Dangerous Days of Summer

ENVIRONMENTAL DEFENSE
finding the ways that work

Dangerous Days of Summer

AUTHORS
John Balbus, M.D., M.P.H.
Yewlin Chee

ENVIRONMENTAL DEFENSE
finding the ways that work

Cover photos: Lester Lefkowitz/Corbis (smokestacks), Photodisc/Getty Images (girl with breathing mask).

Our mission
Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

Printed on 100% (50% post-consumer) recycled paper, 100% chlorine free.

The complete report is available online at www.environmentaldefense.org.

Contents

Acknowledgments

The authors would like to acknowledge the teamwork and significant efforts on the part of many that went into producing this report. Jessica Mendelowitz helped write and edit the report and also provided critical support in managing the project and keeping it on schedule. Vickie Patton and Andy Darrell helped conceptualize and write key sections. Michael Replogle and Mark MacLeod also helped write important sections. Tracy Andres and Richard Denison assisted with the data analysis. Karen Florini contributed to the original concept for the analysis. Marcia Aronoff gave guidance and constructive editing.

Many thanks to Bonnie Greenfield for swiftly and surely completing the design and layout of the report, and to Allison Cobb and Anna Brinsmade for skillful copy editing.

Executive summary

Kids and summer. The two go together. Summer is the time of year when children get their fill of outdoor fun. But here's a fact that many parents may not know: Half of Americans—more than 160 million people—live in places that fail to meet healthy air standards set by the Environmental Protection Agency (EPA). That child running to catch a ball on a summer afternoon may be breathing air filled with unhealthy particles, smog and other pollutants.

There is no question that dirty air threatens health, contributing to problems like asthma, heart and lung disease, and cancer. Asthma has increasingly gained attention as a nationwide epidemic and a symbol of the manifold health impacts of air pollution. It is the nation's fastest growing chronic disease, afflicting more than 22 million Americans. Asthma rates among children under the age of four have more than doubled over the past two decades. The *Journal of the American Medical Association* has called on policymakers to take stronger steps to reduce air pollution as a way to improve the health of people with asthma.[1]

Evidence suggests that both ozone smog and particulate pollution trigger respiratory problems. For example, consider a study of Atlanta during the 1996 summer Olympics. The report indicates that policies to reduce car traffic during the Olympics also reduced peak ozone concentrations by 28% and hospitalizations for asthma by almost 20%.[2] The importance of particulate pollution on children's respiratory health was demonstrated by a study of the effects of temporarily closing a steel mill in Utah Valley. During the year the steel mill was closed because of labor disputes, particulate pollution dropped by half, and children's hospital admissions for respiratory problems were two to three times lower than usual.[3]

In this study, we call on policymakers and industry leaders to reduce by 80% the most important sources of air pollutants that trigger asthma. Achieving this goal will also help alleviate the other health problems caused by air pollution nationwide.

Dangerous days of summer

Every summer, the health of millions of kids is put at risk when air pollution rises above healthy levels. These "dangerous days of summer" affect kids nationwide, and especially in the country's larger population centers.

This report ranks the 50 major population centers in the United States where the worst air pollution impacts the greatest number of kids. Metropolitan areas were ranked by multiplying the average number of days the air quality was unhealthy according to the EPA over three summers by the number of affected children under 17. Therefore, cities with fewer high-alert days but more affected children sometimes ranked worse than cities with fewer children. The ten cities with the most dangerous days are Los Angeles, Riverside-San Bernardino, New York City, Philadelphia, Chicago, Washington, DC, Houston, Baltimore, Atlanta and Detroit.

Over the past three summers, for example, an average of one out of every five days was considered dangerous for healthy children in Los Angeles to play outside. For the more than 200,000 children in Los Angeles with asthma, nearly half the days of summer put them

at risk. The Riverside-San Bernardino area, which ranked second because of its lower population of children, had even worse air quality. In this city, an average of nearly 70% of summer days were dangerous for children with asthma, and more than one-third of summer days were harmful for all children. Although this study shines a spotlight on children's health, the same air pollution impacts the health of adults, especially the elderly and those with asthma and heart disease.

The rankings in this report provide a national snapshot, but each city faces its own challenges. Some neighborhoods may be disproportionately affected by high levels of local air pollution from specific sources, like truck routes, power plants, industrial facilities and diesel vehicle depots. This local air pollution is a critical determinant of children's health. In some parts of Harlem in New York City, for example, a quarter of school-age children suffer from asthma, one of the highest rates in the country. While this national snapshot shows action is needed to control air pollution in every city, the need is even stronger in these especially affected communities.

The solution: reduce pollution from smokestacks and tailpipes

Available technology makes it practical to cut the major sources of air pollutants that trigger asthma by 80% over a ten year period. This report provides a blueprint for how to achieve that goal. It calls for action in three areas:

1. Clean smokestacks: EPA must strengthen and finalize its proposal to

Ranking of top Metropolitan statistical areas by total "dangerous days of summer" when children are exposed to unhealthy air

The ranking combines the number of days with unhealthy air quality and the number of children affected.

Rank	Metro statistical area	"Dangerous days of summer"	Estimated number of children with asthma	% summer days dangerous for children with asthma
1	Los Angeles, CA	58,345,945	224,657	50
2	Riverside-San Bernardino, CA	38,782,050	88,502	70
3	New York City, NY	13,892,795	188,596	22
4	Philadelphia, PA	12,966,235	106,561	25
5	Houston, TX	8,369,726	105,929	20
6	Washington, DC	7,644,442	98,627	22
7	Chicago, IL	7,581,358	187,629	19
8	Baltimore, MD	6,783,065	54,089	24
9	Atlanta, GA	6,640,293	97,516	21
10	Detroit, MI	4,937,067	118,708	16
11	Fresno, CA	4,536,115	24,644	58
12	Sacramento, CA	4,524,544	38,804	33
13	Bakersfield, CA	4,110,388	17,838	65
14	Dallas, TX	3,694,064	87,129	19
15	Boston, MA	3,362,081	62,119	14
16	St. Louis, MO-IL	3,331,538	56,992	21
17	Cleveland, OH	3,268,093	47,258	21
18	Pittsburgh, PA	2,839,664	42,494	29
19	Fort Worth-Arlington, TX	2,550,867	41,798	23
20	Charlotte, NC	2,313,015	34,053	21

clean up particulate and smog pollution from eastern power plants. EPA should also expand its clean smokestack initiative nationwide so that millions of American families in the West are not left behind. Proven technology can scrub and chemically remove smog- and particulate-forming pollutants from power plant smokestacks, cutting these emissions significantly.

2. Clean diesel: Cleaner fuel and retrofit technologies can make deep cuts in particulates and smog-forming pollutants in diesel exhaust. EPA recently adopted strong standards for new diesel engines, but because of the slow fleet turnover of existing engines, the federal standards won't deliver their full promise until 2030 or later. To maximize public health protections in the next decade, a parallel commitment by industry and government to clean up existing engines is needed. Within ten years, existing diesel engines should meet or exceed the federal standards for new engines. A federal funding program should also be expanded beyond school buses to other sectors to help achieve this goal.

