AMERICAN
LUNG
ASSOCIATION®

State of the Air: 2001

TABLE OF CONTENTS

List of Tables

INTRODUCTION

Americans closed the 1990s with a great sense of expectation. We have seen advances all around us—medical discoveries, technological innovations—so it's only natural for us to expect progress in efforts to clean up the air that we breathe. But the American Lung Association has found, through a careful analysis of environmental data, that we are not yet winning the fight for clean air. In fact, the American Lung Association's *State of the Air 2001* finds some very disturbing trends in air quality.

Last year, the American Lung Association initiated its *State of the Air* annual assessment to provide citizens with easy-to-understand air pollution summaries of the quality of the air in their communities that are based on concrete data and sound science. Air quality in cities and counties is assigned a grade ranging from "A" through "F" based on how often their air pollution levels exceed the "unhealthful" categories of the U.S. Environmental Protection Agency's Air Quality Index for ground-level ozone (smog) pollution. The Air Quality Index is, in turn, based on the national air quality standards. The air quality standard for ozone used as the basis for this report, 80 parts per billion averaged over an eight-hour period, was adopted by the EPA in 1997 based on the most recent health effects information. The grades in this report are assigned based on the quality of the air in areas, and do not reflect an assessment of efforts to implement controls that improve air quality.

EXECUTIVE SUMMARY

State of the Air 2000 confirmed that air pollution remains a major threat to Americans, contributing substantially to the nation's ill health burden. *State of the Air 2001* finds that since last year's report, many *more* people are breathing in unhealthy air:

- The number of Americans living in areas that received an "F" in this report *increased* by more than 9 million compared with last year's report—from 132 million to more than 141 million. This figure represents approximately 75 percent of the nation's population who live in counties where there are ozone monitors.
- More than 30 million children under age 14—whose lungs are particularly vulnerable to the effects of ozone-filled air—are living in counties that received an "F" in air quality. That's 1.6 million more children who live in areas with "failing" air quality than last year.
- More than 17 million Americans over age 65—another group at particular risk of suffering health problems from dirty air—live in areas that received an "F". That's over one million *more* elderly at risk than last year.
- 3.6 million adults with asthma, and 1.9 million children with asthma, live in counties that received an "F" rating.
- The number of U.S. counties that received an "F" in air quality jumped 15 percent from last year—from 333 to 382 counties. That means that more than half of the counties where there are ozone monitors received a failing grade.
- The total number of high ozone days in the "F" range jumped 25.3 percent in monitored counties.
- *State of the Air 2001* found that according to the Environmental Protection Agency's Air Quality Index, there were a total of 12,805 "Orange" (unhealthy for sensitive groups) days in counties being monitored for ozone in 1997 to 1999—a jump of 25% from the *State of the Air 2000* report. The number of "Red" (unhealthy) days rose 11% during the same period. "Purple" (very unhealthy) days decreased slightly, from 219 in the 2000 report to 209 in this year's report.

State of the Air 2000 focused on ozone levels for the years 1996-1998, while *State of the Air 2001* looks at 1997-1999 data. This represents the most recent available complete ozone monitoring data that has been fully reviewed by the EPA for quality assurance at the time this report was prepared. The hot summer weather of 1999 increased the amount of ozone in the air in many parts of the country, and made breathing more difficult for many Americans. But clearly there was no significant drop in emissions of the air pollutants that form ozone, also known as smog, to compensate for the increased ozone generated by the hot summer of 1999. We will need a major reduction in emissions if we want our most vulnerable citizens to survive hot summers without having to struggle to breathe due to ozone pollution. Further, recent predictions of a trend toward hotter summers in the future for much of the United States due to the effects of global climate change will likely worsen the nation's ozone problem unless future reductions in ozone-forming pollution are sufficient to compensate for the warmer temperatures.

The stakes are high: scientists have estimated that the number of deaths in the United States associated with air pollution range from 50,000 to 100,000 per year[1] . While particulate matter is the form of air pollution most prominently linked to premature death, there is increasing evidence that ozone pollution may also have a role in this most serious of health outcomes. A study of air pollution and daily mortality in London between 1987 and 1992 found that same-day ozone levels were associated with a significant increase in mortality due to all causes, and with cardiovascular and respiratory deaths in particular. The effects were independent of the effects of other pollutants.[2] And a study conducted in Amsterdam found a link between a day's ozone levels and the death rate two days later.[3]

For every 75 deaths per year due to air pollution, health scientists have estimated that there are 265 hospital admissions for asthma and 240 non-asthma respiratory admissions, 3,500 respiratory emergency doctor visits, 180,000 asthma attacks, 930,000 restricted activity days, and 2,000,000 acute respiratory symptom days[4] .

NATIONWIDE AND REGIONAL TRENDS

Most areas that were found to be the most ozone-polluted in *State of the Air 2000* didn't fare any better in *State of the Air 2001*. Only three cities from last year's report dropped off the list of America's 25 most ozone-polluted cities: Modesto, California; Birmingham, Alabama; and St. Louis, Missouri (However, the air quality in these cities continue to receive a failing grade). Five new cities appear this year: Richmond-Petersburg, Virginia; Baton Rouge, Louisiana; Louisville, Kentucky; Greensboro-Winston-Salem-High Point, North Carolina; and Chattanooga, Tennessee.

The similar findings in the 2000 and 2001 reports indicate that the high levels of ozone around the country found in *State of the Air 2000* were not an anomaly. The two reports taken together show that high ozone levels are an ongoing, widespread national problem that affects a significant portion of the U.S. population.

Nationwide Danger. As with last year's report, *State of the Air 2001* finds that ozone levels violate the health-based standards of the Clean Air Act in major cities and counties throughout the United States. From San Diego to Houston to Atlanta to Philadelphia, ozone-filled air threatens the ability of people with asthma, chronic bronchitis and emphysema to breathe easily. Big cities such as New York and Los Angeles, smaller cities like Lancaster, Pennsylvania and Redding, California, and medium-sized cities, such as Memphis and Charlotte, all carry the burden of smog-filled air. Some cities suffer from high levels of ozone air pollution because of local traffic and industry, while other areas without major industry or large populations must breathe in pollution blown in from other communities.

This report demonstrates that ozone air pollution isn't just a problem in isolated areas of the country. Southeastern and Mid-Atlantic cities are on the list of the highest-ozone cities, along with the better-known pollution centers such as Los Angeles and Houston. Atlanta jumped from the 9th to the 6th worst polluted city, Knoxville, Tennessee jumped to the 9th worst city from 12th, while the Philadelphia and Raleigh-Durham, North Carolina areas tied for 10th place, a jump from 13th and 17th place, respectively.

Slightly Better News in California. In general, the news was better this year, but only relatively, for California, which has the dubious distinction of having the most counties (11) on the most-polluted counties list—down from 14 last year. But even with fewer counties on the list, the top five—San Bernadino, Riverside, Kern, Fresno and Tulare—are all in California. San Diego, Sacramento and Shasta Counties dropped off the list of the 25 most ozone-polluted. Los Angeles County, number 5 last year on the list of America's 25 most ozone-polluted counties, moved down to number 8 in the new report. Also encouraging for the state: San Diego dropped from number 6 down to 17 on the list of America's 25 most ozone-polluted cities. The improvement in California's area air quality is likely due to both reduced ozone precursor emissions from pollution controls and weather conditions less favorable to ozone formation in 1999.

