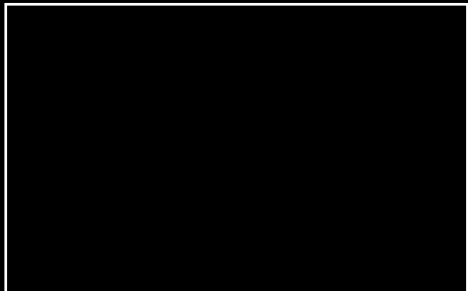
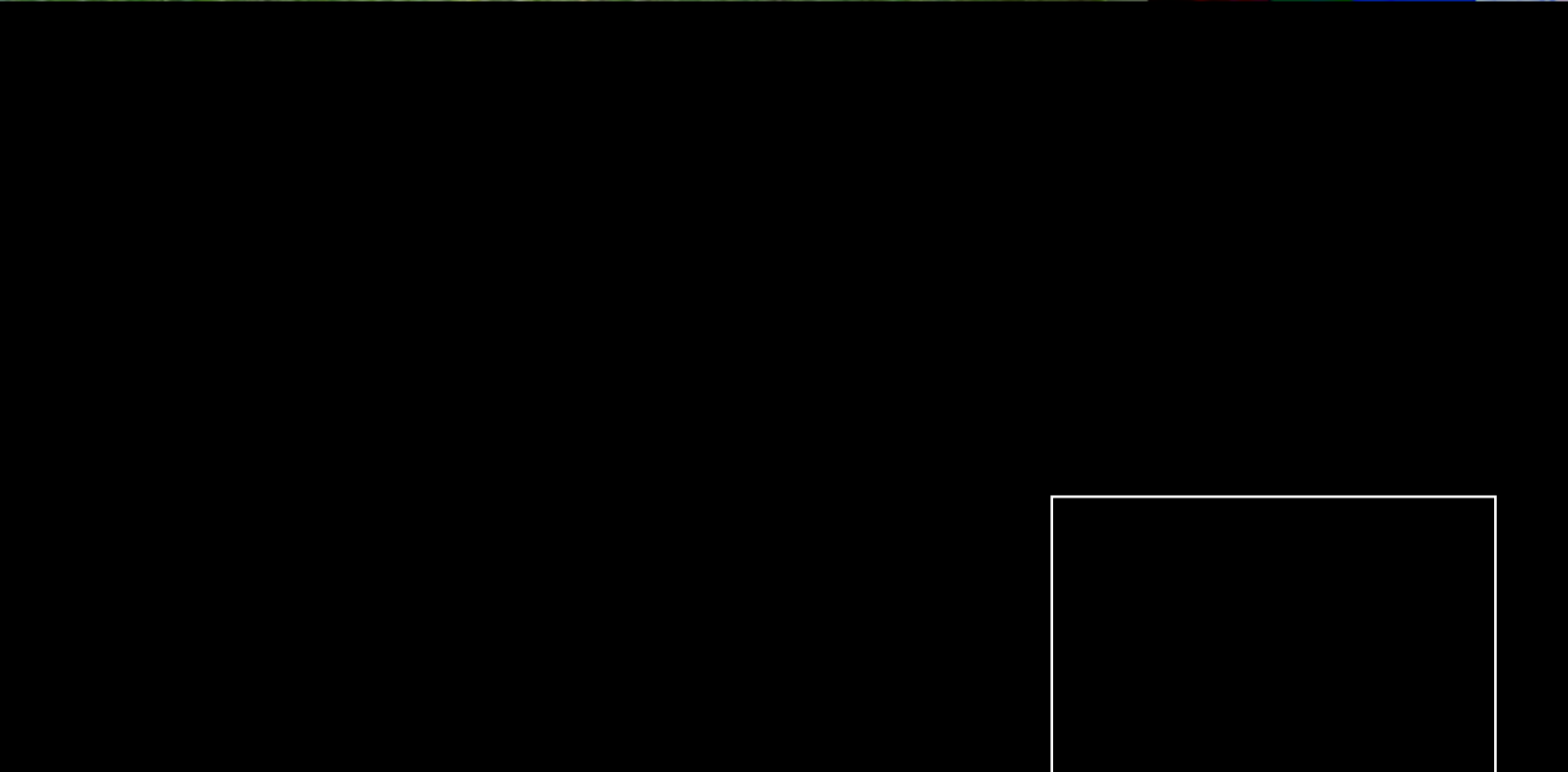
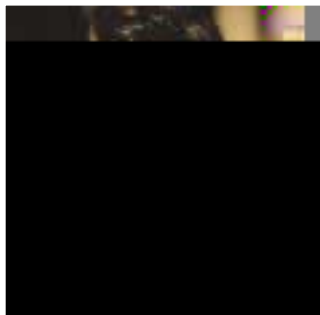
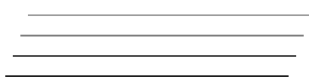