3. Reduced exposure to road pollution: Federal leaders must devise a national transportation policy that relies on market tools to limit traffic congestion, increase travel options, promote smart growth and encourage cleaner vehicles. Better incentives can help cut traffic growth and related pollution. The Clean Air Act requires that planned investments in transportation must take the impacts on air quality into account. These provisions of the law have lately come under attack, and they must be protected.

If these steps are taken now to cut pollution, the mother of a child born today can be confident that by the time her child is in the fifth grade the air she breathes will be substantially cleaner.

Toward a healthier future

Cleaner air is possible. The technology exists to substantially cut pollution from smokestacks and tailpipes, and some American companies are already bringing these technologies to market. For example, Environmental Defense worked with FedEx Express to develop the next generation of cleaner trucks. FedEx has now put into service hybrid delivery vehicles that emit 90% less pollution and travel 50% farther on a gallon of fuel. The technology has the potential to replace 30,000 FedEx delivery trucks. Many other fleet owners have expressed interest in the technology. Policies that support investments in cleaner technology will help bring these cleaner vehicles to market sooner.

States and cities across the country have designed programs that can serve as national models for cutting power plant pollution, retrofitting diesel engines, and using incentives to manage traffic pollution. A law in North Carolina goes above the national standard for power plant emissions, cutting particulate and smog-forming pollution by more than 70%. New York City recently passed a law that could cut by up to 90% diesel emissions from heavy construction machinery used in city projects. Introducing time-of-day tolls on Hudson River crossings gave an incentive for drivers to travel at off peak times. The plan helped cut traffic congestion and therefore pollution significantly and toll revenues support regional transit and transportation infrastructure projects.

At the federal level, the Clean Air Act provides the framework needed to

reduce pollution nationwide. The law must remain strong, and federal officials must build on 30 years of success in reducing pollution to implement the measure's full promise.

For the more than 160 million Americans still living in places with unhealthy air, the job is not yet done. This report outlines steps to reduce pollution that are practical, achievable and cost-effective. By lowering harmful pollution from smokestacks and tail-pipes, we can help bring an end to the dangerous days of summer.

Introduction

Kids and summer—it's a combination that cannot fail to bring a smile to anyone's face. But here's a surprising fact that many parents may not know: more than half of all Americans—over 160 million people—live in places that fail to meet basic healthy air standards set by Environmental Protection Agency (EPA). As kids run to catch a ball on a summer afternoon, they may be breathing air filled with unhealthy particles, smog and other pollutants.

Despite some improvements in air quality over the past 30 years, air pollution continues to diminish most Americans' quality of life. Ozone (smog) and particulate pollution (soot) are two of the biggest pollution hazards for public health. Nearly 160 million Americans live in areas where ozone smog levels exceed national standards and rise high enough to damage their lungs or trigger asthma attacks. Some 99 million Americans live in areas that exceed annual fine particle standards according to EPA. Exposures to air pollutants may be higher in minority or low-income communities, which are disproportionately located in urban areas with poor air quality.

While everyone exposed to high levels of air pollution suffers some harm, people with asthma are especially vulnerable. Mary Hintikka from Houston, TX struggles to cope with the dilemmas that air pollution creates for her and her asthmatic son, Phillip. The high pollution levels in Mary's community are a deciding factor if Phillip should attend outdoor birthday parties or summer camp.

Mary and mothers like her have good reason to worry. Over the past 25 years, the number of people with asthma has risen steadily. Particularly hard hit are inner-city communities of color. Recent studies have shown as many as 25% of children in inner-city neighborhoods suffer from asthma. Public health experts have not determined the cause of this increase in asthma incidence, but they agree that air pollution can trigger asthma attacks.

Most major forms of air pollution cause asthma attacks by increasing inflammation in the lungs and airways. This leads to worsened breathing, the need to take more asthma medication, and more emergency and hospital visits. Studies show that air pollution often teams up with other asthma triggers, like viral infections and pollens, to produce more severe asthma attacks. At present, there is no cure for the 22 million children and adults with asthma in the United States, but air pollution is one trigger that can be addressed.

The importance of ozone in triggering summertime asthma attacks is corroborated by a study of Atlanta during the 1996 summer Olympics. Policies that reduced car traffic during the Olympics were shown to reduce peak ozone concentrations by 28% and asthma hospitalizations by almost 20%.[4] Evidence of the effects of particulate pollution on local children's respiratory health was demonstrated by a study of a community located near a steel mill in Utah Valley. During the year that the steel mill was closed by labor disputes, particulate pollution was cut in half and children's hospital admissions for respiratory problems were two to three times lower than when the mill was in operation.[5]

All of these studies and personal sagas present a compelling public health need to reduce smog and fine particle pollution until levels are achieved that do not cause significant harm. For the millions of children and adults with

asthma, the stakes are high. They must constantly balance their medications against airborne asthma triggers and make choices about their activities in order to be able to breathe. And for susceptible adults who are placed at risk of death and severe illness from lung and heart disease worsened by smog and fine particle pollution, the stakes are even higher.

The good news is that there is a lot that can be done to reduce air pollution from current levels in a cost-effective way. This report calls for the reduction of the most important sources of air pollutants that trigger asthma by 80%. This action will address the broad array of health problems caused by air pollution, including heart and lung disease, cancer risk and premature mortality in adults.

CHAPTER 1

Air Quality Index: decoding code purple, red and orange days

The Air Quality Index (AQI) is an EPA guide of health effects that may be caused by air pollution in a local area. An AQI value of 100 for an air pollutant generally indicates that concentrations of that pollution are at the level of its national standard. Index values above 100 mean that pollutant exceeds its national standard. On any given day, the AQI that is reported corresponds to the air pollutant that is most elevated compared to its standard. Thus, on one day the AQI may be reported for ozone, but if on another day particulate pollution is more elevated than any other pollutant compared to the national standard, the AQI for that day will communicate the health risks from particulate pollution. The AQI is coded by a color scale, with each color representing different degrees of health risks.

On a code green or yellow day, the majority of the population will not feel any impact from air pollution. Orange, red, purple and maroon days present increasing degrees of health threats.

A code orange day occurs when the level of air pollution is high enough for sensitive members of the population to experience ill health effects. When a code orange day results from high ozone smog or fine particle pollution, children with asthma are sensitive and advised to avoid the outdoors.

A code red day occurs when the level of air pollution is high enough for everyone to suffer health effects. Members of the population who are particularly sensitive to pollution could experience more severe effects on code red days. Accordingly, all children are advised to avoid outdoor exertion on code red days.

Pollution on code purple and maroon days is significant enough for the entire population to be in danger of more severe health consequences. Fortunately, code maroon days are exceedingly rare. Children, especially asthmatic children, are at higher risk for ill health effects from air pollution on code red, purple and maroon days; even the simple act of playing outdoors can become a health hazard.

Air Quality Index Levels of health concern	Numerical value	Meaning
Good	0-50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51–100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for sensitive groups	101–150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151–200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201–300	Health alert: everyone may experience more serious health effects.
Hazardous	300	Health warnings of emergency conditions. The entire population is more likely to be affected.