Spreading Problem in Some States. *State of the Air 2001* found that three states—North Carolina, Georgia and Maryland—have more counties on this year's list of America's 25 most ozone-polluted counties compared with last year. In North Carolina, Rowan County joined Mecklenburg and Wake Counties; in Maryland, Charles County joined Anne Arundel and Prince George's; and in Georgia, Douglas County joined Fulton and Rockdale.

The Cleanest Air. Most of the areas that were rated as having the best record on ozone air pollution, reporting no days in the unhealthy ranges, in last year's report again rated highly this year. Bellingham, Washington; Colorado Springs, Colorado; Des Moines, Iowa; and Duluth, Minnesota, all made the list of clean cities for both the 2000 and 2001 reports.

Table 1: Estimated Populations at Risk by Grading Level, 2000 and 2001 [1]
State of the Air Reports

Population-At-Risk	Grade A (0.0)		Grade B (0.3-0.9)		Grade C (1.0-2.0)		Grade D (2.1-3.2)		Grade F (3.3+)		National Population	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Total Population	10,477,773	8,453,938	8,582,029	9,343,164	12,856,894	10,269,797	10,459,616	9,821,670	132,494,679	141,793,488	185,164,054	187,627,908
Number of Counties	62	55	48	41	59	58	54	41	333	382	678	660
Age Groups												
Under 14	2,296,548	1,824,279	1,865,757	2,059,705	2,692,794	2,112,737	2,206,390	2,067,946	29,045,221	30,680,052	40,343,997	40,423,987
Over 65	1,251,960	1,015,492	1,179,695	1,096,632	1,824,144	1,514,827	1,453,631	1,334,036	15,944,372	17,120,347	22,992,964	23,103,750
Chronic Diseases												
Adult Asthma	*	215,759	*	236,607	*	266,743	*	253,069	*	3,628,507	*	4,805,058
Pediatric Asthma	*	116,835	*	131,951	*	134,775	*	132,024	*	1,944,477	*	2,567,435
Chronic Bronchitis	*	284,546	*	312,045	*	351,792	*	333,759	*	4,785,438	*	6,337,115
Emphysema	*	93,808	*	102,872	*	115,972	*	110,029	*	1,577,613	*	2,089,149
Number of High Ozone Days												
Orange	0	0	68	57	256	254	414	314	9,519	12,180	10,257	12,805
Red	0	0	0	1	3	4	12	12	1,335	1,488	1,350	1,505
Purple	0	0	0	0	0	0	0	0	219	209	219	209

Note:
* Chronic disease estimates for 2000 and 2001 **CANNOT BE COMPARED TO EACH OTHER**. Between the release dates of these two publications, the National Health Interview Survey (the source of information on the prevalence of chronic disease in the civilian, noninstitutionalized, household population of the US) completely redesigned their questionnaire, and this prevents any comparison in disease trends. Therefore, estimated prior to 1997 cannot be compared with later estimates.

Table 2: Comparison of Number of Counties and High Ozone Days, 2000-2001

	Counties				High Ozone Days in Unhealthy Ranges		
	2000		2001		2000	2001	
Grade	Number	%	Number	%	Number	Number	% Difference
*	122	18.0	83	12.6	*	*	*
A	62	9.1	55	8.3	0	0	0
B	48	7.1	41	6.2	68	58	-14.7
C	59	8.7	58	8.8	259	258	-0.4
D	54	8.0	41	6.2	426	326	-23.5
F	333	49.1	382	57.9	11,073	13,877	25.3
TOTAL	678	100.0	660	100.0	11,826	14,519	22.8

Note: * indicates incomplete monitoring data for all three years. Therefore, those counties are excluded from the grade analysis.

Table 3
People at Risk
In America's 25 Most Ozone-Polluted Cities

CMSA	2001 Rank	2000 Rank	Total Population	Under 14	Over 65	Pediatric Asthma	Adult Asthma	Chronic Bronchitis	Emphysema
Los Angeles-Riverside-Orange County, CA, CMSA	1	1	15,796,407	3,732,836	1,642,211	234,164	392,836	518,087	170,798
Bakersfield, CA, MSA	2	2	631,615	176,202	59,937	10,864	14,732	19,430	6,405
Fresno, CA, MSA	3	3	869,574	241,956	92,835	14,981	20,267	26,729	8,812
Visalia-Tulare-Porterville, CA, MSA	4	4	354,527	106,614	35,555	6,617	7,932	10,461	3,449
Houston-Galveston-Brazoria, TX, CMSA	5	5	4,400,689	1,066,523	350,062	67,692	107,843	142,228	46,888
Atlanta, GA, MSA	6	9	3,744,022	816,665	293,831	51,676	95,594	126,073	41,562
Washington-Baltimore, DC-MD-VA-WV, CMSA	7	7	7,269,756	1,498,026	765,106	94,678	189,293	249,647	82,301
Charlotte-Gastonia-Rock Hill, NC-SC, MSA	8	8	1,382,548	300,502	149,046	18,959	35,380	46,661	15,383
Knoxville, TN, MSA	9	12	666,383	124,080	89,399	7,966	17,815	23,495	7,745
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD, CMSA	10	13	5,986,651	1,261,635	834,337	79,942	154,600	203,893	67,217
Raleigh-Durham-Chapel Hill, NC, MSA	10	17	1,079,286	222,862	100,158	13,928	28,186	37,173	12,255
Sacramento-Yolo, CA, CMSA	12	11	1,707,530	395,899	195,571	24,649	42,895	56,571	18,650
Merced, CA, MSA	13	10	197,261	61,172	17,942	3,776	4,352	5,740	1,892
Dallas-Fort Worth, TX, CMSA	14	14	4,794,486	1,108,648	403,308	70,103	119,863	158,080	52,114
New York, Northern New Jersey, Long Island, CT-NJ-NY, CMSA	15	16	20,090,086	4,096,315	2,671,321	258,768	524,982	692,368	228,252
Nashville, TN, MSA	16	18	1,155,611	242,726	118,779	15,394	29,867	39,390	12,986
Phoenix-Mesa, AZ, MSA	17	19	2,930,726	680,751	362,747	42,852	73,269	96,630	31,856
San Diego, CA, MSA	17	6	2,766,123	611,802	320,248	38,212	70,604	93,116	30,697
Pittsburgh, PA, MSA	19	21	2,345,139	428,926	417,262	27,685	62,920	82,981	27,356
Lancaster, PA, MSA	20	22	456,679	101,807	64,071	6,467	11,554	15,238	5,023
Redding, CA, MSA	21	15	164,156	38,935	23,929	2,458	4,066	5,363	1,768
Memphis, TN-AR-MS, MSA	22	23	1,092,414	251,870	110,654	15,989	27,300	36,005	11,870
Richmond-Petersburg, VA, MSA	23	N/A	952,207	191,884	110,308	12,250	24,892	32,828	10,823
Baton Rouge, LA, MSA	24	N/A	574,226	127,545	54,500	8,289	14,425	19,025	6,272
Louisville, KY-IN, MSA	25	N/A	998,858	198,509	128,693	12,838	26,120	34,448	11,356
Greensboro-Winston-Salem-High Point, NC, MSA	25	N/A	1,167,651	232,644	153,031	14,785	30,678	40,459	13,338
Chattanooga, TN-GA, MSA	25	N/A	449,627	89,038	61,013	5,747	11,778	15,533	5,121

Adding across rows does not produce valid estimates except for the calculation of pediatric and adult asthma.

