truck isn't ozone, but the raw ingredients for making ozone. Ozone is formed by chemical reactions in the atmosphere from two raw gases that do come out of tailpipes, smokestacks and many other sources. These essential raw ingredients for ozone are nitrogen oxides (NO_x) and hydrocarbons, also called volatile organic compounds (VOCs). They are produced primarily when fossil fuels like gasoline, oil or coal are burned or when some chemicals, like solvents, evaporate.

When NO_x and VOCs come in contact with both heat and sunlight, they combine and form ozone smog. NO_x is emitted from power plants, motor vehicles and other sources of high-heat combustion. VOCs are emitted from motor vehicles, chemical plants, refineries, factories, gas stations, paint and other sources. The formula for ozone is simple, and like any formula, the ingredients must all be present and in the right proportions to make the final product.



You may have wondered why "ozone action day" warnings are sometimes followed by recommendations to avoid activities such as mowing your lawn or refilling your gas tank during daylight hours. Lawn mower exhaust and gasoline vapors are VOCs that could turn into ozone in the heat and sun. Take away the sunlight and ozone doesn't form, so refilling your gas tank after dark is better on high ozone days. Since we can't control sunlight and heat, we must reduce the chemical raw ingredients if we want to reduce ozone.

Who are at risk from breathing ozone?

Five groups of people are especially vulnerable to the effects of breathing ozone:

- children and teens;
- anyone 65 and older;
- people who work or exercise outdoors;
- people with existing lung diseases, such as asthma and chronic obstructive pulmonary disease (also known as COPD, which includes emphysema and chronic bronchitis); and
- "responders" who are otherwise healthy but for some reason react more strongly to ozone.

The impact on your health can depend on many factors, however, not just whether you are part of one of these groups. For example, the risks would be greater if ozone levels are higher, if you are breathing faster because you're working outdoors or if you spend more time outdoors.

Lifeguards in Galveston, Texas, provided evidence of the impact of even short-term exposure to ozone on healthy, active adults in a study published in 2008. Testing the breathing capacity of these outdoor workers several times a day, researchers found that many lifeguards had greater obstruction in their airways when ozone levels were high. Because of this research, Galveston became the first city in the nation to install an air quality warning flag system on the beach.[10]

How Ozone Pollution Harms Your Health

Scientists have studied the effects of ozone on health for decades. Hundreds of research studies have confirmed that ozone harms people at levels currently found in the United States. In the last few years, we've learned that it can also be deadly.

Breathing ozone may shorten your life. Strong evidence arrived late in 2004, when two large multi-city investigations documented that short-term exposure to ozone can shorten lives, building on numerous earlier studies. One of them looked at 95 cities across the United States over a 14-year period. That study compared the impact of ozone on death patterns during several days after the ozone measurements. Even on days when ozone levels were low, the researchers found that the risk of premature death increased with higher levels of ozone. They estimated that over 3,700 deaths annually could be attributed to a 10-parts-per-billion increase in ozone levels.[11] Another study, published the same week, looked at 23 European cities and found similar effects on mortality from short-term exposure to ozone.[12]

Confirmation came in the summer of 2005. Three groups of researchers working independently reviewed and analyzed the research around deaths associated with short-term exposures to ozone. The three teams—at Harvard, Johns Hopkins and New York University—used different approaches but all came to similar conclusions. All three studies reported a small, but robust association between daily ozone levels and increased deaths.[13] Writing a commentary on these reviews, the late David Bates, MD, explained how these premature deaths could occur:

> "Ozone is capable of causing inflammation in the lung at lower concentrations than any other gas. Such an effect would be a hazard to anyone with heart failure and pulmonary congestion, and would worsen the function of anyone with advanced lung disease."[14]

In 2008 a committee of the National Research Council, a division of the National Academy of Sciences, reviewed the evidence again and concluded that "short-term exposure to ambient ozone is likely to contribute to premature deaths." They recommended that preventing early death be included in any future estimates of the benefits of reducing ozone.[15]

Other immediate risks from breathing high levels of ozone. Many areas in the United States produce enough ground-level ozone during the summer months to cause health problems that can be felt right away. Immediate problems—in addition to increased risk of premature death—include:

- shortness of breath;
- chest pain when inhaling;
- wheezing and coughing;
- asthma attacks;
- increased susceptibility to respiratory infections;
- increased susceptibility to pulmonary inflammation; and
- increased need for people with lung diseases, like asthma or chronic obstructive pulmonary disease (COPD), to receive medical treatment and to go to the hospital.[16]

Breathing ozone for longer periods can alter the lungs' ability to function. Two studies published in 2005 explored ozone's ability to reduce the lung's ability to work efficiently, a term called "lung function." Each study looked at otherwise healthy groups who were exposed to ozone for long periods: outdoor postal workers in Taiwan and college freshmen who were lifelong residents of Los Angeles or the San Francisco Bay area. Both studies found that the long exposure to elevated ozone levels had decreased their lung function.[17]

Other effects of long-term exposure to ozone. Inhaling ozone may affect the heart as well as the lungs. One recent study linked exposures to high ozone levels for as little as one hour to a particular type of cardiac arrhythmia that itself increases the risk of premature death and stroke.[18] A French study found that exposure to elevated ozone levels for one to two days increased the risk of heart attacks for middle-aged adults without heart disease. [19]