Source: http://www.epa.gov/airnow/aqi.html

CHAPTER 2

Calculating the dangerous days of summer

To demonstrate how air pollution impacts the lives of children, 50 metropolitan statistical areas (MSAs) in the United States were ranked according to where the worst air quality affected the greatest number of children. Because children are more likely to be exposed to air pollution during summertime outdoor play, the analysis was limited to the period between Memorial Day and Labor Day. Air quality data for the years 2001 through 2003 were obtained from EPA and the number of unhealthy summer air quality days was averaged over these three years. Those cities with the largest combination of unhealthy air days and children affected ranked the highest (for a full explanation of data sources and methods used, see Appendix A).

The results show that for many children around the country, breathing outdoor air is a health threat during a significant portion of the summer. Over the past three summers, for example, healthy children in Los Angeles were at risk if they played outside during 20% of the summer. For the more than 200,000 children in Los Angeles with asthma, nearly half the days of summer put them at risk of worsening their disease. The Riverside-San Bernardino area, which ranked second, had even worse air quality, with an average of nearly 70% of summer days putting children with asthma at risk, and 35% of summer days having air quality that was harmful for all children. Despite having a greater number of unhealthy air days than Los Angeles, this area ranked second because the number of affected children in the area was much lower.

Children in major metropolitan areas in the East, Midwest and South also faced significant health threats, with a greater proportion of dangerous days due to excessive particulate pollution. In New York for example, over 180,000 children with asthma were endangered breathing the air on an average 22% of summer days between 2001 and 2003. About 40% of New York's dangerous days were related to excessive particulate pollution. On average, the 2.3 million children with asthma who live within the 50 top-ranked MSAs were endangered breathing summertime air on 23% of days, and 28.8 million children risked their health breathing summertime air 6% of the time.

This analysis provides a national or regional snapshot, but each community faces its own challenges. Within any one city, some neighborhoods may be disproportionately affected by high levels of local air pollution from specific sources, like truck routes, power plants, industrial facilities and diesel vehicle depots. Exposure studies show that particulate pollution can vary widely depending on how close one is to the source. Studies in school buses, for example, have shown that children can be exposed to particulate pollution levels several times higher than the levels in outdoor air.[6] Because of differences in the prevalence of diseases like asthma in different communities, local air pollution may have a disproportionate effect on children's health. In some parts of Harlem in New York City, for example, where 25% of school-age children suffer from asthma, local air pollution is a critical health determinant. At the national level, the need for action is clear but the need is even greater in these highly affected communities.

For areas like Los Angeles, Riverside, Fresno and Houston, the local climate creates unhealthy air days well outside our definition of "summer." These areas experience high AQI days nearly year-round, making the public health burden

Ranking of top 50 metropolitan areas by total "dangerous days of summer"

Rank	Metro statistical area	"Dangerous days of summer"	Estimated number of children with asthma	% summer days dangerous for children with asthma
1	Los Angeles, CA	58,345,945	224,657	50
2	Riverside-San Bernardino, CA	38,782,050	88,502	70
3	New York City, NY	13,892,795	188,596	22
4	Philadelphia, PA	12,966,235	106,561	25
5	Houston, TX	8,369,726	105,929	20
6	Washington, DC	7,644,442	98,627	22
7	Chicago, IL	7,581,358	187,629	19
8	Baltimore, MD	6,783,065	54,089	24
9	Atlanta, GA	6,640,293	97,516	21
10	Detroit, MI	4,937,067	118,708	16
11	Fresno, CA	4,536,115	24,644	58
12	Sacramento, CA	4,524,544	38,804	33
13	Bakersfield, CA	4,110,388	17,838	65
14	Dallas, TX	3,694,064	87,129	19
15	Boston, MA	3,362,081	62,119	14
16	St. Louis, MO-IL	3,331,538	56,992	21
17	Cleveland, OH	3,268,093	47,258	21
18	Pittsburgh, PA	2,839,664	42,494	29
19	Fort Worth-Arlington, TX	2,550,867	41,798	23
20	Charlotte, NC	2,313,015	34,053	21
21	Newark, NJ	1,933,661	44,173	15
22	Memphis, TN	1,901,866	26,953	11
23	Monmouth-Ocean, NJ	1,824,303	23,779	20
24	Indianapolis, IN	1,698,320	34,323	14
25	Cincinnati, OH	1,569,002	43,525	18
26	Hartford, CT	1,302,847	21,307	13
27	Middlesex-Hunterdon, NJ	1,232,664	24,630	19
28	Columbus, OH	1,116,169	33,768	15
29	Raleigh, NC	1,071,819	26,129	14
30	Grand Rapids, MI	1,018,751	25,667	14
31	Buffalo-Niagara Falls, NY	1,002,977	22,725	13
32	Richmond, VA	938,594	21,226	15
33	Greensboro-High Point, NC	893,927	26,194	17
34	Providence, RI	848,540	23,116	10
35	Denver, CO	771,107	47,031	9
36	New Haven, CT	734,828	10,834	16
37	Salt Lake City, UT	648,118	34,374	8
38	Louisville, KY	638,644	20,117	16
39	Wilmington, DE	630,613	12,097	19
40	Ventura, CA	628,583	18,138	17
41	Dayton-Springfield, OH	564,813	19,379	18
42	Akron, OH	524,533	14,290	15
43	Kansas City, KS/MO	498,402	39,338	9
44	Allentown, PA	498,101	12,367	14
45	San Antonio, TX	481,921	38,738	5
46	Birmingham, AL	454,651	19,146	13
47	Knoxville, TN	434,073	11,737	21
48	Bridgeport, CT	431,346	9,564	12
49	Harrisburg, PA	424,949	12,121	13
50	San Diego, CA	415,907	62,386	7

of ozone and fine particle air pollution greater than the measure used in this report. Even in areas with cooler climates, particulate pollution can reach unhealthy levels throughout the year.

In addition, high AQI days only reflect short-term exposures to particulate pollution. There are two federal standards for particulate pollution; one for daily levels and one for annual levels. The vast majority of areas that exceed federal particulate pollution standards do so on the basis of the annual standard. With mounting medical evidence that health is harmed even at exposures below the current daily particulate pollution standard, the AQI (which is based on the daily standard) may not fully reflect the risk to children and sensitive adults from particulate pollution.[7]

Lastly, our estimates of the number of children with asthma are based on the national average of current asthma rates in children. While some cities and states have conducted surveys that provide more localized estimates of the number of children with asthma, there is no national source of state or city-specific asthma rates for children. This means that in some areas with very high rates of asthma in children, our calculation of dangerous days is an underestimate. For example, the current asthma rate in children in Fresno, California is over 16%, or nearly twice the national average of 8.3%. Other areas may have rates lower than the national average. In order to rank all areas of the country on a consistent basis, this report relied on the national average.

CHAPTER 3

Smokestacks and tailpipes: the sources of pollution

Ozone (smog) and fine particulate (soot) pollution pose a severe and widely recognized public health threat in the United States. This past spring, EPA found that 474 counties—home to 159 million Americans—did not meet the nation's health-based ozone standard (see Figure 1). This past summer, EPA announced that some 244 counties with 99 million Americans did not meet the nation's health-based particulate pollution standard. EPA projects restoring healthy air to these communities would prevent tens of thousands of premature deaths and avoid hundreds of thousands of asthma attacks each year. In order to achieve this goal, harmful particulates and smog pollution must be cut from the nation's smokestacks and tailpipes.