Table 4
People at Risk
In America's 25 Most Ozone-Polluted Counties

At-Risk											Number of High Ozone Days in the Unhealthy Ranges, 1997-1999				
County	ST	2001 Rank	2000 Rank	Total Population	Under 14	Over 65	Pediatric Asthma	Adult Asthma	Adult Chronic Bronchitis	Adult Emphysema	Orange	Red	Purple	Weighted Avg (1)	Grade
San Bernardino	CA	1	1	1,635,967	457,489	144,367	28,241	38,092	50,238	16,562	160	74	52	125.0	F
Riverside	CA	2	2	1,480,708	384,469	185,118	23,716	35,676	47,050	15,511	154	54	24	94.3	F
Kern	CA	3	3	631,615	176,202	59,937	10,864	14,732	19,430	6,405	167	55	4	85.8	F
Fresno	CA	4	4	755,051	212,745	78,100	13,151	17,505	23,086	7,611	178	44	5	84.7	F
Tulare	CA	5	6	354,527	106,614	35,555	6,617	7,932	10,461	3,449	180	19	0	69.5	F
Harris	TX	6	8	3,202,021	770,056	245,942	48,789	78,771	103,886	34,248	78	43	21	61.5	F
Fulton	GA	7	13	737,222	149,822	66,771	9,515	19,252	25,390	8,370	92	18	8	45.0	F
Los Angeles	CA	8	5	9,223,807	2,128,522	962,493	133,874	231,241	304,970	100,540	72	28	10	44.7	F
Rockdale	GA	9	14	68,278	15,534	6,352	995	1,709	2,254	743	70	31	4	41.5	F
Anne Arundel	MD	10	11	474,682	100,113	47,178	6,393	12,223	16,120	5,314	85	23	2	41.2	F
Mecklenburg	NC	11	12	630,813	137,538	58,407	8,557	16,203	21,370	7,045	89	18	0	38.7	F
Sevier	TN	12	19	64,371	12,059	8,649	787	1,710	2,255	743	91	11	0	35.8	F
Blount	TN	13	25	101,211	18,731	13,875	1,215	2,702	3,564	1,175	88	12	0	35.3	F
Ventura	CA	14	7	732,143	175,310	76,748	11,048	18,081	23,846	7,861	89	8	2	35.0	F
Knox	TN	15	18	374,693	69,133	47,741	4,406	10,064	13,273	4,376	81	13	0	33.5	F
Camden	NJ	16	21	504,268	121,094	63,346	7,545	12,495	16,479	5,433	72	11	1	30.2	F
Wake	NC	16	24	570,353	119,983	43,934	7,451	14,836	19,567	6,451	71	13	0	30.2	F
El Dorado	CA	18	17	158,322	36,457	19,733	2,271	3,987	5,258	1,733	70	10	2	29.7	F
Douglas	GA	19	N/A	89,398	20,753	6,713	1,323	2,225	2,934	967	67	13	1	29.5	F
Rowan	NC	19	N/A	125,057	26,562	17,899	1,671	3,229	4,259	1,404	70	11	1	29.5	F
Kings	CA	21	9	118,667	32,020	8,860	1,973	2,812	3,709	1,223	77	5	0	28.2	F
Imperial	CA	22	10	143,735	40,035	13,960	2,548	3,303	4,356	1,436	72	8	0	28.0	F
Merced	CA	23	16	197,261	61,172	17,942	3,776	4,352	5,740	1,892	62	13	1	27.8	F
Charles	MD	23	N/A	118,060	29,828	8,928	1,896	2,841	3,747	1,235	67	11	0	27.8	F
Prince George's	MD	25	24	776,907	164,836	61,086	10,451	20,013	26,394	8,701	63	11	1	27.2	F
Denton	TX	25	22	383,369	90,357	19,235	5,652	9,554	12,600	4,154	60	13	1	27.2	F

Note:

(1) The weighted average was derived by adding the three years of individual level data (1997-1999), multiplying the sums of each level by the assigned standard weights, i.e. 1=orange, 1.5=red, 2.0=purple, and calculating the average.

Table 5: Counties with the Worst Ozone Air Pollution in Each State

				Number of High Ozone Days in the Unhealthy Ranges, 1997-1999				
	County	ST	Metropolitan Statistical Area	Orange	Red	Purple	Weighted Avg (1)	Grade
1	San Bernardino	CA	Riverside-San Bernardino, CA, PMSA	160	74	52	125.0	F
2	Harris	TX	Houston, TX, PMSA	78	43	21	61.5	F
3	Fulton	GA	Atlanta, GA, MSA	92	18	8	45.0	F
4	Anne Arundel	MD	Baltimore, MD, PMSA	85	23	2	41.2	F
5	Mecklenburg	NC	Charlotte-Gastonia-Rock Hill, NC-SC, MSA	89	18	0	38.7	F
6	Sevier	TN	Knoxville, TN, MSA	91	11	0	35.8	F
7	Camden	NJ	Philadelphia, PA-NJ, PMSA	72	11	1	30.2	F
8	Maricopa	AZ	Phoenix-Mesa, AZ, MSA	74	0	0	24.7	F
9	Fairfield	CT	Bridgeport, CT, PMSA; Danbury, CT, PMSA	44	16	2	24.0	F
10	Allegheny	PA	Pittsburgh, PA, MSA	55	10	0	23.3	F
11	Washington	DC	Washington, DC-MD-VA-WV, PMSA	57	6	1	22.7	F
12	Fairfax	VA	Washington, DC-MD-VA-WV, PMSA	53	8	0	21.7	F
13	New Castle	DE	Wilmington-Newark, DE-MD, PMSA	49	8	0	20.3	F
14	East Baton Rouge	LA	Baton Rouge, LA, MSA	40	9	1	18.5	F
15	Jefferson	KY	Louisville, KY-IN, MSA	47	5	0	18.2	F
16	New York	NY	New York, NY, PMSA	37	9	1	17.5	F
16	Richmond	NY	New York, NY, PMSA	36	7	3	17.5	F
17	Butler	OH	Hamilton-Middletown, OH, PMSA	46	1	1	16.5	F
18	Shelby	AL	Birmingham, AL, MSA	37	7	0	15.8	F
19	Saint Charles	MO	St. Louis, MO-IL, MSA	41	3	1	15.8	F
20	Clark	IN	Louisville, KY-IN, MSA	38	3	1	14.8	F
21	Berrien	MI	Benton Harbor, MI, MSA	40	2	0	14.3	F
22	Anderson	SC	Greenville-Spartanburg-Anderson, SC, MSA	37	4	0	14.3	F
23	Cabell	WV	Huntington-Ashland, WV-KY-OH, MSA	31	7	0	13.8	F
24	Kenosha	WI	Kenosha, WI, PMSA	33	3	0	12.5	F
25	Bristol	MA	Providence-Fall River-Warwick, RI-MA, MSA; Boston, MA-NH, PMSA; Brockton, MA, PMSA; New Bedford, MA, PMSA;	27	5	0	11.5	F
26	Tulsa	OK	Tulsa, OK, MSA	29	1	0	10.2	F
27	Jackson	MS	Biloxi-Gulfport-Pascagoula, MS, MSA	26	2	0	9.7	F
28	Escambia	FL	Pensacola, FL, MSA	24	3	0	9.5	F
29	Cook	IL	Chicago, IL, PMSA	24	2	0	9.0	F
30	Crittenden	AR	Memphis, TN-AR-MS, MSA	24	1	0	8.5	F
31	Salt Lake	UT	Salt Lake City-Ogden, UT, MSA	21	2	0	8.0	F
32	York	ME	Portland, ME, MSA	16	5	0	7.8	F
33	Rockingham	NH	Boston, MA-NH, PMSA; Manchester, NH, PMSA Portsmouth-Rochester, NH-ME, PMSA; Lawrence, MA-NH, PMSA	17	4	0	7.7	F