Breathing other pollutants in the air may make your lungs more responsive to ozone—and breathing ozone may increase your body's response to other pollutants. For example, research warns that breathing sulfur dioxide and nitrogen oxide—two pollutants common in the eastern U.S.—can make the lungs react more strongly than to just breathing ozone alone.[20] Breathing ozone may also increase the response to allergens in people with allergies. A large study published in 2009 found that children were more likely to suffer from hay fever and respiratory allergies when ozone and $PM_{2.5}$ levels were high.[21]

Low levels of ozone may be deadly. A large study of 48 U.S. cities looked at the association between ozone and all-cause mortality during the summer months. Ozone concentrations by city in the summer months ranged from 16 percent to 80 percent lower than EPA currently considers safe. Researchers found that ozone at those lower levels was associated with deaths from cardiovascular disease, strokes, and respiratory causes. [22]

Particle Pollution

Ever look at dirty truck exhaust?

The dirty, smoky part of that stream of exhaust is made of particle pollution. Overwhelming evidence shows that particle pollution—like that coming from that exhaust smoke—can kill. Particle pollution can increase the risk of heart disease, lung cancer and asthma attacks and can interfere with the growth and work of the lungs.

What Is Particle Pollution?

Particle pollution refers to a mix of very tiny solid and liquid particles that are in the air we breathe. But nothing about particle pollution is simple. First of all, the particles themselves are different sizes. Some are one-tenth the diameter of a strand of hair. Many are even tinier; some are so small they can only be seen with an electron microscope. Because of their size, you can't see the individual particles. You can only see the haze that forms when millions of particles blur the spread of sunlight. You may not be able to tell when you're breathing particle pollution. Yet it is so dangerous it can shorten your life.

The differences in size make a big difference in how they affect us. Our natural defenses help us to cough or sneeze larger particles out of our bodies. But those defenses don't keep out smaller particles, those that are smaller than 10 microns (or micrometers) in diameter, or about one-seventh the diameter of a single human hair. These particles get trapped in the lungs, while the smallest are so minute that they can pass through the lungs into the blood stream, just like the essential oxygen molecules we need to survive.

Researchers categorize particles according to size, grouping them as coarse, fine and ultrafine. Coarse particles fall between 2.5 microns and 10 microns in diameter and are called $PM_{10-2.5}$. Fine particles are 2.5 microns in diameter or smaller and are called $PM_{2.5}$. Ultrafine particles are smaller than 0.1 micron in diameter[23] and are small enough to pass through the lung tissue into the blood stream, circulating like the oxygen molecules themselves. No matter what the size, particles can be harmful to your health.

Because particles are formed in so many different ways, they can be composed of many different compounds. Although we often think of particles as solids, not all are. Some are completely liquid; some are solids suspended in liquids. As the U.S. Environmental Protection Agency puts it, particles are really "a mixture of mixtures." [24] The mixtures differ between the eastern and western United States and in different times of the year. For example, the Midwest, Southeast and Northeast states have more sulfate particles than the West in the summer, largely due to the high levels of sulfur dioxide emitted by large, coal-fired power plants. By contrast, nitrate particles from motor vehicle exhaust form a larger proportion of the unhealthful mix in the winter in the Northeast, Southern California, the Northwest, and North Central U.S.[25]

Where Does Particle Pollution Come From?

Particle pollution is produced through two separate processes—mechanical and chemical.

Mechanical processes break down bigger bits into smaller bits with the material remaining essentially the same, only becoming smaller. Mechanical processes primarily create coarse particles.[26] Dust storms, construction and demolition, mining operations, and agriculture are among the activities that produce coarse particles.

By contrast, chemical processes in the atmosphere create most of the tiniest fine and ultrafine particles. Combustion sources burn fuels and emit gases. These gases can vaporize and then condense to become a particle of the same chemical compound. Or, they can react with other gases or particles in the atmosphere to form a particle of a different chemical compound. Particles formed by this latter process come from the reaction of elemental carbon (soot), heavy metals, sulfur dioxide (SO_2), nitrogen oxides (NO_x) and volatile organic compounds with water and other compounds in the atmosphere.[27] Burning fossil fuels in factories, power plants, steel mills, smelters, diesel- and gasoline-powered motor vehicles (cars and trucks) and equipment generate a large part of the raw materials for fine particles. So does burning wood in residential fireplaces and wood stoves or burning agricultural fields or forests.

What Can Particles Do to Your Health?

Particle pollution can be very dangerous to breathe. Breathing particle pollution may trigger illness, hospitalization and premature death, risks showing up in new studies that validate earlier research.[28]

Good news came last year from researchers who looked at the impact of the drop in year-round levels of particle pollution between 1980 and 2000 in 51 US cities. Thanks to reductions in particle pollution, people living in these cities had 5 months added to their life expectancy on average.[29] This study added to the growing research that cleaning up air pollution improves life and health. Other researchers estimated that reductions in air pollution can be expected to produce rapid improvements in public health, with fewer deaths occurring within the first two years after reductions.[30]

Researchers these days are exploring possible differences in health effects of the three sizes of particles and particles from different sources, such as diesel particles from trucks and buses or sulfates from coal-fired power plants. So far, the evidence remains clear that all particles from all sources are dangerous.[31]

Particle pollution can damage the body in ways similar to cigarette smoking. A recent review of the research on how particles cause harm found that the body responds to particles in similar ways to its response to cigarette smoke. These findings help explain why particle pollution can cause heart attacks and strokes.[32]