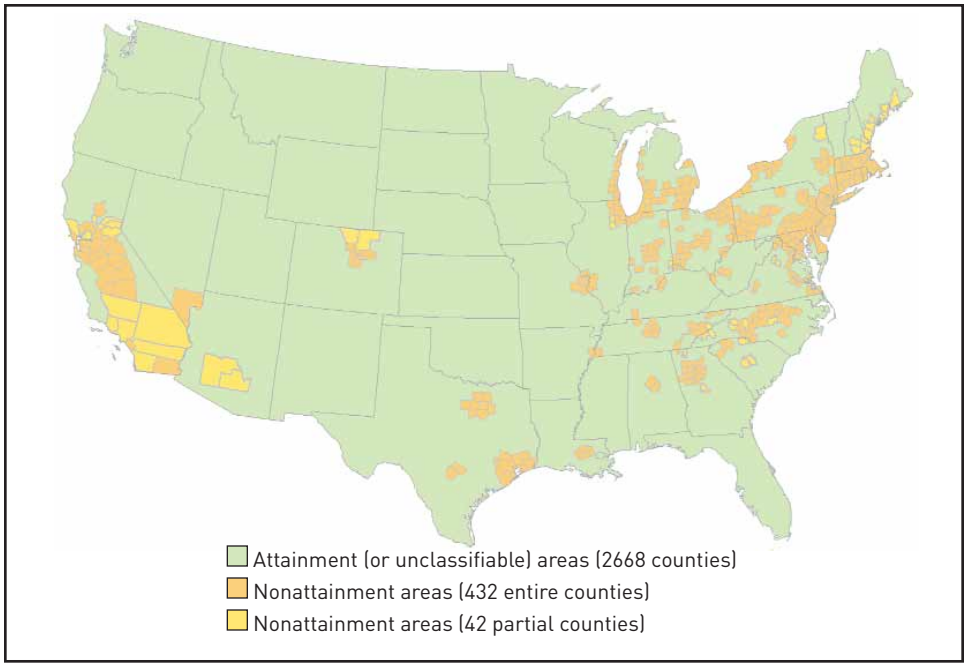
Ozone (smog)

Ozone, the main component of photochemical smog, forms in the lower atmosphere when NO_x and various volatile organic compounds interact in the presence of sunlight, heat and relatively stagnant air. Exposure to ozone can have serious effects on respiratory health. Inflammation and irritation of the respiratory tract can cause shortness of breath, throat irritation, chest pains and coughing that can lead to asthma attacks, hospital admissions and emergency room visits, decreased lung function and possible long-term lung damage.[8] These consequences are more severe if exposure occurs during physical activity.

Since EPA's 1997 decision to strengthen the national health-based air quality standard for ozone, a wealth

FIGURE 1

Map of areas with unhealthy ozone levels: attainment and nonattainment areas in the U.S. (8-hour ozone standard)



Source: U.S. EPA map of nonattainment areas, available at http://www.epa.gov/ozonedesignations/nonattaingreen.htm, accessed August 17, 2004.

of scientific investigation has further documented ozone's adverse health effects, even at levels below the new standard. Many of these studies have highlighted the harmful effects of ozone on children, especially children with asthma. Post-1997 studies have linked ozone to school absenteeism due to sore throats, coughs, asthma attacks, decreased lung function in girls with asthma and long-term lung damage in children.[9] A recent study demonstrated that children who use maintenance medication for asthma had an increased likelihood of wheezing and chest tightness when ozone levels increased.[10] One major study associated exposure to ozone with the onset of asthma in children not previously diagnosed with asthma.[11]

Particulate pollution (soot)

Particulate pollution is one of the nation's most pressing environmental health problems. Particulate pollution includes both small sooty particles discharged directly from sources like diesel and gasoline engines and coal-fired power plants, and tiny particles formed in the atmosphere from the extensive SO_2 and NO_x pollution released by these same sources.

Due to its small size, particulate pollution is easily inhaled and reaches deep into the lungs where it can trigger an inflammatory response. Particulate pollution is associated with heart attacks, irregular heartbeat, asthma attacks, reduced lung function and bronchitis. These impacts result in tens of thousands of premature deaths from heart and lung disease annually, as well as hospital admissions, emergency room visits, absences from school or work, and restricted activities related to asthma attacks. Evidence continues to mount that children, particularly children with asthma, are especially sensitive to the effects of particulate pollution.[12] Increases in particulate pollution have also been associated with a rise in the incidence of asthma attacks among adults with asthma.[13] An important study of 500,000 adults in more than 100 American cities concluded that prolonged exposure to particulate pollution significantly increases the risk of dying from lung cancer and cardiopulmonary causes.[14] New studies and reanalysis of pre-existing work show that chronic exposure to particulate pollution may lower life expectancy by months or years.[15]

Smokestacks and tailpipes

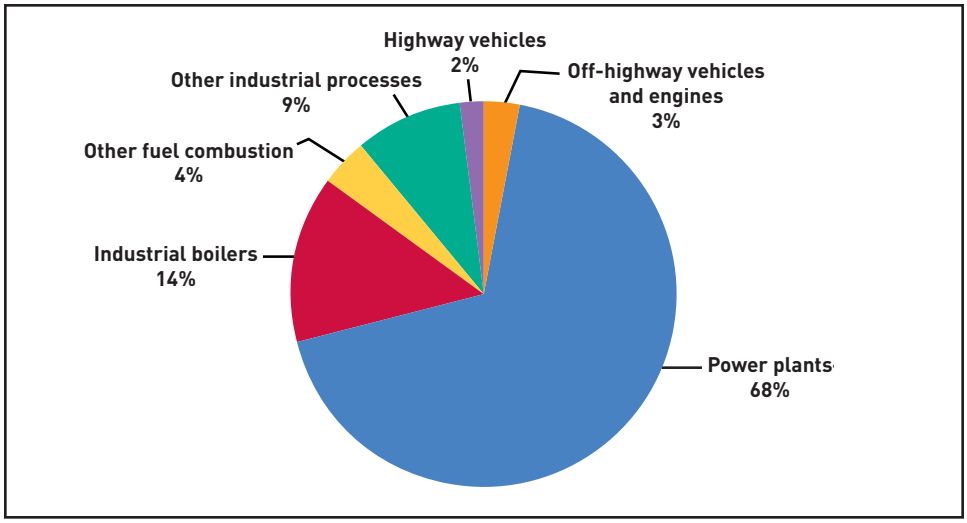
Power plant smokestacks and engine tailpipes are major contributors to the SO_2, NO_x and sooty particles that cause unhealthy ozone and particulate pollution in communities across the nation. Power plants are the predominant source of SO_2, which transforms in the atmosphere into harmful particulate pollution. Power plant smokestacks discharge 68% of the nation's SO_2 pollution—some 10.8 million tons annually—emitting more sulfur dioxide pollution than all other sources combined.

Both tailpipes and smokestacks discharge large amounts of NO_x pollution, which is not only a key ingredient in the formation of ozone but also transforms in the atmosphere into harmful particulate pollution. Passenger vehicles, large diesel trucks and buses, and off-highway diesel equipment and engines are responsible for more than one-half of the nation's NO_x pollution. Power plant smokestacks release more than 20% of NO_x pollution nationwide.