Table 5a: Counties with the Worst Ozone Air Pollution in Each State

	County	ST	Metropolitan Statistical Area	Number of High Ozone Days in the Unhealthy Ranges, 1997-1999				
				Orange	Red	Purple	Weighted Avg (1)	Grade
37	Wyandotte	KS	Kansas City, MO-KS, MSA	8	1	0	3.2	D
38	King	WA	Seattle-Bellevue-Everett, WA, PMSA	4	2	0	2.3	D
39	Dona Ana	NM	Las Cruces, NM, MSA	5	0	0	1.7	C
40	Jackson	OR	Medford-Ahland, OR, MSA	5	0	0	1.7	C
41	Bennington	VT	N/A	5	0	0	1.7	C
42	Scott	IA	Davenport-Molina-Rock Island, IA-IL, MSA	4	0	0	1.3	C
43	Douglas	NE	Omaha, NE-IA, MSA	2	0	0	0.7	B
44	Anoka	MN	Minneapolis-St. Paul, MN-WI MSA	1	0	0	0.3	B
44	Washington	MN	Minneapolis-St. Paul, MN-WI MSA	1	0	0	0.3	B

Note:
(1) The weighted average was derived by adding the three years of individual level data (1997-1999), multiplying the sums of each level by the assigned standard weights, i.e. 1=orange, 1.5=red, 2.0=purple, and calculating the average.

Table 6:
Cities and Counties Deleted from the Lists of the 25 Most Ozone-Polluted Cities and Counties Between 2000 and 2001

City	2000 Rank	2000 Grade	2001 Grade
Modesto, CA, MSA	20	F	F
Birmingham, AL, MSA	24	F	F
St. Louis, MO-IL, MSA	25	F	F

County	2000 Rank	2000 Grade	2001 Grade
San Diego, CA	15	F	F
Sacramento, CA	20	F	F
Shasta, CA	23	F	F
Ocean, NJ	24	F	F
Jefferson, TN	25	F	F
Sumner, TN	25		F

Tabel 7: Metropolitan Areas with No Monitored Ozone Air Pollution Levels in Unhealthy Ranges

Metropolitan Area	Population
Bellingham, WA, MSA	157,244
Colorado Springs, CO, MSA	490,044
Des Moines, IA, MSA	436,787
Duluth Superior, MN-WI, MSA	236,591
Fargo-Moorhead, ND-MN, MSA	168,410
Flagstaff, AZ-UT, MSA	120,306
Honolulu, HI, MSA	871,768
Laredo, TX, MSA	186,798
Lincoln, NE, MSA	235,537
McAllen-Edinburg-Mission, TX, MSA	519,661
Salinas, CA, MSA	366,631
Spokane, WA, MSA	408,221

Note: MSA's were included only if all their respective counties with monitoring sites received a grade of A. Metropolitan areas are listed in alphabetical order; they are not ranked.

Table 8: Counties with No Monitored Ozone Air Pollution Levels in Unhealthy Ranges in Each State

County	State	Metropolitan Statistical Area
Sumter	AL	N/A
Yukon-Koyukuk	AK	N/A
Cochise	AZ	N/A
Coconino	AZ	Flagstaff, AZ-UT, MSA
Lake	CA	N/A
Marin	CA	San Francisco, CA, PMSA
Mendocino	CA	N/A
Monterey	CA	Salinas, CA, MSA
Plumas	CA	N/A
San Francisco	CA	San Francisco, CA, PMSA
San Mateo	CA	San Francisco, CA, PMSA
Santa Cruz	CA	Santa Cruz-Watsonville, CA, PMSA
Siskiyou	CA	N/A
El Paso	CO	Colorado Springs, CO, MSA
Montezuma	CO	N/A
Weld	CO	Greeley, CO, PMSA
Honolulu	HI	Honolulu, HI, MSA
Palo Alto	IA	N/A
Polk	IA	Des Moines, IA, MSA
Story	IA	N/A
Warren	IA	Des Moines, IA, MSA
Butte	ID	N/A
Rock Island	IL	Davenport-Moline-Rock Island, IA-IL, MSA
Oxford	ME	N/A
Dakota	MN	Minneapolis-St. Paul, MN-WI, MSA
Lake	MN	N/A
Saint Louis	MN	Duluth Superior, MN-WI, MSA
Flathead	MT	N/A
Cass	ND	Fargo-Moorhead, ND-MN, MSA
Mercer	ND	N/A
Oliver	ND	N/A
Steele	ND	N/A
Lancaster	NE	Lincoln, NE, MSA
Carroll	NH	N/A
Grafton	NH	N/A
Eddy	NM	N/A
San Juan	NM	N/A
Valencia	NM	Albuquerque, NM, MSA
Douglas	NV	N/A
White Pine	NV	N/A
Carson City	NV	N/A
Herkimer	NY	Utica-Rome, NY, MSA
Columbia	OR	Portland-Vancouver, OR-WA, PMSA
Brewster	TX	N/A
Hidalgo	TX	McAllen-Edinburg-Mission, TX, MSA
Webb	TX	Laredo, TX, MSA
Cache	UT	N/A
San Juan	UT	N/A
Clallam	WA	N/A
Clark	WA	Portland-Vancouver, OR-WA, PMSA
Skagit	WA	N/A
Spokane	WA	Spokane, WA, MSA
Whatcom	WA	Bellingham, WA, MSA
Saint Croix	WI	Minneapolis-St. Paul, MN-WI, MSA
Teton	WY	N/A

N/A= Not Applicable

Table 9: Breakdown of High Ozone Days Among Counties with Monitoring Sites

Category	Number of Counties 2001	Number of Counties 2000
Monitoring Sites	660	678
Monitoring Sites with Incomplete Data (that were excluded in the analysis)	83	122
Monitoring Sites with Complete Data	577	556
Monitoring Sites that had at least 1 day of high ozone in the Unhealthy, Moderate, and Good Ranges	522	494
Monitoring Sites that had zero days of high ozone in the Unhealthy Ranges but had at least 1 day of high ozone in the Moderate and Good Ranges	48	62
Monitoring Sites that had zero days of high ozone in the Unhealthy Ranges plus zero days of high ozone in the Moderate Range but had at least 1 day of high ozone in the Good Range.	7	7