Short-Term Exposure Can Be Deadly

First and foremost, short-term exposure to particle pollution can kill. Peaks or spikes in particle pollution can last for hours to days. Deaths can occur on the very day that particle levels are high, or within one to two months afterward. Particle pollution does not just make people die a few days earlier than they might otherwise—these are deaths that would not have occurred if the air were cleaner.[33]

Researchers from Harvard University recently tripled the estimated risk of premature death following a review of the newer evidence from fine particle monitors ($PM_{2.5}$) in 27 US cities.[34] As mentioned earlier, scientists at the California Air Resources Board also tripled their estimate of the number of deaths occurring each year from particle pollution. They now put the range between 5,600 to 32,000 deaths a year in that state alone.[35]

Particle pollution also diminishes lung function, causes greater use of asthma medications and increased rates of school absenteeism, emergency room visits and hospital admissions. Other adverse effects can be coughing, wheezing, cardiac arrhythmias and heart attacks. According to the findings from some of the latest studies, short-term increases in particle pollution have been linked to:

- death from respiratory and cardiovascular causes, including strokes;[36,37,38,39]
- increased mortality in infants and young children;[40]
- increased numbers of heart attacks, especially among the elderly and in people with heart conditions;[41]
- inflammation of lung tissue in young, healthy adults;[42]
- increased hospitalization for cardiovascular disease, including strokes and congestive heart failure;[43,44,45]
- increased emergency room visits for patients suffering from acute respiratory ailments;[46]
- increased hospitalization for asthma among children;[47,48,49] and
- increased severity of asthma attacks in children.[50]

Again, the impact of even short-term exposure to particle pollution on healthy adults showed up in the Galveston lifeguard study, in addition to the harmful effects of ozone pollution. Lifeguards had reduced lung volume at the end of the day when fine particle levels were high.[51]

Year-Round Exposure

Breathing high levels of particle pollution day in and day out also can be deadly, as landmark studies in the 1990s conclusively showed.[52] Chronic exposure to particle pollution can shorten life by one to three years.[53] Other impacts range from premature births to serious respiratory disorders, even when the particle levels are very low.

Year-round exposure to particle pollution has also been linked to:

- increased hospitalization for asthma attacks for children living near roads with heavy truck or trailer traffic;[54,55]
- slowed lung function growth in children and teenagers;[56,57]
- significant damage to the small airways of the lungs;[58]
- increased risk of dying from lung cancer; and[59]
- increased risk of death from cardiovascular disease.[60]

Alarmingly, the risks may be even greater than previously thought. Earlier studies of the long-term health risks of air pollution relied on estimates of the average exposure to people in the community. New evidence from studies published since 2005 suggests that those estimates may be far too low. California just completed a review of this research and tripled the estimated number of people killed each year by particle pollution: 18,000 premature deaths annually, with a range of 5,600 to 32,000 deaths.[61]

Research into risks to the health of 65,000 women over age 50 found that those who lived in areas with higher levels of particle pollution faced a much greater risk of dying from heart disease than had been previously estimated. Even women who lived within the same city faced differing risks depending on the annual levels of pollution in their neighborhood.[62]

The Environmental Protection Agency released the most thorough review of the current research on particle pollution in December 2009.[63] The Agency had engaged a panel of expert scientists, the Clean Air Scientific Advisory Committee, to help them assess the evidence, in particular research published between 2002 and May 2009. EPA concluded in the published Integrated Science Assessment that particle pollution caused multiple, serious threats to health. Their findings are highlighted in the box below.

EPA Concludes Fine Particle Pollution Poses Serious Health Threats

- Causes early death (both short-term and long-term exposure)
- Causes cardiovascular harm (e.g. heart attacks, strokes, heart disease, congestive heart failure)
- Likely to cause respiratory harm (e.g. worsened asthma, worsened COPD, inflammation)
- May cause cancer
- May cause reproductive and developmental harm

—U.S. Environmental Protection Agency, *Integrated Science Assessment for Particulate Matter,* December 2009. EPA 600/R-08/139F.

Who Is at Risk?

Anyone living in an area with a high level of particle pollution is at risk (you can take a look at levels in your state in this report). People at the greatest risk from particle pollution exposure include those with lung disease such as asthma and chronic obstructive pulmonary disease (COPD), which includes chronic bronchitis and emphysema; people with sensitive airways, where exposure to particle pollution can cause wheezing, coughing and respiratory irritation; the elderly; people with heart disease; and children. New research points to ever-larger groups at higher risk, including diabetics, and most recently, women over 50.[64]

Researchers are identifying increased risk for workers whose jobs expose them to heavy diesel exhaust as a routine part of their job. The risk of dying from lung cancer and heart disease is markedly higher in truck drivers than in the general population in the U.S., according to a study by Harvard University researchers.[65] This study of over 50,000 members of the Teamsters Union employed from 1985 to 2000 looked at the cause of death of workers classified by job category. Truckers are exposed to traffic pollution and diesel engine emissions, while dockworkers are exposed to exhaust from forklifts and trucks in the shipyard. The study found that death rates for heart disease were 49 percent higher among truck drivers, and 32 percent higher among dockworkers than in the general U.S. population. Lung cancer death rates were 10 percent higher in both the drivers and the dockworkers. Railroad workers have also faced higher risks of death from lung cancer and COPD, according to two studies looking at historical data for those workers.[66]

Focusing on Children's Health

Children may look like miniature adults, but they're not. Air pollution is especially dangerous to them because their lungs are growing and because they are so active.