Smokestacks and tailpipes also directly discharge significant amounts of sooty particulate pollution that harms health. Recent studies have strongly underscored the human health benefits of lowering the particulate soot from diesel exhaust discharged by diesel-powered buses, freight trucks, machinery and electrical gener-

FIGURE 2

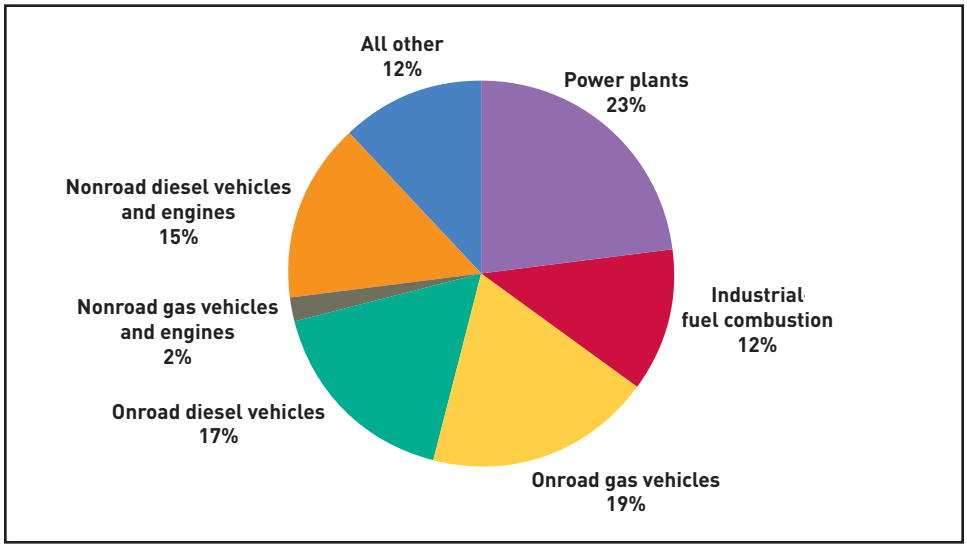
National sulfur dioxide emissions sources, 2001 (15.8 million short tons)



Source: Adapted from U.S. EPA National Emissions Inventory Average Annual Emissions, All Criteria Pollutants Years Including 1970–2001, available online at http://www.epa.gov/ttn/chief/trends/index.html, accessed August 17, 2004.

FIGURE 3

National nitrogen oxide emissions sources, 2001 (22.3 million short tons)



Source: Adapted from U.S. EPA National Emissions Inventory Average Annual Emissions, All Criteria Pollutants Years Including 1970–2001, available online at http://www.epa.gov/ttn/chief/trends/index.html, accessed August 17, 2004.

ators. A 2002 Dutch study found that people living near a main road and exposed to traffic-related particulate pollution and diesel soot were almost twice as likely to die from heart or lung disease compared to people living further from traffic.[16] A landmark air toxics exposure study in the Los Angeles air basin found that diesel particulate pollution was responsible for 70% of the cancer risk associated with all air pollution in the metropolitan area.[17] The study showed that the sites with the greatest cancer risk are in South-Central and East-Central Los Angeles, which are predominantly low-income and minority communities.

CHAPTER 4

Putting an end to the dangerous days by reducing pollution

Today, it is possible to envision a future in which the major sources of air pollutants that trigger asthma have been cut by 80% over a ten-year period. Cutting the sources that trigger asthma will also address the broader array of health problems caused by air pollution, including heart and lung disease, cancer risk and premature mortality in adults.

This section provides a blueprint for achieving this goal by reducing pollution from smokestacks and tailpipes in cost-effective and practical ways. The three basic steps outlined in this report call for:

1. Clean smokestacks: Strengthen and finalize EPA's proposal to clean up the smokestacks of eastern power plants that cause particulate and smog pollution. EPA should also expand a clean smokestack initiative nationwide so that millions of American families in the West are not left behind. Existing, proven technology can scrub and chemically remove the smog and particulate-forming pollutants from power plant smokestacks by 90% or more.

2. Clean diesel: A national commitment to replace or retrofit all existing diesel machinery within a decade to meet or exceed the protective federal standards for new engines. EPA recently adopted strong standards for new diesel engines, but because of the slow fleet turnover of high-polluting existing engines, the federal standards won't deliver their full promise until 2030 or later. To maximize public health protections in the next decade, a parallel commitment by industry and government to clean up existing engines is needed. Clean fuel and retrofit technologies can cut diesel exhaust by up to 90%.

3. Reduced exposure to road pollution: Incorporate market tools into the nation's transportation policy to limit traffic congestion in our communities, enhance travel options, promote smart growth and speed introduction of clean cars, trucks and public transportation. Better incentives can cut traffic growth and related pollution by 20% or more. The Clean Air Act requires that planned investments in transportation projects must take the impacts of air quality into account. These provisions of the law have lately come under attack, and they must be protected.

Clean smokestacks: slashing pollution from coal-fired power plants

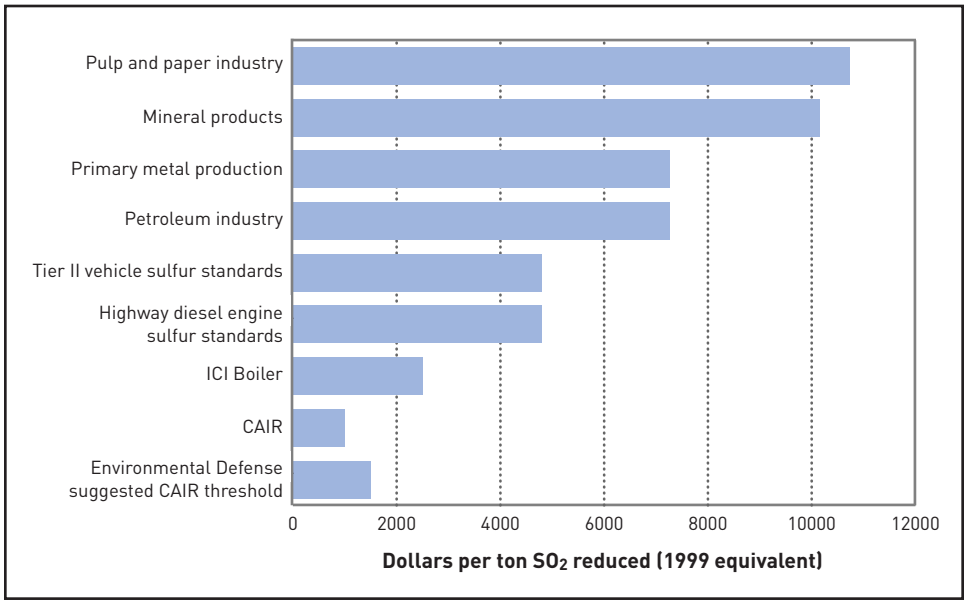
The nation's fleet of coal-fired power plants discharges two-thirds of the 16 million tons of SO_2 released annually and is responsible for more than 20% of all NO_x pollution. These contaminants are critical ingredients in the dangerous particulate and smog pollution in cities across America. EPA has proposed to cut the harmful SO_2 and NO_x discharged from power plant smokestacks in 28 states in the eastern half of the nation (through the Clean Air Interstate Rule, or CAIR). While proposed standards make headlines, they do not clean the air. No one will breathe easier until EPA adopts final, enforceable standards.