CLEAN AIR TASK FORCE



CLEAN AIR TASK FORCE





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Copies of the report and state fact sheets are available at:

www.cleartheair.org

<http://clnatf.org>



Millions of children in America today are exposed to



Our children are at risk from power plant pollution:

- Over 25 million children in the U. S. live in counties that violate national air quality standards for the common pollutants ozone, particulate matter and sulfur dioxide;
- Cases of asthma have rapidly increased, more than doubling in the past two decades. Six percent of U.S. children have asthma;
- Thirty-five million of our children live within 30 miles of a power plant — a distance within which local communities may reasonably be affected by a power plant's smoke plume; an estimated 2 million of these children are asthmatic and are particularly susceptible to these pollutants;
- 72,000 of our schools are within 30 miles of a power plant;
- Average health risks to children due to exposure to power plant combustion wastes could be up to 10,000 times higher than EPA's allowable risk levels for cancer and other illnesses.

Power plants are a major source of the most common pollutants in the air that harm children. Power plants emit 67 percent of the sulfur dioxide (SO₂), 23 percent of the nitrogen oxides (NO_x), 33 percent of the mercury, and 38 percent of the carbon dioxide from energy related sources. In m

Key findings of recent studies include:

For all children:

- As fine particulate levels rise, emergency room visits by asthmatic children also increase, even when fine particulate levels are *below* EPA's air quality standard;
- Exposure to particulate matter can slow lung function growth in children;
- Children living in high ozone communities and who played sports year-round were three times more likely to develop asthma compared to children who did not play sports. This is some of the first evidence suggesting smog can cause asthma;
- Methylmercury can have adverse effects on the developing and adult cardiovascular systems, blood pressure regulation and heart-rate variability;
- Global warming could lead to more frequent and severe air pollution problems, the spread of infectious and communicable diseases, and increasingly extreme weather events such as heat waves that could disproportionately affect children.

For unborn children (prenatal):

- A new California study suggests prenatal ozone exposures may cause heart defects;
- Research in a coal dominated region of the Czech Republic indicates that stunted development in unborn children may be a result of exposure to very high levels particulate matter;
- Researchers in China have found that high concentrations of particulate matter may affect developing babies;
- Methylmercury interferes with the development and function of the central nervous system. Prenatal exposure from maternal consumption of mercury-contaminated fish can result in problems later in childhood such as learning disabilities, attention deficits, loss of

IQ points or other disorders depending on the severity of exposure. Ten percent of women of child-bearing age are estimated to carry a body burden of mercury contamination above EPA's safe level.

For newborns:

- U.S. researchers in a study of 86 cities found that infants who lived in a highly polluted city during their first two months of life had a mortality rate ten percent higher than infants living in the city with the cleanest air;
- A preliminary study projects that eleven percent of the infant mortality in the United States is attributable to particulate matter even at low to moderate levels;
- Exposure to ozone may permanently affect lung structure of children; monkeys exposed to ozone developed little more than half of the normal number of branches of their lungs compared to monkeys exposed only to clean air;
- A recent study suggests that asthmatic children that were born pre-term and/or with low birth weights, are at greater risk from ozone exposures;
- The ten percent of women above EPA's safe level of mercury translates nationally into 6 million women of childbearing age with elevated levels of mercury from eating contaminated fish, and approximately 390,000 newborns at risk of neurological effects from being exposed in utero to elevated levels of mercury.

