

Epidemic of a Chronic Disease

The Growing Problem of Asthma

Asthma is a chronic inflammatory lung disease characterized by recurrent episodes of breathlessness, wheezing, coughing, and chest tightness, termed exacerbations. The severity of exacerbations can range from mild to life threatening. Exacerbations can be triggered by exposures and conditions such as: respiratory infections, house dust mites, cockroaches, animal dander, mold, pollen, cold air, exercise, stress, tobacco smoke and indoor and outdoor air pollutants. Both the frequency and severity of asthma symptoms can be reduced by using medications and reducing exposure to environmental triggers.

Ongoing preventive management is needed for patients with persistent asthma, even when mild. Learning how to manage asthma as a chronic disease is a major challenge for patients, as well as for health care providers and others involved in asthma care.

An epidemic of asthma is underway in the United States. The number of people with asthma has more than doubled in the past 15 years. Even if rates were to stabilize, asthma would continue to be a profound public health problem.

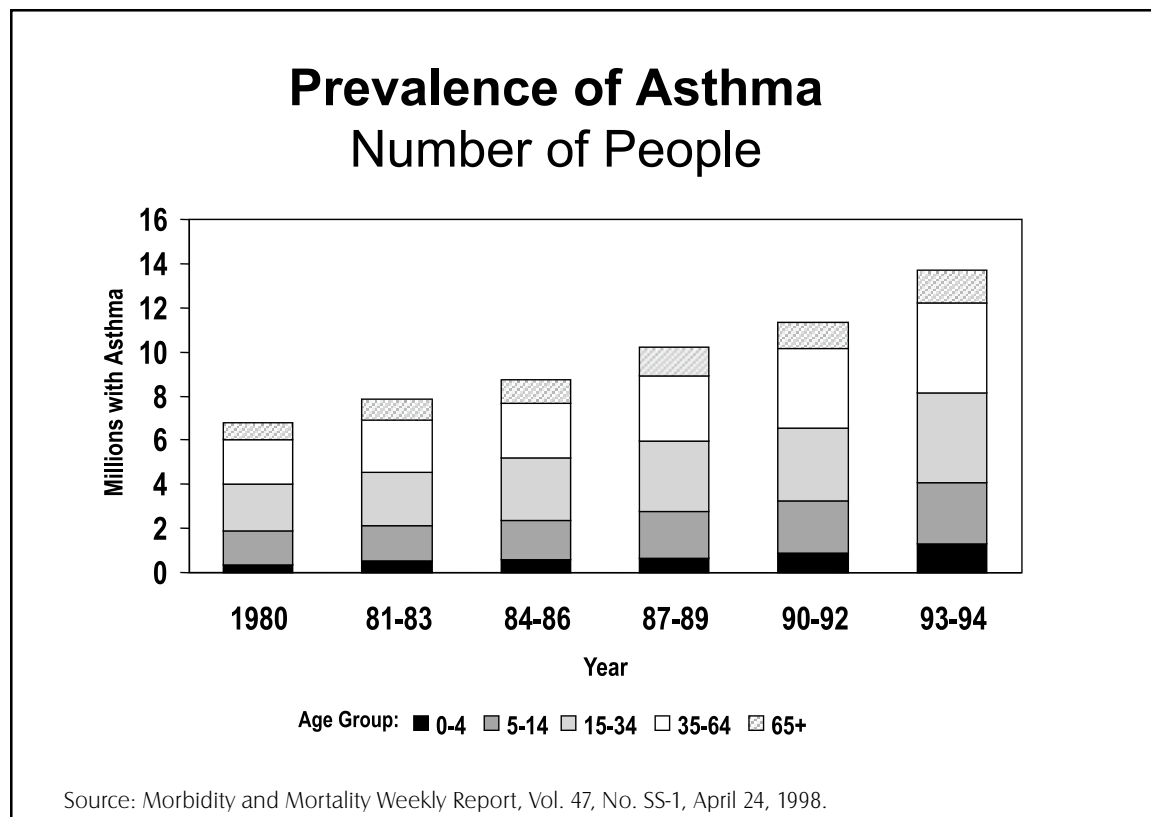
For the past 15 years, an epidemic of asthma has been underway in the United States. The steady rise in the prevalence of asthma constitutes an epidemic, which by all indications is continuing. Even if rates were to stabilize, asthma would continue to be a profound public health problem. It is a potentially fatal, chronic disease responsible for over 1.8 million emergency room visits per year, over 460 thousand hospitalizations per year and over five thousand deaths per year (4). Although the burden of asthma affects Americans of all ages, races and ethnic groups, recent data indicate that children, low-income and minority⁴ populations have been most severely affected.⁵

National survey data – the responses of randomly selected US residents when asked whether they had symptoms of physician-diagnosed asthma in the previous 12 months — indicate that the number of people with asthma in the United States has more than doubled in the past 15 years (see figure 1). In 1980, 6.8 million Americans had asthma. By 1996, the number had risen to 14.6 million (5). Rates of asthma are increasing in all age groups, among both men and women, and across all racial and ethnic groups (4) (see figure 2). Total deaths from asthma have also risen, from a low of 1,674 in 1977, to 5,637 in 1995 (4) (see figure 3).