Table 10a: State Comparisons, 2000-2001

State	County Additions	County Subtractions	Grade Changes [1] County Name	2000	2001	Miscellaneous
AL		DeKalb	Lawrence	D	F	Shelby replaces Jefferson as worst county.
		Morgan				
AR		Clark	Newton	B	C	
			Pulaski	C	D	
CA			Butte	B	C	
			Colusa	C	B	
			Glen	B	C	
			San Benito	F	D	
			Santa Cruz	B	A	
			Yolo	D	F	
CO		Gunnison	Jefferson	D	F	
CT			Windham			
FL		Calhoun	Alachua	*	F	Dade County is now called Miami-Dade.
			Brevard	C	D	
			Lee	C	D	
			Leon	A	B	
			Palm Beach	B	C	
			Pasco	C	D	
			Pinellas	D	F	
			St. Johns	B	*	
			Sarasota	D	F	
GA	Cherokee	Spalding	Bibb	*	F	
	Cobb		Chatham	A	C	
	Coweta		Douglas	*	F	
	Henry					
IL		Jo Daviess	Effingham	C	D	Cook replaces Madison as worst county.
			Hamilton	*	C	
			Kane	A	B	
			McHenry	D	F	
			Macoupin	D	C	
			Peoria	B	C	
			Randolph	B	C	
			Will	C	D	
IN	Gibson	DeKalb	Elkhart	F	D	Clark replaces Warrick as worst county.
		Knox	Johnson	*	F	
		Wabash	Morgan	*	F	
			Vigo	F	D	
IA	Clinton		Harrison	*	B	
			Linn	A	B	
			Palo Alto	*	A	
			Story	*	A	
			Van Buren	A	B	
			Warren	*	A	
KS	Sumner	Sherman	Wyandotte	F	D	
KY		Morgan	Boone	D	F	
		Washington	Boyd	D	F	
			Christian	D	F	
			Graves	D	F	
			Hardin	C	F	
			Jessamine	D	F	
			Lawrence	B	*	
			McCracken	D	F	
			McLean	D	F	
			Perry	A	B	
			Putaski	C	F	
			Trigg	D	F	
LA			Lafourche	D	F	E. Baton Rouge replaces Iberville as worst county.
			Ouachita	A	B	
			Pointe Couppe	D	F	
			St. Charles	D	F	
			St. James	D	F	
			St. Mary	D	F	
ME		Aroostook				
		Somerset				
MD	Washington	Dorchester	Charles	F	*	
MA			Berkshire	C	B	
			Suffolk	C	F	
MI	Grand Traverse	Manistee	Clinton	B	D	
		Mecosta	Huron	D	F	
		Roscommon	Ingham	D	F	
		Tuscola	Lenawee	F	C	

Table 10b: State Comparisons, 2000-2001

State	County Additions	County Subtractions	County Name	Grade Changes [1] 2000	2001	Miscellaneous
			Oakland	D	F	
MN	Mille Lacs	Koochiching				
MS	Bolivar	Yalobusha	Hancock	D	F	
	Harrison		Hines	B	C	
			Lauderdale	B	C	
			Lee	D	F	
MO			Greene	B	C	
			Jackson	A	B	
			Monroe	D	F	
NE			Douglas	A	B	
NV			Washoe	A	B	
			Carson City	*	A	
NH			Grafton	B	A	
			Merrimack	C	B	
NJ			Bergen	D	*	
NM			Bernalillo	A	B	
			Eddy	*	A	
			San Juan	*	A	
NY		Kings	Hamilton	B	C	New York and Richmond are tied for worst county.
		Tompkins	Madison	B	C	New York was the worst county last year.
			Monroe	C	F	
			Onondaga	C	D	
			Saratoga	C	F	
			Schenectady	B	C	
			Wayne	D	F	
NC	Jackson	Carteret	Buncombe	C	D	
	Union	Macon	Caldwell	*	F	
		Montgomery	Camden	*	D	
			Martin	*	C	
			North Hampton	*	F	
			Person	*	F	
			Yancey	A	F	
ND	Dunn		McKenzie	A	*	
OH		Crawford	Delaware	*	F	
		Pickaway	Geauga	*	F	
			Greene	*	F	
			Union	*	F	
			Wood	*	F	
OK	Cherokee		Latimer	*	D	
	Jefferson		McClain	C	D	
	Kay					
	Love					
	Marshall					
OR			Clackamas	F	C	Jackson replaces Clackamas and Marion as worst county.
			Lane	D	B	
			Marion	F	B	
PA	Tioga	Adams	Armstrong	*	F	
		Elk	Lawrence	D	F	
		Somerset				
RI			Washington	*	F	
SC			Charleston	C	D	Anderson replaces Aiken as worst county.
			Colleton	*	C	
			Oconee	D	F	
			Union	D	F	
			Williamsburg	A	B	
			York	D	F	
SD	Minnehaha					
TN	Dickson	Claiborne	Lawrence	*	F	Sevier replaces Knox as worst county.
	Roane	DeKalb	Putnam	*	F	
		Giles				
		Loudon				
TX	Montgomery		Nueces	D	F	
			Orange	F	D	
			Victoria	B	C	
UT			Utah	D	F	
VA	Page	Montgomery	Wythe	D	F	
	Rockbridge	Prince Edward				
		Smyth				

Table 10c: State Comparisons, 2000-2001

State	County Additions	County Subtractions	Grade Changes [1] County Name	2000	2001	Miscellaneous
WA			Clark	C	A	
			King	F	D	
WV		Glimer				
		Tucker				
WI	Vilas	Taylor	Dodge	C	D	Kenosha replaces Manitowoc as worst county.
			Florence	B	C	
			Fond Du Lac	C	D	
			Jefferson	C	F	
			Marathon	B	C	
			Oneida	B	C	
			Outagamie	C	D	
			Polk	B	*	
			Sauk	B	C	
			Walworth	D	F	
			Washington	C	D	
			Waukesha	C	F	
			Winnebago	B	D	

Notes: * indicates incomplete monitoring data for all three years. Therefore, those counties are excluded from the grade analysis.

(1) The "grade changes" column represents counties that have either increased or decreased by a grade within the past year, i.e. going from a B to an A or a C to a D. This column does not include counties that had increases or decreases in their weighted averages but did not change an actual grade level.

HEALTH EFFECTS OF OZONE

The American Lung Association *State of the Air* reports focus on ozone, one of the most dangerous of the common air pollutants. As this report proves, ozone plagues many areas of the country and many U.S. cities, both large and small. As of 1998, 92.5 million Americans still lived in areas classified as not meeting the earlier one-hour national ozone standard of 0.12 parts per million.[5]

The Lung Association also chose to focus on ozone because there is better historical data on ozone levels compared with some of the other common air pollutants, which makes it easier to observe trends over time. Although ozone levels can fluctuate from year to year due to meteorological conditions, lack of a downward trend over several years in a given geographical area can be an indication that neither the government nor polluting companies are making a concerted effort to reduce pollution.

The Dangers of Ozone. Ozone is a powerful respiratory irritant at the levels frequently found in most of the nation's urban areas during summer months. Symptoms include shortness of breath, chest pain when inhaling deeply, wheezing and coughing. Research on the effects of prolonged exposures (6 ½ hours) to relatively low levels of ozone have found reductions in lung function, biological evidence of inflammation of the lung lining and respiratory discomfort. In studies of animals, ozone exposure has been found to increase susceptibility to bacterial pneumonia infection. One study of 16 Canadian cities over a 10-year period found that air pollution, including ozone, at relatively low concentrations, is associated with excess admissions to the hospital for respiratory diseases.[6]

Ozone levels typically rise during the May through September period when higher temperatures and the increased amount of sunlight combine with the stagnant atmospheric conditions that are associated with ozone air pollution episodes.