Association between Air Pollution and Lung Function in Southern California Children

Fetal Growth and Maternal Mercury Exposure

Jan DeJmek,¹ Sherry G. Seaman

Recommendations

While the benefits of reducing power plant pollution have been estimated for adults and are many times the cost of emissions controls, little work has been done to quantify the benefits for children. But, certainly the benefits will be great. Quality of life can be improved. Premature death can be avoided. The cost of health care can be decreased.

Comprehensively reducing pollution from coal-fired power plants will address each of the threats from air pollution that children face. Power plants must be required to comply with modern emission control standards. In addition, the nation's power fleet should be held to nationwide caps on all four of the key types of power plant pollution including nitrogen oxides, sulfur dioxide, mercury and other air toxics, and carbon dioxide. Reducing power plant emissions of nitrogen oxides and sulfur dioxide by at least 75 percent beyond current legal requirements will dramatically reduce fine particulate matter pollution so that children can breathe more easily.

The threat of power plant air pollution to children can only be meaningfully reduced when the Clean Air Act's 30-year loophole that allows old and dirty power plants to escape modern standards is finally closed. Once this is accomplished, U.S. energy policy will better account for

public health and the environmental costs associated with electricity production. This will propel us toward a more sustainable energy future that relies increasingly on cleaner sources of energy including renewable energy resources and conservation.

Strategies that will reduce carbon dioxide pollution from power plants will not only curb emissions of a greenhouse gas that causes climate change, but will provide the added benefits of reducing exposure to air pollutants, decreasing the risk of the spread of infectious diseases, and reducing temperature-related stress on children.

Our children's health and quality of life are harmed by air pollution today. The specter of global warming hangs over their future. We can leave our children a legacy of cleaner air and an improved environment by making wise choices today. Let's make comprehensive power plant clean up our gift to them.



children in the U. S. live in counties that violate national air quality standards for the common pollutants ozone, particulate matter and sulfur dioxide.¹³ Nearly two million of the children in areas violating air standards are asthmatic and are particularly susceptible to these pollutants.

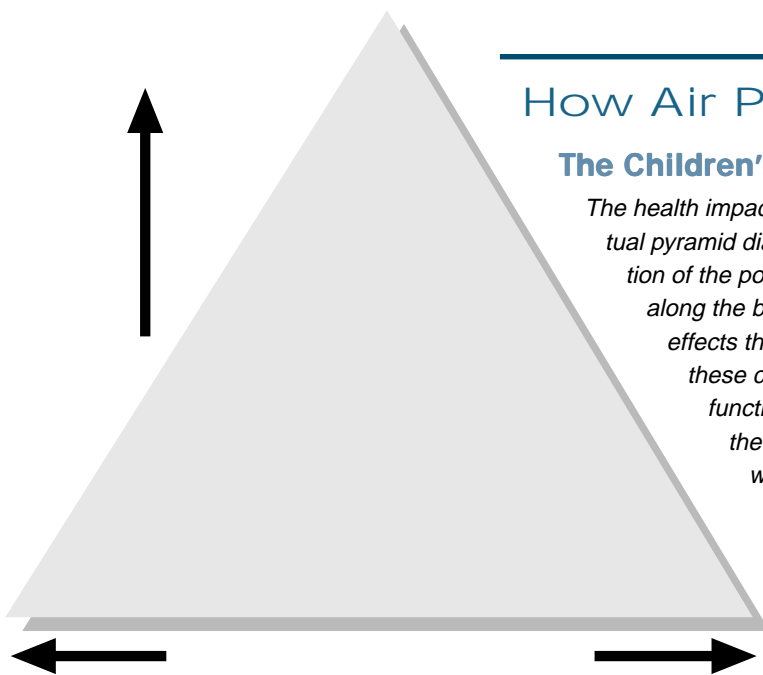
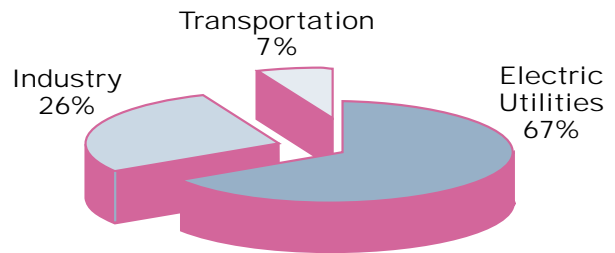
Many of America's children also live close to and go to school near power plants. Thirty-five million of our children live within 30 miles of a power plant – a distance within which local communities may be directly affected by a power plant's smoke plume.¹⁵ An estimated 2 million of these children are asthmatic. What's worse, 72,000 of our schools are within 30 miles of a power plant. (See *state statistics, Appendix A and ranked exposure profiles, Appendix B.*) Also, as described below, children living near power plants may also inhale various other air toxics emitted from the smokestack or may be exposed to pollutants in power plant combustion wastes released into ground water.