Just like the arms and legs, the largest portion of a child's lungs will grow long after he or she is born. Eighty percent of their tiny air sacs develop after birth. Those sacs, called the alveoli, are where the life-sustaining transfer of oxygen to the blood takes place. The lungs and their alveoli aren't fully grown until children become adults.[67] In addition, the body's defenses that help adults fight off infections are still developing in young bodies.[68] Children have more respiratory infections than adults, which also seems to increase their susceptibility to air pollution.[69]

Furthermore, children don't behave like adults, and their behavior also affects their vulnerability. They are outside for longer periods and are usually more active when outdoors. Consequently, they inhale more polluted outdoor air than adults typically do.[70]

Major Reviews Confirm Harm to Children

Two major analyses recently concluded that air pollution is especially harmful to children. They found that air pollution is so dangerous that it can even threaten children's lives.

The World Health Organization (WHO) published an in-depth look at the research on children's health and air pollution. Most importantly, the scientists concluded that particle pollution caused infant deaths. In addition, they found that air pollution caused a host of harmful effects on children, including:

- short-term and long-term decreased lung function rates and lower lung function levels, critical measures of how well the child will breathe throughout his or her life (due primarily to exposure to particle pollution and traffic-related pollution);
- worsening of asthma (from exposure to particle as well as ozone pollution);
- increased prevalence and incidence of cough and bronchitis (primarily from particle pollution); and
- increased risk of upper and lower respiratory infections.[71]

The American Academy of Pediatrics issued a statement on the dangers of outdoor air pollution on children's health, pointing out the special differences for children.[72] The Academy reported many of the health effects cited by the WHO study, but also focused on the sources common to many children. Both the WHO monograph and the Academy statement highlighted recent studies showing how children living near heavily traveled highways appear to be particularly harmed by traffic-related pollution. The Academy statement highlighted the specific concern over diesel school buses, citing a pilot study that showed children riding inside a school bus may be exposed to four times more diesel exhaust than if they were riding in a car.[73]

Research on Prenatal Exposure to Air Pollution

Several studies published in 2005 found prenatal exposure to air pollution can harm children. A study of pregnant women in four Pennsylvania counties found an increased risk of preterm births linked to chronic exposure to high levels of air pollution during the last six weeks of pregnancy.[74] A study of three low-income neighborhoods in New York City found that infants born to nonsmoking mothers faced a possible increased risk of cancer from living in areas with elevated urban area air pollutants.[75] A third study in the Czech Republic found evidence that the mother's exposure to air pollution may even alter the immune systems of the fetus.[76]

Air Pollution Linked to Increased Risk to Newborns and Infants

As the World Health Organization concluded, evidence shows that air pollution, especially particle pollution, increases the risk of infant death. A study looking at the infant deaths in the US from 1999 to 2002 confirmed the risk from particle pollution and found evidence that ozone may also increase the risk of sudden infant death syndrome, or SIDS.[77]

Researchers from Yale University looked at the records of over 350,000 babies born in Connecticut and Massachusetts with low birth weights to see if they could identify any relationships with outdoor air pollutants. The researchers concluded that air pollution may increase the risk of babies being born with low birth weight, even though almost all the air pollutants were at levels that were officially listed as safe by the Environmental Protection Agency.[78]

Air Pollution Linked to Asthma Attacks, New Onset of Asthma

A 2003 study followed children with asthma by having their mothers track their symptoms on a daily basis. The study found that children with asthma were particularly vulnerable to ozone even at levels then officially considered safe.[79] An accompanying editorial warned, "Air pollution is one of the most under-appreciated contributors to asthma exacerbation."[80]

A recent study suggests that year-round exposure to ozone may be associated with an increased risk of the development of asthma. While more research is needed to confirm this finding, researchers tracking 3,500 students in Southern California found an increased onset of asthma in children who were taking part in three or more outdoor activities in communities with high levels of ozone.[81]

Air Pollution Increases Risk of Underdeveloped Lungs

Another finding from the Southern California Children's

Health study looked at the long-term effects of particle pollution on teenagers. Tracking 1,759 children between ages 10 and 18, researchers found that those who grew up in more polluted areas face the increased risk of having underdeveloped lungs, which may never recover to their full capacity. The average drop in lung function was 20 percent below what was expected for the child's age, similar to the impact of growing up in a home with parents who smoked.[82]

Community health studies are pointing to less obvious, but serious effects from year-round exposure to ozone, especially for children. Scientists followed 500 Yale University students and determined that living just four years in a region with high levels of ozone and related co-pollutants was associated with diminished lung function and frequent reports of respiratory symptoms.[83] A much larger study of 3,300 school children in Southern California found reduced lung function in girls with asthma and boys who spent more time outdoors in areas with high levels of ozone.[84]

Cleaning Up Pollution Can Reduce Risk to Children

There is also real-world evidence that reducing air pollution can help protect children. Two studies published in 2005 added more weight to the argument.