Recently, attention has begun to focus on the effects of long-term, repeated exposures to high levels of ozone. A study of college freshmen who were lifelong residents of Northern or Southern California found a strong relationship between lifetime ozone exposure and reduced lung function.[7] Additional evidence comes from a study of 72 cadets at the U.S. Military Academy at West Point, who attended a summer training program in which they spent an average of 11 hours a day outdoors. The study found that the 21 cadets who attended summer training in Fort Dix, New Jersey, an area with elevated ozone levels, had a larger drop in lung function over the summer, compared with the cadets who trained at sites in Georgia, Missouri and Oklahoma with lower ozone levels.[8]

Long-term exposures of animals to moderate ozone levels produce changes in the structure of the lung. A recent study of 1,150 children followed for three years suggests that long-term ambient ozone exposure might negatively affect human lung function growth. The researchers observed small but consistent decrements in lung function in the children that were associated with ambient ozone exposure.[9]

High ozone levels are particularly dangerous for people with asthma. When ozone levels are high, more people with asthma suffer asthma attacks that require a doctor's visit or use of extra medication. Just one example of how many people can be affected by high ozone levels: *State of the Air 2001* found that in the Los Angeles-Riverside-Orange County area, rated the most ozone-polluted city in the United States based on 1997-99 levels, approximately 400,000 adults and 230,000 children suffer from asthma.

A recent study underscores the benefits of reducing ozone and other air pollutants for people with asthma. Researchers compared the number of asthma-related hospital emergency department and urgent care center visits, as well as hospital admissions, for children under age 17 in Atlanta before, during and after the 1996 Olympics. The study concluded that the reduced traffic levels due to traffic controls implemented during the Olympics"…was associated with a prolonged reduction in ozone pollution and significantly lower rates of childhood asthma events."[10]

Children at Risk. A number of recent studies have added to the evidence that children are especially vulnerable to the harmful effects of ozone. Children spend significantly more time outdoors, especially in the summertime when ozone levels are the highest. Children also spend more time engaged in exercise, and such activity results in breathing in more air, and therefore more pollution being taken deep into the lungs.

One study found that when air pollution worsens, more children stay home sick from school due to respiratory illnesses. The University of Southern California researchers found that school absences due to sore throats, coughs, asthma attacks and similar problems increase in the three to five days after a significant rise in ozone.[11] Another study of schoolchildren in Nevada also found that increases in ozone levels was associated with an increase in the school absentee rate.[12]

Children with asthma are particularly susceptible to ozone. Researchers at the University of Southern California conducted a 10-year prospective study of Southern California public school children, and found a statistically significant association between ozone exposure and decreased lung function in girls with asthma.[13] Another recent study found asthmatic children who had a low birthweight or a premature birth are especially susceptible to the effects of summer ozone.[14]

The Elderly. As we age, our breathing ability diminishes over time. So even the healthy elderly are at increased risk from exposure to ozone and other air pollutants, which can further reduce their lung function. Ozone air pollution also increases susceptibility to influenza, pneumonia and other infections, which are especially dangerous for the elderly. A study of the relationship between daily death rates in the elderly, outdoor air temperatures and ozone levels in Belgium confirms the deadly potential of ozone for senior citizens. The study demonstrated a statistical association between daily mortality in the elderly and ambient ozone concentration during the hot summer of 1994.[15] In addition, ozone can significantly worsen the condition of people with chronic bronchitis and emphysema, and since most of these diseases occur in the elderly population, these elderly are at special risk for exposure to ozone.

Ozone and the Air Quality Index. The Air Quality Index (AQI), established by the U.S. Environmental Protection Agency, is used by state and local agencies to report levels of air pollution. The AQI divides ambient concentrations of air pollution into categories, assigning each one a descriptor and color: Green (good); Yellow (moderate); Orange (unhealthy for sensitive groups); Red (unhealthy) Purple (very unhealthy). The American Lung Association defines sensitive groups for ozone to include children, the elderly, people with lung disease including asthma, outdoor workers, and healthy adults who exercise outdoors.

Ozone and Other Pollutants. A recent study found that ozone increases the damaging effect of diesel exhaust particles in the lungs of rats.[16] Ozone also has been shown to increase allergic responses in people with asthma or allergies. One study found that people with allergies who first breathed in ozone and then inhaled allergens experienced a 7.8% decrease in lung function; those who breathed in filtered air and then allergens had only a 1.3% decrease.[17] Another study looked at allergic asthmatics (people whose asthma is triggered by allergies) who were exposed to ozone, and then had allergens applied to one nostril and saline to the other. The researchers found that ozone "primed" the nose for allergic responses, and induced inflammation in the nasal airways.[18]

ATTACKING THE NATION'S OZONE PROBLEM

Overview of Ozone Sources. Ozone is a highly reactive gas that is a form of oxygen. It is the main component of the air pollution known as smog. Ozone reacts chemically ("oxidizes") with internal body tissues that it comes in contact with, such as those in the lung.

Ozone is formed by the action of sunlight on carbon-based chemicals known as hydrocarbons, acting in combination with a group of air pollutants called oxides of nitrogen (NOx). Hydrocarbons are emitted by motor vehicles, oil and chemical storage and handling facilities, and a variety of commercial and industrial sources such as gas stations, dry cleaners and degreasing operations. Oxides of nitrogen are a by-product of burning fuel in sources such as power plants, steel mills and other heavy industry and in motor vehicles.

Wind can carry NOx hundreds of miles, so people who don't live in areas with high levels of NOx emissions aren't necessarily safe from these emissions. EPA has been tracking NOx and five other major air pollutants since 1970, and found that while carbon monoxide, lead, particulate matter, sulfur dioxide, and volatile organic compounds have decreased significantly, NOx emissions have increased approximately 10 percent.

CONTROL STRATEGIES

New Diesel Regulations. In January 2001, the Environmental Protection Agency issued new regulations that will help millions of Americans, especially children with asthma, breathe easier. The regulations significantly limit tailpipe emissions from heavy-duty diesel vehicles.

The new rule will cap sulfur levels in diesel fuel at 15 parts per million (ppm) and impose tough new emissions standards on all heavy-duty vehicles. This will result in a more than 90 percent reduction in emissions of harmful pollutants like particulate matter (PM) and nitrogen oxides (NOx). Particulate matter has been linked to premature death and worsening asthma, and nitrogen oxides are a principal component of ozone smog.

The oil industry had tried to water down the rules by offering an alternative proposal with higher sulfur levels. That plan would have severely weakened the program and precluded significant reductions of nitrogen oxides and particulate matter pollution. In response to the new sulfur in diesel fuel regulations, the National Petroleum Refiners Association filed a lawsuit challenging the new EPA regulations in February 2001. The American Lung Association has intervened in this lawsuit to support the EPA heavy-duty diesel regulations.

Public opinion stands behind the clean up of dirty diesel buses and trucks. In a recent American Lung Association survey, nearly nine of ten voters (87 percent) favored requiring production of cleaner diesel fuel and 84 percent of voters said it is personally important to them to require the production of cleaner diesel fuel. Likewise, nearly nine of ten (85 percent) of voters favored requiring18-wheelers and other big diesel vehicles to use the best available pollution control technology, even if it costs them more money.

In addition, voters also believe cleaner diesel fuel can have a positive impact on our nation's air quality. More than three fourths of voters (77 percent) believe cleaner diesel fuel will make a difference in cleaning up air pollution.