EPA's smokestacks clean-up plan must also be strengthened to protect human health.

According to EPA's own analysis, millions of Americans in Heartland cities—including Chicago, Cleveland, Cincinnati, Detroit, Pittsburgh, Knoxville, Atlanta and Birmingham-will be left breathing unhealthy air even after

FIGURE 4

The cost threshold for EPA power plant proposal does not measure up to the projected costs for cleaning up other sectors



This figure shows that the cost-effectiveness threshold for the EPA proposed power plant rule ($1,000 per ton of SO_2 reduced) does not measure up to the costs of cleaning up other sources of SO_2 pollution. EPA's power plant proposal is thus less protective than other EPA standards, such as those for motor vehicles and diesel freight trucks.

EPA's power plant rule is implemented. But even deeper pollution cuts from power plants are still considerably more cost-effective than cuts from other economic sectors.

Environmental Defense recently released an analysis showing that even a modest strengthening of EPA's smokestack standards would prevent a total of about 1 million asthma episodes annually and 16,000 premature deaths in the eastern states targeted for clean up. EPA should strengthen and swiftly finalize smokestack standards to begin realizing these vital human health protections. In addition, EPA should expand clean smokestack standards nationwide so that all American families can be protected from high-polluting power plants.

Faced with delay in federal action, some states have adopted their own strategies to cut smokestack pollution. In 2002, North Carolina adopted a Clean Smokestacks Act that substantially lowers SO_2 and NO_x from power plants statewide. Then in 2004, North Carolina took tough action to protect its citizens from upwind pollution by petitioning EPA to cut power plant smokestack pollution in surrounding states. State leadership to curb smokestack pollution, like that in North Carolina, will continue to be essential to safeguard children from dangerous air pollution in the absence of protective federal action.

Clean diesel: speeding the transition to cleaner diesel engines

Diesel engines are a major source of particulate and smog-forming pollution. Numerous governmental agencies and scientific bodies—including the National Institute for Occupational Safety and Health, the World Health Organiza-

tion, the U.S. Environmental Protection Agency, the U.S. Department of Health and Human Service's National Toxicology Program and the International Agency for Research on Cancer—have concluded that diesel exhaust is a probable human carcinogen. Indeed, the dangerous pollutants in diesel exhaust pose a cancer risk greater than any other toxic air pollutant. And because diesel engines are so often operated where people live, play, work or go to school, they can directly impact human health.

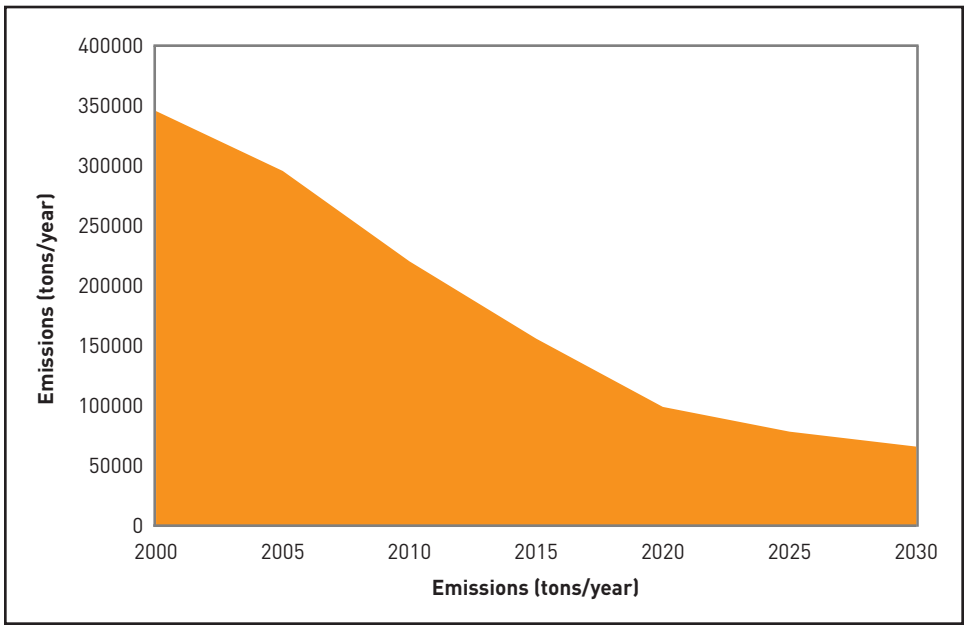
Over the past several years EPA under the Clinton and Bush administrations has issued strong pollution control standards for *newly manufactured* diesel trucks, buses and machinery. But the full pollution reduction and public health benefits of these standards will not be realized for more than 20 years due to the time lag before the emission standards come into effect and because of the long life spans of existing large diesel engines not subject to these standards. Figure 5 shows the national particulate pollution under the phase-in of the federal emission standards for new diesel trucks and buses, and machinery.

The public health benefits will lag behind this phase-in of pollution reductions. EPA estimates, for example, that only about 30% of the ultimate level of annual benefits under its recently announced pollution control standards for new diesel machinery will be realized by 2015; just over 50% will be realized by 2020. While the health benefits from full implementation of EPA's national diesel emission standards for new engines are extremely important, the delayed realization of these benefits means that thousands of premature deaths each year, occurring now, could be prevented by expediting the clean-up of diesel engines.

The children with asthma who struggle to breathe when pollution levels climb should not have to wait decades to curb diesel pollution. Policymakers at all levels of government can take sensi-

FIGURE 5

Particulate pollution under phase-in of federal standards for new diesel trucks, buses, and machinery (onroad and nonroad)



Source: Estimated from EPA, 2000 and EPA, 2004a

ble steps to protect public health now, without waiting for high polluting diesel engines to wear out. To accelerate the transition to cleaner diesel engines and realize more immediate public health protections, diesel retrofit, repowering and other similar programs are urgently needed to clean up the pollution from existing diesel engines.

Fortunately, clean air solutions are at hand. Communities and states from New York City to California are already taking these steps. Well-designed programs at the federal, state and local level can help fund or provide the technical know-how for the replacement of dirty equipment or the repowering of old equipment with cleaner engines. These programs often take the form of funding assistance, contract incentives, and private sector initiatives.

Texas adopted a funding assistance program, dubbed the Texas Emission Reduction Plan, which provides about $130 million annually through 2008. Modeled after a similar program in California, the Texas diesel program provides technical assistance and financial support through payment of the incremental cost of cleaner diesel equipment. The program is designed to aid key Texas communities in achieving the federal health standard for ground-level ozone. The Texas program also provides financial incentives to encourage research and development of new emissions-reducing technology, helping foster even more efficient, low-pollution options for the future. See www.tnrcc.state.tx.us/oprd/sips/terp.html for more information.

An example of a federal funding assistance program to help spur local emission reductions is EPA's Clean School Bus USA program. This program is designed to lower children's exposure to diesel exhaust by bringing together partners from business, education, transportation, and public health organizations to reduce school bus idling, retrofit school buses and replace the oldest, highest polluting buses. See www.epa.gov/otaq/retrofit/index.htm and www.epa.gov/otaq/schoolbus/.