Changes in air pollution from the reunification of Germany proved a real-life laboratory. Both East and West Germany had different levels and sources of particles. Outdoor particle levels were much higher in East Germany, where they came from factories and homes. West Germany had higher concentrations of traffic-generated particles. After reunification, emissions from the factories and homes dropped, but traffic increased. A German study explored the impact on the lungs of six-year olds from both East and West Germany. Total lung capacity improved with the lower particle levels. However, for those children living near busy roads, the increased pollution from the increased traffic kept them from benefiting from the overall cleaner air.[85]

In Switzerland, particle pollution dropped during a period in the 1990s. Researchers there tracked 9,000 children over a nine-year period, following their respiratory symptoms. After taking other factors such as family characteristics and indoor air pollution into account, the researchers noted that during the years with less pollution, the children had fewer episodes of chronic cough, bronchitis, common cold, and conjunctivitis symptoms.[86]

In this country, the 1996 Olympics in Atlanta, Georgia remain one of the most interesting cases. Atlanta is a prime example of an urban area with a history of serious ozone problems. The determined efforts of the city to reduce traffic during the Olympics succeeded in not just reducing congestion, but in improving the health of children with asthma. Concerned with an expected traffic nightmare, the city brought in more buses, more subway cars, and encouraged ridesharing and telecommuting during the Summer Olympic Games. These measures created a prolonged period of low ozone pollution that resulted in significantly lower rates of childhood asthma events for children aged 1–16. The number of asthma acute care events (e.g., treatment and hospitalization) decreased 42 percent in the Georgia Medicaid claims files. Pediatric emergency departments also saw significant reductions, as did the Georgia Hospital Discharge Database and a health maintenance organization database. It is important to note researchers determined that weather was not the determining factor in the reduced ozone levels.[87]

Disparities in the Impact of Air Pollution

The burden of air pollution is not evenly shared. Poorer people and some racial and ethnic groups are among those who often face higher exposure to pollutants and who may experience greater responses to such pollution. Many studies have explored the differences in harm from air pollution to racial or ethnic groups and people who are in a low socioeconomic position, have less education, or live nearer to major sources,[88] including a workshop the American Lung Association held in 2001 that focused on urban air pollution and health inequities.[89]

Many studies have looked at differences in the impact on premature death. Results have varied widely, particularly for effects between racial groups. Some studies have found no differences among races,[90] while others found greater responsiveness for Whites and Hispanics, but not Blacks/African-Americans,[91] or for Blacks/African-Americans but not other races or ethnic groups.[92] Other researchers have found greater risk for Blacks/African-Americans from air toxics, including those pollutants that also come from traffic sources.[93]

Socioeconomic position has been more consistently associated with greater harm from air pollution. Recent studies show evidence of that link. Low socioeconomic status consistently increased the risk of premature death from fine particle pollution among 13.2 million Medicare recipients studied in the largest examination of particle pollution mortality nationwide.[94] In the 2008 study that found greater risk for premature death for Blacks/African-Americans, researchers also found greater risk for people living in areas with higher unemployment or higher use of public transportation.[95] A 2008 study of Washington, DC found that while poor air quality and worsened asthma went hand-in-hand in areas where Medicaid enrollment was high, the areas with the highest Medicaid enrollment did not always have the strongest association of high air pollution and asthma attacks.[96] However, two other recent studies in France have found no association with lower income and asthma attacks.[97]

Scientists have speculated that there are three broad reasons why disparities may exist. First, groups may face greater exposure to pollution because of factors ranging from racism to class bias to housing market dynamics and land costs. For example, pollution sources may be located near disadvantaged communities, increasing exposure to harmful pollutants. Second, low social position may make some groups more susceptible to health threats because of factors related to their disadvantage. Lack of access to health care, grocery stores and good jobs, poorer job opportunities, dirtier workplaces or higher traffic exposure are among the factors that could handicap groups and increase the risk of harm. Finally, existing health conditions, behaviors, or traits may predispose some groups to greater risk. For example, diabetics are among the groups most at risk from air pollutants and the elderly, Blacks/African Americans, Mexican Americans and people living near a central city have higher incidence of diabetes.[98]

Living Near Highways May Be Especially Dangerous

Being in heavy traffic, or living near a road may be even more dangerous than being in other places in a community. Several studies have found that the vehicle emissions coming directly from those highways may be higher than in the community as a whole, increasing the risk of harm to people who live or work near busy roads.

Children and teenagers are among the most vulnerable—though not the only ones at risk. A new European study found infants and young children exposed to air pollution from traffic faced a greater risk of wheezing.[99] In Southern California, a 2007 study found that air pollution can limit the capacity of the lungs in ten- to eighteen-year-olds who live within about one-third of a mile of a freeway. Changes such as that can reduce their capacity to breathe for the rest of their lives and increase their risk of developing serious lung diseases. Other recent research found that children who live near freeways had a higher risk of being diagnosed with asthma.[100,101] However, children are not the only ones at risk. Studies have found increased risk of premature death from living near a major highway or an urban road.[102] Another study found an increase in risk of heart attacks from being in traffic, whether driving or taking public transportation.[103]

The Health Effects Institute published an extensive review of research on risks from traffic exposure in January, 2010. The review concluded that being within 300 to 500 meters of traffic can worsen asthma in children, and may even cause children's asthma. The review also found evidence of premature death, cardiovascular disease, respiratory symptoms, and other health effects.[104]

How to Protect Yourself from Ozone, Particle Pollution

To minimize your exposure to ozone and particle pollution:

- Pay attention to forecasts for high air pollution days to know when to take precautions;
- Avoid exercising near high-traffic areas;
- Avoid exercising outdoors when pollution levels are high, or substitute an activity that requires less exertion;
- Do not let anyone smoke indoors and support measures to make all places smokefree; and
- Reduce the use of fireplaces and wood-burning stoves.