Power Plants are the Largest Sources of Air Pollution in the U.S.

Power plants are a major source of the most common pollutants in the air that harm children. In 1998, power plants emitted 67 percent of the sulfur dioxide (Figure 1) 25 percent of the nitrogen oxides, 34 percent of the mercury and 38 percent of the CO₂ in the United States.^{16,17,18} Moreover, after spewing from smokestacks right in our communities, these pollutants combine in

the atmosphere forming "secondary pollutants".¹⁹ Secondary pollutants, particularly ozone and sulfate, are some of the most harmful and widespread. For example, nitrogen oxides form acidic nitrate particulate matter, nitric acid droplets and ozone smog. Sulfur dioxide emissions from power plants form sulfate particulate matter and sulfuric acid. Sulfates are the dominant contributor to fine particulate matter in many areas of the U.S., especially in the eastern half.²⁰ Burning coal also releases highly toxic mercury and other toxic air emissions. Coal-fired power plants are the largest U.S. source of air toxics.²¹ Smokestacks directly emit toxic metals and gases directly into the atmosphere such as mercury, arsenic, chromium, beryllium and acid gases such as hydrochloric acid. Stack tests at the nation's coal-fired power plants have detected sixty-seven different air toxics emitted from the smokestacks.

Figure 1 – Sources of Sulfur Dioxide in the U.S., 1999.¹⁶ Electric utilities comprise two thirds of all sulfur emissions.



How Air Pollution Harms Children

The Children's Health Impacts Pyramid¹⁴

The health impacts of air pollution on children are illustrated in a conceptual pyramid diagram. The base of the pyramid represents the proportion of the population at risk from air pollution. Children represented along the base experience some symptoms beginning with subtle effects that may either go untreated or need no treatment. Of these children, however, some will have small changes in lung function, increased symptoms and medication use (higher up the pyramid). With more severe exposures, some children will see physicians and be prescribed medications or be admitted to the hospital. For the children represented by the top of the pyramid, in the worst instances, permanent changes may occur in the developing lungs of children and in some cases pollution can result in death.

Particulate Matter Dangerous for Children to Breathe

Particulate matter is, perhaps, the most pervasive and harmful pollutant from power plants plaguing America's children (Figure 2). During the hot, hazy days of summer, it is the particulate matter haze that you see hanging in the air not just humidity. While power plants directly emit some particulate matter as soot, the sulfur dioxide gas from power plants is a major source of particulate matter as it becomes transformed into tiny acidic sulfate particles in the atmosphere. These tiny particles are the most harmful and therefore of greatest concern. Fine particulate matter is of concern because it penetrates into our indoor living spaces thereby increasing our exposure. Fine particulate matter, known as $PM_{2.5}$, less than 2.5 microns in diameter or 1/100th the width of a human hair is deposited deep in the lung where it can affect both the respiratory and cardiovascular systems. Power plants release more tons of particulate matter-forming sulfur dioxide than any other pollution source. This means that power plants are responsible for about half of the fine particulate matter in many parts of the U.S. Epidemiological studies have suggested that sulfate-related particles are among the most strongly associated with health impacts and premature mortality in adults due to heart attacks, respiratory disease and lung cancer.^{22,23,24}