But financial support for this successful federal program needs to be dramatically expanded. In its first year of operation, the Clean School Bus USA program received only $5 million dollars of funding even though it received applications that totaled over $65 million dollars. By comparison, Texas alone is investing more than the entire federal government to support the clean up of existing diesel engines.

A federal funding assistance program should also be expanded beyond school buses to other sectors that produce harmful diesel emissions. Emission reduction projects in the construction, transit, and

Taking on New York City's rising asthma rates

On December 22, 2003, Mayor Bloomberg signed Local Law 77, which calls on New York City to require cleaner fuels and advanced pollution control technologies as a condition of all public works contracts. Large diesel construction machinery emits dangerous air pollutants and is a particular health risk to children with asthma. Local Law 77 is a prime example of how city leadership can improve local air quality by using its purchasing power to cut pollution from high-polluting diesel engines in a practical, cost-effective manner. The local law positions New York as one of the first major U.S. cities to protect public health by requiring cleaner diesel equipment in the solicitation and performance of public works construction. See webdocs.nyccouncil.info/pdf_files/bills/law03077.pdf for more information.

Delivering cleaner air

Environmental Defense and Federal Express have partnered to develop new medium-duty trucks that reduce particle emissions by 90%, reduce smog-causing emissions by 75%, travel 50% farther on a gallon of fuel, yet cost the same as a standard vehicle. Two trucks are already on the ground delivering packages in Sacramento and 16 more will be in operation this fall. Following FedEx's commitment, a number of other companies have adopted or expressed interest in clean technology vehicles. In June of this year, DHL announced that they would place two cleaner technology vehicles into operation. The Army and Frito Lay have also expressed interest in adopting cleaner technologies into their fleets.

freight sectors, among others, should compete for federal funds depending on which projects produce the greatest health benefits per dollar of assistance.

Some state and local governments are leveraging their own purchasing power to spur the use of cleaner diesel engines. In 2003, Environmental Defense teamed up with New York City officials and other groups concerned about rising asthma rates in the City's children. The resulting local law required cleaner diesel engines as a condition of all City public works contracts. Earlier, Environmental Defense worked with New York State to secure a similar commitment to require clean diesel equipment in the reconstruction of the World Trade Center site.

Private companies, from contractors to developers, can also take the lead. Large development projects can protect air quality in surrounding communities by taking steps to cut air pollution from diesel trucks, construction equipment and other pollution sources associated with the project. "Community Benefits Packages" can help lock these commitments into place and assure they are carried out. In Los Angeles, for example, Environmental Defense helped negotiate a "Community Benefits Package" for the neighborhood affected by expansion plans for the Staples Center arena and is currently working with a broad coalition of groups to ensure that retrofits are part of the massive construction envisioned for the expansion of Los Angeles International Airport.

Environmental Defense has created a "toolkit" that outlines technologies, policies and ways to leverage public and private contracts to win clean air. "Cleaner Diesel Handbook: Cost-Effective Steps to Reducing Diesel Pollution" is available online at www.environmentaldefense.org.

All levels of government, from city to federal, must demonstrate leadership by requiring commitments to major pollution reductions through "Retrofit and Replace" strategies and operational measures like anti-idling in public fleets and contracts. Federal and state governments must dramatically expand incentives like funding and tax credits to aid in voluntary pollution reduction steps by the private sector. A substantial increase in federal funding for voluntary retrofit programs is an important element of this effort.

By working together to support and carry out "Retrofit and Replace" strategies, we can help lower the dangerous pollution from diesel engines *today*.

Reduce road traffic pollution exposure: finding better ways to move

Today's cars are much cleaner than they were 20 years ago. But our roadways are now much wider and traffic much heavier, so people often live, work, play

and go to school near major roadways. A growing body of public health literature demonstrates that being within 500 yards of a major roadway significantly increases exposure to particulate pollution and other toxic air pollutants. Studies show increased rates of cancer and lung problems, including asthma symptoms, among people living close to major roadways, especially those with heavy diesel vehicle traffic. Cleaner vehicles alone are inadequate to address these problems for the foreseeable future in many of the highest traffic corridors. "Buffer zones" that separate such roadways from residential, work, school and recreational areas need to be considered, along with transportation policies that reduce and manage traffic growth, expand travel choices, and shift more hazardous dirty diesel vehicle traffic away from places where children and those with asthma live, play or work.

One solution to roadway pollution is to improve incentives for, and the availability of, cleaner modes of transportation. It is no surprise that traffic-related pollution and congestion is often worst where there are limited or no viable alternatives to driving to work in a single occupant passenger vehicle or to moving goods by truck.

Transportation alternatives to the private passenger vehicle are viable. From 1996 to 2002, United States transit ridership grew *faster* than car use. This breakthrough reflected mutually reinforcing federal and local action. Communities invested in better public transportation, including innovative measures like bus rapid transit and employer-provided commuter transit benefits, as federal transportation spending and tax policies shifted in the 1990s to offer support for such clean transportation investments. Transportation and air quality agencies began to coordinate their policies to reduce the likelihood that highway pollution would undermine air quality plans. Yet now, the Clean Air Act programs that helped encourage these cleaner transportation alternatives are being threatened in the pending federal transportation-spending bill.

We must turn back these damaging political threats to healthy air and expand investments in clean transportation measures. Bus rapid transit, light rail and other advanced forms of transit can bring flexible, cost-effective transportation to growing U.S. cities without the additional burden of excessive air pollution. Rail-freight infrastructure in high-traffic freight corridors can help decrease the demand for diesel trucks and shift the transportation of goods to more efficient and potentially less polluting rail and coastal shipping, reducing exposures of sensitive populations to pollution near high traffic volume roads. Land use and development measures that encourage denser and more pedestrian-friendly residential and commercial development near existing public transportation facilities can also lower pollution from private vehicles.

Environmental Defense is pioneering market incentives that can be harnessed to help cut air pollution from crowded roadways. For example, congestion pricing has proven effective in places like San Diego, New York and other large cities. Just as phone rates go up at peak times, congestion pricing varies toll rates to make them cheaper off-peak and creates pricing incentives to use alternative means of transport at peak times. Pay-as-you-drive insurance lets car owners lower their car insurance premiums by driving less. Commuter choice incentives reward companies that help pay for employees' transit passes, while reducing taxes for employees who commute by transit. And economic strategies to facilitate the "transfer of development rights" can provide

incentives to develop land in already developed areas and spare outlying, more pristine regions from new development. This program has been carried out in metropolitan New York, Maryland and other metropolitan areas. Well-designed, innovative programs to lower driving activity in tandem with federal programs that require increasingly rigorous emission standards can help protect children with asthma and neighborhoods near roadways from dangerous pollution levels.

We call on Congress to abandon proposed rollbacks that would diminish consideration of transportation alternatives and weaken long-standing Clean Air Act measures that protect public health from roadway pollution. And we urge expanded federal efforts to more fully assess the health impacts of transportation plans and projects, with greater support for transportation alternatives that reduce exposures to harmful air pollutants.

Conclusion

Cleaning up the nation's air pollution problems is not an easy task, but it is an essential one to protect the health of the growing number of people with asthma as well as those susceptible to air pollution's effects on the cardiovascular system. By tracking the dangerous days of summer, Environmental Defense has highlighted how many children around the country are affected by poor air quality. The dangerous days, of course, are just the tip of the iceberg in terms of public health and quality of life impacts due to existing levels of air pollution.