Bottom line: Help yourself and everyone else breathe easier. Support national, state and local efforts to clean up sources of pollution. Your life and the life of someone you love may depend on it.

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Description of Methodology

Statistical Methodology: The Air Quality Data

Data Sources

The data on air quality throughout the United States were obtained from the U.S. Environmental Protection Agency's Air Quality System (AQS), formerly called Aerometric Information Retrieval System (AIRS) database. The American Lung Association contracted with Dr. Allen S. Lefohn, A.S.L. & Associates, Helena, Montana, to characterize the hourly averaged ozone concentration information and the 24-hour averaged $PM_{2.5}$ concentration information for the 3-year period for 2006-2008 for each monitoring site.

Design values for the annual $PM_{2.5}$ concentrations by county were collected from data previously summarized by the U.S. Environmental Protection Agency (EPA) and were downloaded on December 1, 2009 from EPA's website at http://www.epa.gov/air/airtrends/values.html.

Ozone Data Analysis

The 2006, 2007, and 2008 AQS hourly ozone data were used to calculate the daily 8-hour maximum concentration for each ozone-monitoring site. The data were considered for a 3-year period for the same reason that EPA uses 3 years of data to determine compliance with the ozone: to prevent a situation in any single year, where anomalies of weather or other factors create air pollution levels, which inaccurately reflect the normal conditions. The highest 8-hour daily maximum concentration in each county for 2006, 2007, and 2008, based on the EPA-defined ozone season, was identified.

On March 12, 2008, the EPA lowered the national ambient air quality standard for ozone to 0.075 ppm measured over 8-hours and adjusted the Air Quality Index to reflect the tighter standard. Using these results, A.S.L. & Associates prepared a table by county that summarized, for each of the 3 years, the number of days the ozone level was within the ranges identified by EPA based on the EPA Air Quality Index:

8-hour Ozone Concentration	Air Quality Index Levels
0.000 – 0.059 ppm	Good (Green)
0.060 – 0.075 ppm	Moderate (Yellow)
0.076 – 0.095 ppm	Unhealthy for Sensitive Groups (Orange)
0.096 – 0.115 ppm	Unhealthy (Red)
0.116 – 0.374 ppm	Very Unhealthy (Purple)
>0.374 ppm	Hazardous (Maroon)

The goal of this report was to identify the number of days that 8-hour daily maximum concentrations occurred within the defined ranges, not just those days that would fall under the requirements for attaining the national ambient air quality standards. Therefore, no data capture criteria were applied to eliminate monitoring sites or to require a number of valid days for the ozone season. All valid days of data within the ozone season were used in the analysis. However, for computing an 8-hour average, at least 75 percent of the hourly concentrations (i.e., 6-8 hours) had to be available for the 8-hour period. In addition, an 8-hour daily maximum average was identified if valid 8-hour averages were available for at least 75 percent of possible hours in the day (i.e., at least 18 of the possible 24 8-hour averages). Because the EPA includes days with inadequate data if the standard value is exceeded, our data capture methodology may result at times in underestimations of the number of 8-hour averages within the higher concentration ranges. However, our experience is that underestimates are infrequent.

Following receipt of the above information, the American Lung Association identified the number of days each county, with at least one ozone monitor, experienced air quality designated as orange (Unhealthy for Sensitive Groups), red (Unhealthy), or purple (Very Unhealthy).

Short-term Particle Pollution Data Analysis

A.S.L. & Associates identified the maximum daily 24-hour AQS $PM_{2.5}$ concentration for each county in 2006, 2007, and 2008 with monitoring information. Using these results, A.S.L. & Associates prepared a table by county that summarized, for each of the 3 years, the number of days the maximum of the ***daily*** $PM_{2.5}$ concentration was within the ranges identified by EPA based on the EPA Air Quality Index, adjusted by the American Lung Association as discussed below:

24-hour $PM_{2.5}$ Concentration	Air Quality Index Levels
from 0.0 µg/m³ to 15.4 µg/m³	Good (Green)
from 15.5 µg/m³ to 35.0 µg/m³	Moderate (Yellow)
from 35.1 µg/m³ to 65.4 µg/m³	Unhealthy for Sensitive Groups (Orange)
from 65.5 µg/m³ to 150.4 µg/m³	Unhealthy (Red)
from 150.5 µg/m³ to 250.4 µg/m³	Very Unhealthy (Purple)
greater than or equal to 250.5 µg/m³	Hazardous (Maroon)

On September 21, 2006, the EPA announced a revised 24-hour National Ambient Air Quality standard for $PM_{2.5}$, changing the standard to 35 µg/m³ from 65 µg/m³. As of December 2009, the EPA had not yet announced changes to the Air Quality Index based on the new standard. The Lung Association adjusted the level of the category "Unhealthy for Sensitive Groups" to include the new standard, making that category range from 35.1 µg/m³ to 65.4 µg/m³.

The goal of this report was to identify the number of days that the maximum in each county of the ***daily*** $PM_{2.5}$ concentration occurred within the defined ranges, not just those days that would fall under the requirements for attaining the national ambient air quality standards. Therefore, no data capture criteria were used to eliminate monitoring sites. Only 24-hour averaged PM data were used. Included in the analysis are data collected using only FRM and FEM methods, which reported 24-hour averaged data. As instructed by the Lung Association, A.S.L. & Associates included the exceptional and natural events that were identified in the database and identified for the Lung Association the dates and monitoring sites that experienced such events.