A recent report estimated that 30,000 premature adult deaths a year occur because of particulate matter.²⁶ However, children may be at even higher risk for particulate matter exposure than adults.²⁷ One factor contributing to this higher risk may be that their exposure to fine particulate matter can be much higher than adults.²⁸ Another factor may be that children are more susceptible to the effects of particulate matter

than adults. Studies in the U.S. have shown that emergency room visits by asthmatic children increase when particulate matter levels rise just slightly above the national air quality standards.



The benefits of reducing particulate matter are clear. For example, in a study undertaken in Germany, changes in respiratory disorders in children were tracked as particulate matter and sulfur dioxide in the air declined in East Germany following the fall of the Berlin Wall.³⁴ The results suggest that non-asthmatic respiratory symptoms such as coughing, chronic bronchitis, ear infections, frequent colds and febrile infections declined in parallel with improving air quality.

Lung Growth in Children is Decreased by Particulate Matter

Can exposure to particulate matter permanently affect a



at risk

Ozone Smog Harms Developing Lungs

Ozone, Another Byproduct of Fossil Power is Hazardous to Children

Millions of children live in areas that violate national air quality standards for the ozone (see Table 1). Ground level ozone—the main component of smog—is formed in the presence of sunlight from nitrogen oxides and

concern. The potential effects of exposure to these pollutants may be cancer or a range of developmental problems such as learning disabilities, attention deficits, loss of IQ points or other disorders depending on the severity of exposure. Many air toxics are also respiratory irritants that can worsen conditions such as asthma.

Children are Exposed to Power Plant Air Toxics in Many Ways

Some air toxics bioaccumulate in the food chain and are ingested as part of our diet, while still others are dispersed globally and contaminate regions far from the emitting source. Exposure to air toxics from power plants may occur from direct inhalation of air pollutants, or "indirect exposure" including the ingestion of meat, dairy products and fish, as well as water, soil, or vegetation that becomes contaminated by air emissions that have deposited to earth and accumulated in the food chain. Pollutants for which indirect exposure is particularly important are mercury, arsenic, dioxins, cadmium and lead. Some toxics may be absorbed through the skin. Absorption through the skin of some power plant air toxics may also occur, especially from direct contact with contaminated water or soil. Another important exposure pathway for children is the ingestion of contaminated soil during play.

Children also can be exposed to contaminants in power plant combustion wastes. Minefilling (i.e., dumping large volumes of combustion waste in abandoned mines) and the disposal of combustion waste in unlined surface impoundments and landfills can contaminate groundwater (a source of drinking water). Agricultural uses of combustion waste as a soil amendment directly contaminates the soil and can contaminate nearby areas with windblown dust. Combustion waste is largely made up of ash and other uncombusted materials that are left when coal and oil are burned. Each year more than 100 million tons of waste is generated from coal and oil combustion. These wastes contain concentrated levels of numerous contaminants, particularly metals like mercury, arsenic, lead, chromium and cadmium.

How Hazardous Pollutants from Power Plants Get into the Environment

Because power plant waste is generally disposed of at the plant site, children living in the vicinity of power plants experience the highest exposure to coal combustion waste and consequently have the highest risk of adverse



combustion waste leaked from surface impoundments or ash landfills and contaminated drinking water wells.⁹¹

EPA found that if children drink, over a period of years, an average amount of water contaminated with combustion waste, they will have a higher risk of cancer and other health effects. The EPA found the highest potential risks to children from contaminated groundwater were from arsenic, chromium VI, nickel and selenium.