To address air pollution problems, Environmental Defense has designed a comprehensive campaign that works at all levels of government, addresses both new and existing sources of pollution, and finds partners among health and private business sectors. We call on Congress, the President, the nation's mayors and corporate leaders from coast to coast to take these steps today and insure that the dangerous days of summer come to an end.

APPENDIX

Calculating the dangerous days of summer

The "dangerous days of summer" are the product of the number of days with high air quality index values and the number of children affected by those high air quality indices. This provides a measure of the exposure burden of air pollution on children. The total number of code red and purple days in a metropolitan area for both ozone and particulate pollution was multiplied by the number of children aged 17 and under, and the number of code orange days was multiplied by the number of asthmatic children aged 17 and under. This was based on the health advisories that apply to all children for code red and purple days, but just asthmatic and other especially sensitive children for code orange days. These two values were added together to yield the total number of dangerous summer days in that year. Estimates were made for the period between Memorial Day and Labor Day for the years 2001 through 2003, and the results then averaged.

To calculate the percentage of the summer that was dangerous for sensitive children, the number of code orange, red and purple days for ozone and particulate pollution was summed for each MSA and divided by 99, the total number of days between Memorial Day and Labor Day. The number of code red and purple days in each MSA was used to calculate the percentage of the summer dangerous for all children. There were no code maroon days during this period.

In order to assure all major MSAs were evaluated in the same way, the EPA AirData website, www.epa.gov/air/data/index.html, which generates reports from the EPA Air Quality System database was used. Data from 2004 will not be available until late fall and therefore were not included in this analysis. The definition of metropolitan areas used was the same as that used for the EPA Air Quality System. For some areas, this was the Primary Metropolitan Statistical Area, for others the Metropolitan Statistical Area as defined by the US Census Bureau in 1999. Population data for the total number of children 17 and under were based on the United States Census 2000. When available, pediatric asthma population data were taken from the American Lung Association "State of the Air: 2004" report (available at lungaction.org/reports/sota04_full.html). When metropolitan areas contained counties that were not included in the ALA report, we used the same method to estimate the numbers of asthmatic children as was used by the ALA: the 2002 projected population aged 17 and under for the county, obtained from the US Census Bureau, was multiplied by the national average annual prevalence rate of 8.31%. This prevalence rate was estimated by the ALA based on data from the 2002 National Health Information Survey.

Notes

[1] Air Pollution as an Underappreciated Cause of Asthma Symptoms George D. Thurston, ScD; David V. Bates, MD *JAMA.* 2003;290:1915–1917

[2] Friedman MS, Powell KE, Hutwagner L, Graham LM, Teague WG. Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. *JAMA.* 2001 Feb 21;285(7):897–905.

[3] Pope CA 3rd Respiratory disease associated with community air pollution and a steel mill, Utah Valley. *Am J Public Health.* 1989 May;79(5):623–8.

[4] Friedman, M.S., Powell K.E., Hutwagner L., Graham L.M., Teague W.G. Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. JAMA. 2001 Feb 21; 285(7):897–905

[5] C.A. Pope. 3rd Respiratory disease associated with community air pollution and a steel mill, Utah Valley. Am J Public Health. 1989 May;79(5):623–8

[6] California Air Resources Board. Characterizing the Range of Children's Pollutant Exposure During School Bus Commutes. 2003. [cited 2004 June 28]. Available from ftp://ftp.arb.ca.gov/carbis/research/schoolbus/report.pdf.; National Resources Defense Council. No Breathing in the Aisles; Diesel Exhaust Inside School Buses. 2001. [cited 2004 June 28]. Available at www.nrdc.org/air/transportation/schoolbus/sbusinx.asp

[7] See, for example, www.cleanairstandards.org/article/articleview/135/1/39/

[8] 62 Fed. Reg. 38,856 (July 18, 1997).

[9] F.D. Gilliland et al. "The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illnesses," *Epidemiology,* 12 (2001) 43–54; L. Chen et al. "Elementary School Absenteeism and Air Pollution," *Inhalation Toxicology,* 12 (2000) 997–1016; J.M. Peters et al. "A Study of Twelve Southern California Communities with Differing Levels and Types of Air Pollution," *Am J Respir Crit Care Med,* 159 (1999) 768–775; T. Frischer et al. "Lung Function Growth and Ambient Ozone: A Three-Year Population Study in School Children," *Am J Respir Crit Care Med,* 160 (1999) 390–396

[10] J.F. Gent et al. "Association of low-level ozone and fine particles with respiratory symptoms in children with asthma," JAMA 290 [2003] 1859–1867

[11] R. McConnell et al. "Asthma in exercising children exposed to ozone: a cohort study," Lancet 359 [2002] 386–391

[12] See, e.g., G. Norris et al. "An Association Between Fine Particles and Asthma in Emergency Department Visits for Children in Seattle," *Environ Health Perspect.* 107 (1999) 489–493; P.E. Tolbert, et al., "Air Quality and Pediatric Emergency Room Visits for Asthma in Atlanta, Georgia," *Am J Epidemiol* 151 (2000) 798–810; J.W. Gauderman, et al. "Association Between Air Pollution and Lung Function Growth in Southern California Children," *American Journal and Critical Care Medicine* 162 (2000) 1383–1390

[13] H. Desqueroux et al. "Short-Term Effects of Low-Level Air Pollution on Respiratory Health of Adults Suffering from Moderate to Severe Asthma," Environmental Research Vol. 98 (Section A) (2002) 29–37

[14] C.A. Pope et al. "Lung Cancer, Cardiopulmonary Mortality, and Long-Term Exposure to Fine Particulate Air Pollution," *Journal of the American Medical Association* 287, no. 9 (March 6, 2002)

[15] Bert Brunekreef. "Air Pollution and Life Expectancy: Is There a Relation?" *Occup. Environ. Med.* 54, no. 11 (1997) 781–4; C.A. Pope, "Epidemiology of Fine Particulate Air Pollution and Human Health: Biological Mechanisms and Who's at Risk?" *Environ Health Perspect* 108 (Suppl 4) (2000) 713–723

[16] G. Hoek et al. "Association Between Mortality and Indicators of Traffic-related Air Pollution in the Netherlands: a Cohort Study," *Lancet* 360 (2002) 1203

[17] South Coast Air Quality Management Ditrict, Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES-II), March 2000, www.aqmd.gov/matesiidf.es.pdf

ENVIRONMENTAL DEFENSE

finding the ways that work

National Headquarters
257 Park Avenue South
New York, NY 10010
212-505-2100

1875 Connecticut Avenue, NW
Washington, DC 20009
202-387-3500

5655 College Avenue
Oakland, CA 94618
510-658-8008

2334 North Broadway
Boulder, CO 80304
303-440-4901

2500 Blue Ridge Road
Raleigh, NC 27607
919-881-2601

44 East Avenue
Austin, TX 78701
512-478-5161

18 Tremont Street
Boston, MA 02108
617-723-5111

Project Office
3250 Wilshire Boulevard
Los Angeles, CA 90010
213-386-5501