Following receipt of the above information, the American Lung Association identified the number of days each county, with at least one $PM_{2.5}$ monitor, experienced air quality designated as orange (Unhealthy for Sensitive Groups), red (Unhealthy), purple (Very Unhealthy) or maroon (Hazardous).

Description of County Grading System

Ozone and short-term particle pollution (24-hour $PM_{2.5}$)

The grades for ozone and short-term particle pollution (24-hour $PM_{2.5}$) were based on a weighted average for each county. To determine the weighted average, the Lung Association followed these steps:

1. First, assigned weighting factors to each category of the Air Quality Index. The number of orange days experienced by each county received a factor of 1; red days a factor of 1.5; purple days a factor of 2; and maroon days a factor of 2.5. This allowed days where the air pollution levels were higher to receive greater weight.
2. Next, multiplied the total number of days within each category by their assigned factor, then summed all the categories to calculate a total.
3. Finally, divided the total by three to determine the weighted average, since the monitoring data were collected over a three-year period.

The weighted average determined each county's grades for ozone and 24-hour $PM_{2.5}$.

- All counties with a weighted average of zero (corresponding to no exceedances of the standard over the three-year period) were given a grade of "A."
- For ozone, an "F" grade was set to generally correlate with the number of unhealthy air days that would place a county in nonattainment for the ozone standard.
- For short-term particle pollution, fewer unhealthy air days are required for an F than for nonattainment under the $PM_{2.5}$ standard. The national air quality standard is set to allow 2 percent of the days during the 3 years to exceed 35 µg/m^3 (called a "98th percentile" form) before violating the standard. That would be roughly 21 unhealthy days in 3 years. The grading used in this report would allow only about 1 percent of the days to be over 35 µg/m^3 (called a "99th percentile" form) of the $PM_{2.5}$. The American Lung Association supports using the tighter limits in a 99th percentile form as a more appropriate standard that is intended to protect the public from short-term spikes in pollution.

Grading System

Grade	Weighted Average	Approximate Number of Allowable Orange/Red/Purple/Maroon days
A	0.0	None
B	0.3 to 0.9	1 to 2 orange days with no red
C	1.0 to 2.0	3 to 6 days over the standard: 3 to 5 orange with no more than 1 red OR 6 orange with no red
D	2.1 to 3.2	7 to 9 days over the standard: 7 total (including up to 2 red) to 9 orange with no red
F	3.3 or higher	9 days or more over the standard: 10 orange days or 9 total including at least 1 or more red, purple or maroon

Weighted averages allow comparisons to be drawn based on severity of air pollution. For example, if one county had 9 orange days and 0 red days, it would earn a weighted average of 3.0 and a D grade. However, another county which had only 8 orange days but also 2 red days, which signify days with more serious air pollution, would receive an F. That second county would have a weighted average of 3.7.

Note that this system differs significantly from the methodology EPA uses to determine violations of both the ozone standard and the 24-hour $PM_{2.5}$. EPA determines whether a county violates the standard based on the 4th maximum daily 8-hour ozone reading each year averaged over three years. Multiple days of unhealthy air beyond the highest four in each year are not considered. By contrast, the system used in this report recognizes when a community's air quality repeatedly results in unhealthy air throughout the three years. Consequently, some counties will receive grades of "F" in this report, showing repeated instances of unhealthy air, while still meeting EPA's 2008 or 1997 ozone standard. EPA is currently reconsidering the 2008 standard based on evidence that that standard failed to protect the health of the public.

Counties were ranked by weighted average. Metropolitan areas were ranked by the highest weighted average among the counties within a given Metropolitan Statistical Area as of 2008 as defined by the White House Office of Management and Budget (OMB). In 2003, the OMB published revised definitions for the nation's Metropolitan Statistical Areas. Therefore, comparisons between MSAs in the State of the Air reports from 2000 to 2003 and the State of the Air reports from 2004 and later should be made with caution.

Year-round particle pollution (Annual $PM_{2.5}$)

Since no comparable Air Quality Index exists for year-round particle pollution (annual $PM_{2.5}$), the grading was based on EPA's determination of violations of the national ambient air quality standard for annual $PM_{2.5}$ of 15 µg/m^3, as reported online and downloaded from the www.epa.gov/airtrends/values.html on December 1, 2009. Counties that EPA listed as being in attainment of the standard were given grades of "Pass." Counties EPA listed as being in nonattainment were given grades of "Fail." Where insufficient data existed for EPA to determine attainment or nonattainment, those counties received a grade of "Incomplete."

Design value is the calculated concentration of a pollutant based on the form of the national ambient air quality standard and is used by EPA to determine whether or not the air quality in a county meets the standard. Counties were ranked by design value. Metropolitan areas were ranked by the highest design value among the counties within a given Metropolitan Statistical Area as of 2008 as defined by the OMB. In 2003, the OMB published revised definitions for the nation's Metropolitan Statistical Areas. Therefore, comparisons between MSAs in the *State of the Air* reports from 2000 to 2003 and the *State of the Air* reports from 2004 and later should be made with caution.