The EPA also analyzed other ways children might be exposed to power plant combustion waste such as inhalation and the ingestion of fruit, vegetables, beef and dairy products contaminated by the wastes.⁹² The highest risks predicted for inhalation were from chromium VI that



bioaccumulation. Consequently, larger predator fish have higher concentrations as a result of eating contaminated prey.⁹⁹

Mercury contamination in fish across the United States is so pervasive that health departments in 42 states have issued fish consumption advisories.¹⁰⁰ In addition, 11 states have consumption advisories for every inland water body for at least one fish species; 6 states have consumption advisories for canned tuna, and 8 have statewide coastal marine advisories for king mackerel. The U.S. Food and Drug Administration has also issued a consumer advisory for pregnant women, women of child-bearing age, nursing mothers and young children. These groups are advised not to eat swordfish, tilefish, shark and king mackerel because of high mercury levels.¹⁰¹

Methylmercury is both a developmental toxin and a neurotoxin. A spectrum of health effects has been observed following exposure, with the severity of effects depending largely on the amount and timing of exposure.¹⁰² Children and the developing fetus are most vulnerable to mercury exposure. Methylmercury that is consumed by the mother passes through the placenta to the developing fetus. Mercury exposure prior to pregnancy is as critical as exposure during pregnancy because it persists in tissues and is slowly excreted from the body. The first weeks of pregnancy also represent a critical time for fetal development. Women of childbearing age (i.e., 15 to 44 years of age) and pregnant women are therefore the most important members of the population in terms of mercury exposure.¹⁰³

In addition to exposure in utero, infants and children ingest methylmercury from breast milk and other foods in their diet. Children and infants are sensitive to mercury's effects because their nervous systems continue to develop until about age 14. Children also have higher exposures than adults because a child eats more food relative to his or her body weight than an adult does. As a result, they have a higher risk for adverse health effects than adults do.¹⁰⁴

Methylmercury interferes with the development and function of the central nervous system. Prenatal exposure from maternal consumption of fish can cause later impairments in children. Infants appear normal during the first few months of life, but later display subtle effects. These effects include poor performance on neuro-

behavioral tests, particularly on tests of attention, fine

much of this increase can be attributed to environmental exposures? The National Academy of Sciences (NAS) recently concluded that as many as 3 percent of known developmental and neurological deficits in children are caused by exposure to known toxic substances, including developmental and neurological toxins. The panel also concluded that 25 percent of these problems may be the result of environmental and genetic factors working in combination, and that toxic substances may play a significant but yet undetermined role.¹¹¹

Using this estimate, the National Environmental Trust (NET), Physicians for Social Responsibility and the Learning Disabilities Association of America calculated that 360,000 children – or 1 in 200 children suffer from developmental or neurological defects caused by exposure to known toxic substances including developmental and neurological toxins.¹¹² They note however that this number is likely underestimated because the NAS considered only known developmental and neurological toxicants. Remarkably, information about potential neurotoxicity and developmental neurotoxicity



Greenhouse Gas Mitigation Benefits to Children's Health

The health of America's children is linked to climate change too. Scientists in the U.S. and worldwide agree that changes in the Earth's atmosphere are occurring due to the build up of carbon dioxide in our atmosphere from burning fossil fuels. In fact, power plants release 38 percent of all of the carbon dioxide emitted from burning fossil fuels in the U.S.¹¹⁶ By reducing emissions from power plants and other CO₂ sources we can diminish the impact of climate change and with it the expected spread of infectious diseases, increased heat and cold-related illnesses, and increased smog formation and the resultant respiratory illnesses.

In a 2001 report to the President, a panel of the National Academy of Sciences concurs with the Intergovernmental Panel on Climate Change (IPCC) scientific report that concludes that global average surface temperatures may increase by 3-10 degrees Fahrenheit by the end of the 21st Century as a result of human activities.¹¹⁷

The potential health impacts associated with climate change are still being assessed, however, based on what we know some early conclusions can be drawn.^{118,119} Potential human health risks include increased preva-

AK	1	1	7,220	10,281
AL	9	15	645,531	57,092
AR	3	5	245,378	35,088
AZ	6	7	213,144	68,563
CA	0	1	5,271	473,486
CO	13	18	777,975	55,524
CT				

Appendix B: Ranked Exposure Profiles for Children within 30 Miles of a Coal-Fired Power Plant.