Voters also favored diesel fuel cleanup even when told it would increase costs to consumers. After hearing statements on both sides of the issue, two-thirds of voters (65 percent) agreed with the statement that "cleaner diesel fuel is necessary to significantly reduce air pollution from big trucks and buses and is worth it even if it costs consumers a little more," versus only 16 percent who agreed that "cleaner diesel fuel for big trucks and buses will be too expensive resulting in higher costs which will be passed on to consumers."[19]

Non-road Heavy Duty Engines. While new rules to regulate emissions of on-road heavy-duty diesels will make a great deal of difference in the quality of our air, these rules alone will not be enough. EPA must also take steps to control non-road heavy-duty diesel engines, such as construction equipment, and clean up the diesel fuel used in these engines. In fact, non-road heavy-duty diesel engines are a more significant source of emissions than on-road heavy-duty diesels.

PM_{10} emission from non-road vehicles and engines accounted for 64% of transportation source emissions and 16% of total emissions; for NOx, they account for 40% of transportation source emissions and 22% of total emissions.

Non-road heavy-duty diesel equipment can benefit from the technological advances that will occur in order to meet the 2007 on-road standards—but only if low-sulfur diesel fuel, which is necessary for these technologies to operate, is available for the non-road sector, as well. That's why the EPA should adopt emission standards and a sulfur cap for non-road heavy-duty diesels and fuel that are equivalent to those for on-road heavy-duty diesels, and in the same time frame.

National Air Quality Standards. On February 27, 2001, the Supreme Court ruled unanimously that the EPA process of setting air quality standards was constitutional, and that costs could not be considered in the standard-setting process. At issue are 1997 standards set by the Environmental Protection Agency (EPA) for ozone (smog) and particles (soot). The EPA estimates the standards will each year prevent thousands of premature deaths, tens of thousands of hospitalizations and other illnesses for respiratory and cardiovascular causes, and millions of days of missed work and school. The standards were challenged by industry and three states.

In 1999, the U.S. Court of Appeals for the DC Circuit ruled that the EPA's interpretation of the Clean Air Act represents an unconstitutional delegation of Congress' legislative authority. The American Lung Association intervened to oppose the challenges and filed briefs in support of the EPA's appeal to the Supreme Court. The Supreme Court also heard oral arguments in a related case in which industry argued for the Court to reverse a long-established legal precedent that bars inclusion of pollution control cost factors in the air quality standard-setting process. The Lung Association, which was a party in this case as well, strongly opposed the industry position as bad public health policy and also directly contravening the Clean Air Act. The Supreme Court did rule that EPA must reconsider how implementation of the 1997 eight-hour standard will be reconciled with implementation of the 1979 one-hour standard.

It is crucial that EPA revise the ozone standard implementation process quickly in order to minimize any further delay in protecting the public from ozone pollution. EPA also must expeditiously classify those areas that violate the eight-hour ozone standard so that states can move forward with identifying and implementing the pollution control strategies needed to meet the standard. Based on 1997-99 monitoring data, a report by the Clean Air Network estimated that almost 117 million Americans live in 333 counties that violate the eight-hour ozone standard.[20]

Power Plants. No other single source of pollution poses so much danger to health and the environment as do coal-burning power plants. The damage continues to mount as the emissions of nitrogen oxides and sulfur dioxide have increased and the emissions of mercury, a toxic contaminant, and carbon dioxide, the foremost pollutant linked to global climate change, have continued unabated.

Since 1970, the Clean Air Act has exempted the oldest, dirtiest coal-burning power plants from complying with modern emissions standards. As a result, these older power plants are permitted to emit as much as 10 times more nitrogen oxides and sulfur dioxide as that of modern coal plants. Even worse, the entire industry is currently allowed to emit unlimited amounts of mercury and carbon dioxide. Power plants are the only unregulated source of toxic mercury air emissions.

This loophole in the Clean Air Act is now allowing power companies using these older facilities with outdated pollution controls to gain a competitive cost advantage over their competitors who are more environmentally friendly. As a result, the power industry is relying on these old plants more than ever: between 1992 and 1998, there was a 15.8% jump in the amount of electricity generated from old coal-fired power plants.

Legislation has been introduced in Congress that would finally close the 30-year old loophole for power plants and that would set reasonable and achievable caps on the four major pollutants.

ENDNOTES

[1] Dockery, D.W., and C.A Pope III. Acute Respiratory Effects of Particulate Air Pollution. *Annual Review Public Health*, 1994, vol 15, 107-32.

[2] H.R. Anderson, A. Ponce de Leon, J.M. Bland, J.S. Bower, D.P. Strachan. Air Pollution and Daily Mortality in London: 1987-92. *British Medical Journal* 1996;312:665-9

[3] A.P. Verhoeff, G. Hoek, J. Schwartz, J.H. van Wijnen. Air Pollution and Daily Mortality in Amsterdam. *Epidemiology* 1996;7:225-230.

[4] Testimony of George Thurston, Hearing, Subcommittee on Health and Environment, Committee on Commerce, U.S. House of Representatives, *Review of EPA's Proposed Ozone and Particulate Matter NAAQS Revisions*, May 8, 1997.

[5] USEPA; *Air Quality and Emission Trends Report*, 1998; March 2000; pp. 67

[6] Burnett, R.T.; Brook, J.R.; Yung, W.T.; Dales, R.E.; Krewski, D. Association between Ozone and Hospitalization for Respiratory Diseases in 16 Canadian Cities. *Environmental Research* 72, 24-31 (1997).

[7] Kunzli, N.; Lurmann, F.; Segal, M.; Ngo, L.; Balmes, J.; Tager, I.B. Association between Lifetime Ambient Ozone Exposure and Pulmonary Function in College Freshmen—Results of a Pilot Study. *Environmental Research* 72, 8-23 (1997).

[8] Kinney, P.L. and Lippmann, M. Respiratory Effects of Seasonal Exposures to Ozone and Particles. *Archives of Environmental Health* 55 (3):210-6 (2000).

[9] Frischer, T.; Studnicka, M.; Gartner, C.; Tauber, E.; Horak, F.; Veiter, A.; Spengler, J.; Kuhr, J.; Urbanek, R. Lung Function Growth and Ambient Ozone: A Three-Year Population Study in School Children. *Am. J. Respir Crit Care Med* 1999 160:390-396.

[10] Friedman, M.: Powell, K.; Hutwagner, L.; Graham, L.; Teague, W.G.; Impact of Changes in Transportation and Commuting Behavior During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma; *Journal of the American Medicall Association*; 285: 897-905 (2001).

[11] Gilliland, F.D.; Berhane, K.; Rappaport, E.B.; Thomas, D.C.; Avol, E.; Gauderman, W.J.; London, S.J.; Margolis, H.G.; McConnell, R.; Islam, K.T.;Peters, J.M. The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illnesses. *Epidemiology* 2001:12:43-54.

[12] Chen, L.; Jennison, B.L.; Yang, W.; Omaye, S.T. Elementary School Absenteeism and Air Pollution. *Inhalation Toxicology* 12:997-1016 (2000).

[13] Peters, J.M., Avol, Edward, Gauderman, W.J.; Linn, W.S.; Navidi, W.; London, S.J.; Margolis, H.; Rappaport, E.; Vora, H.; Gong, H.; Thomas, D.C. A Study of Twelve Southern California Communities with Differing Levels and Types of Air Pollution. *Am J Respir Crit Care Med* 1999; 159:768-775.