The Lung Association received critical assistance from members of the National Association of Clean Air Administrators, formerly known as the State and Territorial Air Pollution Control Administrators and the Association of Local Air Pollution Control Administrators. With their assistance, all state and local agencies were provided the opportunity to review and comment on the data in draft tabular form. The Lung Association reviewed all discrepancies with the agencies and, if needed, with Dr. Lefohn at A.S.L. and Associates. Questions about the annual PM design values were referred to Mr. Schmidt of EPA, who reviewed and had final decision on those determinations. The American Lung Association wishes to express its continued appreciation to the state and local air directors for their willingness to assist in ensuring that the characterized data used in this report are correct.

Calculations of Populations-at-Risk

Presently, county-specific measurements of the number of persons with chronic lung disease and other chronic conditions are not generally available. In order to assess the magnitude of lung disease and other chronic conditions at the state and county levels, we have employed a synthetic estimation technique originally developed by the U.S. Census Bureau. This method uses age-specific national estimates of self-reported lung disease and other conditions to project disease prevalence to the county level. The primary exceptions to this are asthma and diabetes, as state-specific estimates for adult asthma and diabetes are available through one national survey discussed below, and poverty, for which estimates are available at the county level.

Population Estimates

The U.S. Census Bureau estimated data on the total population of each county in the United States for 2008. The Census Bureau also estimated the age specific breakdown of the population and the number of individuals living in poverty by county. These estimates are the best information on population demographics available between decennial censuses.

Poverty estimates came from the Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program. SAIPE was created to provide accurate income and poverty estimates between decennial censuses. The program does not use direct counts or estimates from sample surveys, as these methods would not provide sufficient data for all counties. Instead, a model based on estimates of income or poverty from the Annual Social and Economic Supplement (ASEC) to the Current Population Survey (CPS) is used to develop estimates for all states and counties.

Prevalence Estimates

Chronic Bronchitis, Emphysema, and Pediatric Asthma. In 2008, the National Health Interview Survey (NHIS) estimated the nationwide annual prevalence of diagnosed chronic bronchitis at 9.8 million; the nationwide lifetime prevalence of diagnosed emphysema was estimated at 3.8 million. The NHIS estimated the prevalence of diagnosed pediatric asthma (under age 18) to be over 7.0 million.

Due to the revision of the NHIS questionnaire, prevalence estimates from the *American Lung Association State of the Air 2000* cannot be compared to later publications. Estimates for chronic bronchitis and emphysema can be compared to the *State of the Air* reports for 2001 through 2009. Furthermore, estimates for chronic bronchitis and emphysema should not be combined as they represent different types of prevalence estimates.

Pediatric asthma prevalence estimates from this year's report can only be compared to those in the *State of the Air* reports since 2004 and not the *State of the Air* reports from 2000 through 2003 due to a change of the NHIS.

Local area prevalence of chronic bronchitis, emphysema, and pediatric asthma are estimated by applying age-specific national prevalence rates from the 2008 NHIS to age-specific county-level resident populations obtained from the U.S. Census Bureau web site. Prevalence estimates for chronic bronchitis and emphysema are calculated for those 18-44, 45-64 and 65+. The prevalence estimate for pediatric asthma is calculated for those under age 18.

Adult Asthma and Diabetes. In 2008, the Behavioral Risk Factor Surveillance System (BRFSS) survey indicated that approximately 8.4% of adults residing in the United States reported currently having asthma. The information on adult asthma obtained from the Behavioral Risk Factor Surveillance System survey cannot be compared with pediatric asthma estimates that are derived from the NHIS. The BRFSS indicated that 8.8% of adults in the United States had ever been diagnosed with diabetes in 2008.

The prevalence estimate for adult asthma and diabetes is calculated for those 18-44, 45-64 and 65+. Local area prevalence of adult asthma and diabetes is estimated by applying age-specific state prevalence rates from the 2008 BRFSS to age-specific county-level resident populations obtained from the U.S. Census Bureau web site.

Cardiovascular Disease Estimates. All cardiovascular disease estimates are based on the 2005 National Health and Nutrition Examination Survey and were obtained from the National Heart Lung and Blood Institute (NHBLI). According to their estimate, 79.8 million Americans suffer from one or more types of cardiovascular disease, including coronary heart disease, hypertension, stroke and heart failure. Local area prevalence of cardiovascular disease is estimated by applying age-specific prevalence rates for those 18-44, 45-64 and 65+, provided by NHLBI, to age-specific county-level resident populations obtained from the U.S. Census Bureau web site.

Limitations of Estimates. Since the statistics presented by the NHIS, BRFSS and NHANES are based on a sample, they will differ (due to random sampling variability) from figures that would be derived from a complete census or case registry of people in the U.S. with these diseases. The results are also subject to reporting, non-response and processing errors. These types of errors are kept to a minimum by methods built into the survey.

Additionally, a major limitation of both surveys is that the information collected represents self-reports of medically diagnosed conditions, which may underestimate disease prevalence since not all individuals with these conditions have been properly diagnosed. However, the NHIS is the best available source that depicts the magnitude of chronic disease on the national level and the BRFSS is the best available source for state-specific adult asthma and diabetes information. The conditions covered in the survey may vary considerably in the accuracy and completeness with which they are reported.

Local estimates of chronic diseases are scaled in direct proportion to the base population of the county and its age distribution. No adjustments are made for other factors that may affect local prevalence (e.g. local prevalence of cigarette smokers or occupational exposures) since the health surveys that obtain such data are rarely conducted on the county level. Because the estimates do not account for geographic differences in the prevalence of chronic and acute diseases, the sum of the estimates for each of the counties in the United States may not exactly reflect the national estimate derived by the NHIS or state estimates derived by the BRFSS.

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