State	Children with Pediatric Asthma	Pediatric Asthma (State Rank)	Total State Coal Plant Air Emissions (tons)	Emissions per Child / 30 Mile Radius (tons)	Emissions per Child / 30 Mile Radius (State Rank)	Schools / 30 Mile Radius	Schools / 30 Mile Radius (State Rank)	Children in Non-Attainment Areas / 30 Miles of Coal Plant
AK	406	47	0	0	44	0	48	5,938
AL	34,733	21	88,323,224	137	10	1,992	13	189,779
AR	14,090	30	28,644,100	117	16	841	26	0
AZ	13,952	31	47,135,216	221	9	232	35	188,021
CA	339	48	0	0	44	1	47	5,271
CO	50,336	17	40,535,866	52	29	713	28	523,415
CT	8,715	34	2,287,185	15	41	600	29	151,632
DC	5,244	36	0	0	44	389	32	117,092
DE	8,312	35	5,670,211	40	34	266	34	142,099
FL	90,859	8	77,702,956	56	27	1,723	17	0
GA	78,897	9	83,778,288	67	23	2,379	10	674,716
IA	30,470	22	40,512,642	71	21	1,016	24	0
ID	71	49	0	0	44	0	48	0
IL	157,659	2	92,931,607	34	36	7,464	1	2,034,274
IN	62,469	14	137,162,285	122	15	1,743	15	168,690
KS	18,157	25	39,717,525	126	14	1,051	23	0
KY	44,158	20	104,420,412	129	13	1,326	20	90,616
LA	17,199	27	24,287,341	73	20	568	30	121,999
MA	28,266	23	13,806,340	28	39	1,729	16	499,994
MD	66,360	12	32,503,474	29	38	2,075	12	1,027,336
ME	1,541	44	0	0	44	17	44	29,352
MI	106,194	5	75,587,293	39	35	3,079	7	0
MN	52,479	16	38,300,886	43	33	1,147	21	149,632
MO	65,728	13	71,722,251	62	25	4,630	4	482,500
MS	14,468	29	15,678,705	60	26	537	31	0
MT	2,553	41	17,955,967	376	6	163	39	34,708
NC	74,947	10	73,944,757	63	24	1,659	18	0
ND	1,943	43	37,382,883	966	2	172	38	0
NE	17,706	26	21,435,881	68	22	822	27	111,898
NH	12,630	32	4,706,364	22	40	190	37	205,132
NJ	99,488	6	9,815,066	6	43	1,421	19	1,696,787
NM	3,539	39	33,799,488	555	5	98	41	0
NV	929	45	20,289,092	1,760	1	12	45	5,454
NY	179,051	1	25,760,999	8	42	3,453	6	2,634,480
OH	139,029	4	137,570,633	53	28	7,107	2	836,411
OK	16,611	28	38,849,383	132	11	348	33	0
OR	761	46	4,021,645	319	7	12	46	0
PA	140,949	3	112,280,946	43	32	5,117	3	2,047,542
RI	11,966	33	0	0	44	64	42	215,366
SC	48,567	19	41,015,630	47	30	3,885	5	0
SD	2,327	42	4,159,081	95	18	159	40	0
TN	49,941	18	65,294,367	76	19	2,817	9	226,307
TX	92,386	7	163,298,619	108	17	1,059	22	682,338
UT	2,603	40	37,118,861	798	3	48	43	3,576
VA	73,891	11	39,780,790	32	37	2,136	11	371,590
VT	0	50	0	0	44	0	48	0
WA	5,116	37	10,451,134	129	12	894	25	0
WI	60,829	15	51,081,291	47	31	1,832	14	514,494
WV	19,642	24	92,265,497	231	8	2,987	8	14,165
WY	3,880	38	51,357,490	674	4	190	36	0
US Total	2,032,385		2,154,343,671			72,163		16,202,605

Data: MSB Energy Associates; 2000 Emissions (PM10, ozone, SO2, NOX, VOC, mercury, acid gases, CO2); 1998 asthma statistics: ALA; 1997 children statistics: U.S. census estimate; non-attainment data: EPA Green Book as of January 15, 2002.

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