[14] Mortimer, K.M.; Tager, I.B.; Dockery, D.W.; Neas, L.M.; Redline, S. The Effect of Ozone on Inner-City Children with Asthma. *Am J. Respir Crit Care Med* 2000; 162:1838-1845.

[15] Sartor, F.; Demuth, C.; Snacken, R.; Walckiers, D. Mortality in the Elderly and Ambient Ozone Concentration during the Hot Summer, 1994, in Belgium. *Environmental Research* 72, 109-117 (1997)..

[16] Madden, M.C.; Richards, J.H.; Dailey, L.A.; Hatch, G.E; Ghio, A.J. Effect of Ozone on Diesel Exhaust Particle Toxicity in Rat Lung. *Toxicology and Applied Pharmacology* 2000 168:140-148.

[17] Jorres, R.; Nowak, D.; Magnussen, H. The Effect of Ozone Exposure on Allergen Responsiveness in Subjects with Asthma or Rhinitis. *Am J Respir Crit Care Med* 1996; 153:56-64

[18] Peden, D.; Setzer, R.W. Jr.; Devlin, R.B. Ozone Exposure Has Both a Priming Effect on Allergen-induced Responses and an Intrinsic Inflammatory Action in the Nasal Airways of Perenially Allergic Asthmatics. *Am J Respir Crit Care Med* 1995; 151:1336-45.

[19] The survey of 800 registered voters nationwide who indicated they voted in the November 2000 general election for President and Congress was conducted November 8-12, 2000 by Lake Snell Perry & Associates. The survey margin of error is plus or minus 3 ½ percent.

[20] Clean Air Network; Smog Watch 2000; June, 2000.

Description of Methodology

Statistical Methodology: The Air Quality Data. The data on air quality throughout the United States was obtained from EPA's Aerometric Information Retrieval System (AIRS) database. The American Lung Association used A.S.L.& Associates to analyze data on ozone monitoring for the three-year period 1997–1999. The 1997, 1998, and 1999 AIRS hourly ozone data was used to calculate the daily eight-hour maximum concentration for each ozone-monitoring site. The highest daily eight-hour daily maximum concentration in each county for 1997, 1998, and 1999 based on the EPA-defined ozone season was then determined.

Using these results a table summarizing the ozone data for each county for each of the three years the numbers within the following ranges:

0.000–0.064 ppm	Good (Green)
0.065–0.084 ppm	Moderate (Yellow)
0.085–0.104 ppm	Unhealthy for Sensitive Groups (Orange)
0.105–0.124 ppm	Unhealthy (Red)
0.125–0.374 ppm	Very Unhealthy (Purple)

Using these results, A.S.L. & Associates prepared a table that summarized for each of the three years the number of days the ozone level was within the unhealthy ranges identified by EPA as Orange, Red and Purple Days. The number of days within each of these categories was summed to establish the number of days each monitored county experienced air quality designated as orange, red or purple.

No data capture criteria were used to eliminate monitoring sites. All data were used in the analysis because it was the goal to identify the number of days that eight-hour daily maximum concentrations occurred within the defined ranges.

Description of County Grading System. A weighted average was used to determine the grades of each county. The calculation for the weighted average was as follows: The number of orange days experienced by each county was assigned a factor of 1; red days were assigned a factor of 1.5 and purple days were assigned a factor of 2. After multiplying the total number of days within each category by their assigned factor, a total was determined. Because the monitoring data was collected over a three-year period, the total was divided by three. Each county's grade was determined using the weighted average.

The weighted averages of all counties were ranked and a frequency distribution was determined. Using this frequency distribution, each county was assigned a grade following the system used in a standard grade school setting. The top 10% of counties, with a weighted average of zero (no violations over the three year period) were given a grade of A. The next 10% of counties, with weighted averages between 0.3 and 0.9 were given a grade of B. The next 10% of counties, with a weighted average between 1.0 and 2.0 received a C grade. A grade of D was assigned to those counties with scores between 2.1 and 3.2 - the next 10% of counties. Scores of 3.3 and above (the bottom 60%) were given a grade of F. The counties were further categorized into their respective metropolitan statistical areas (MSAs) to obtain the cities with the worst and best records of ozone air pollution.

Calculations of Populations-at-Risk. Presently, state and county-specific measurements of the number of persons with chronic and acute lung disease are not available. In order to assess the magnitude of lung disease at the state and county levels, we have utilized a synthetic estimation technique originally developed by the U.S. Bureau of the Census. This method uses age-specific national estimates of self-reported lung disease to project the prevalence and incidence of lung disease within the counties served by Lung Association constituents and affiliates.

Population Estimates. The U.S. Census Bureau estimated data on the total population of each county in the United States for 1998. The Census Bureau also estimated the age specific breakdown of the population by county.

Prevalence Estimates: Chronic Bronchitis, Emphysema and Asthma. In 1998, the National Health Interview Survey (NHIS) estimated the nationwide annual prevalence of diagnosed chronic bronchitis at 9 million; the nationwide lifetime prevalence of emphysema was estimated at 3 million. The NHIS estimates that 10.6 million people (3.8 million under age 18) had an asthma attack or episode in 1998. 1998 represents the most recent year of publication of prevalence data for the Health Interview Survey, and so was utilized to calculate county-specific prevalence. The prevalence estimates calculated for these purposes will differ from those delineated in last year's State of the Air Report, due to the change in the Health Interview Survey questionnaire. *Additionally, estimates for chronic bronchitis and emphysema should not be summed since they represent different types of prevalence estimates.*

Local area prevalence of chronic bronchitis, emphysema and asthma are estimated by applying age-specific national prevalence rates from the 1998 NHIS to age-specific county-level resident populations. Prevalence estimates for chronic bronchitis and emphysema are calculated for those 18–44, 45 to 64 and 65+. The prevalence estimate for pediatric asthma is calculated for those under age 18. The prevalence estimate for adult asthma is calculated for those 18–44, 45 to 64 and 65+.

The procedure for determining local prevalence estimate is as follows. First, the age-specific county-level resident population for July 1st, 1998 is obtained from the U.S. Bureau of the Census web site. The age-specific national prevalence rate for each chronic lung disease is applied to the age-specific county-level population of each county. Thereafter, the age-specific prevalence estimates for each county within a Lung Association area are summed to determine its overall prevalence.

Limitations of Estimates. The NHIS is a scientifically designed population sample survey conducted annually by the National Center for Health Statistics. This survey serves as a source of magnitude data on chronic and acute lung disease.

Since the statistics presented by the NHIS 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 the survey is that the information represents medically diagnosed conditions that may underestimate disease prevalence since we know that not all individuals with these conditions have been properly diagnosed. However, the NHIS is the best available source that depicts the magnitude of acute and chronic lung disease on the national level. The conditions covered in the survey may vary considerably in the accuracy and completeness with which they are reported.

Local estimates of chronic lung 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.

REFERENCES

1. Irwin, R. Guide to Local Area Populations U.S. Bureau of the Census Technical Paper Number 39 (1972).
2. National Center for Health Statistics. *Raw Data from the National Health Interview Survey, United States, 1998.* Calculations by the American Lung Association Best Practices Division using SPSS and SUDAAN software.
3. Population Estimates Branch, U.S. Bureau of the Census. County Resident Population Estimates, by Age: July 1, 1998.
4. Population Estimates Branch, U.S. Bureau of the Census. Estimates of Population of Minor Civil Divisions: Annual Time Series, July1, 1998.