⁴ The term “minority” as used in the rest of this paper refers to “racial and ethnic minority.”

⁵ Although national data do not provide the resolution necessary to identify particular geographic areas hardest hit by the asthma epidemic, surveys undertaken in a number of large cities in the United States indicate that the prevalence and severity of asthma are greatest in the medically underserved, inner city. A large proportion of inner-city families are insured through Medicaid.

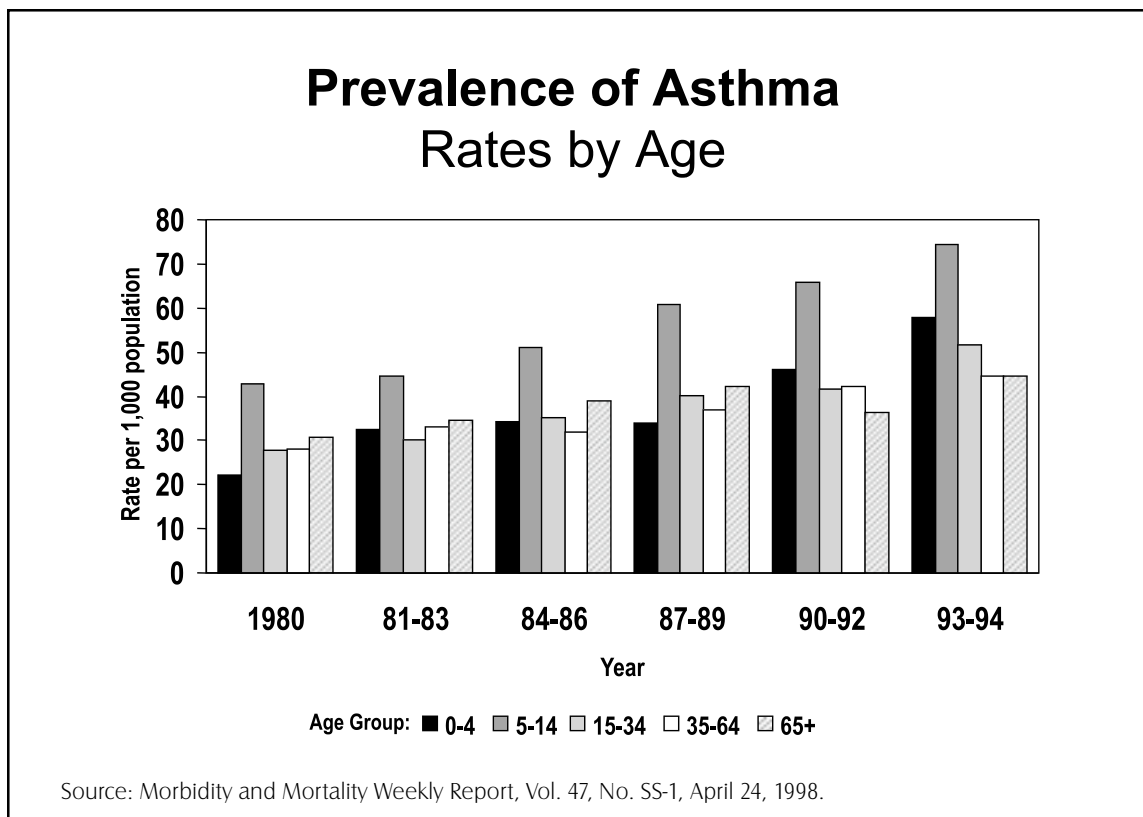
Figure 1. Estimated average annual number of persons with self-reported asthma during the preceding 12 months by age group, United States, National Health Interview Survey, 1980-1994.



Asthma is a common chronic disease of childhood, affecting an estimated 4.4 million children (6). In the United States, the prevalence of asthma is slightly higher in boys than in girls under age 18. Asthma is more common in school-aged children than in preschool-aged children or adults. However, the most rapid increase in cases of asthma are occurring in children under five years old, with rates increasing over 160 percent between 1980 and 1994 (4).

Asthma remains a common problem in adults, reflecting the persistence of childhood asthma and the new cases that develop in adulthood. Among adults, women of all races suffer greater asthma mortality and morbidity than men. Occupational asthma, or the new onset of asthma due to conditions at the workplace, has become the most common occupational lung disease (7, 8, 9, 10, 11). Recent studies in the U.S. have found that in working adults, 6 to 21 percent of new onset asthma is attributable to occupational asthma (12, 13, 14). Depending on the type and intensity of work exposures, the frequency of occupational asthma may be very high in some industrial settings (e.g., about 25 percent in one group of platinum-refinery workers); in other industries, only sporadic cases may be reported (15).

Figure 2. Estimated average annual rate of self-reported asthma during the preceding 12 months by age group, United States, National Health Interview Survey, 1980-1994.

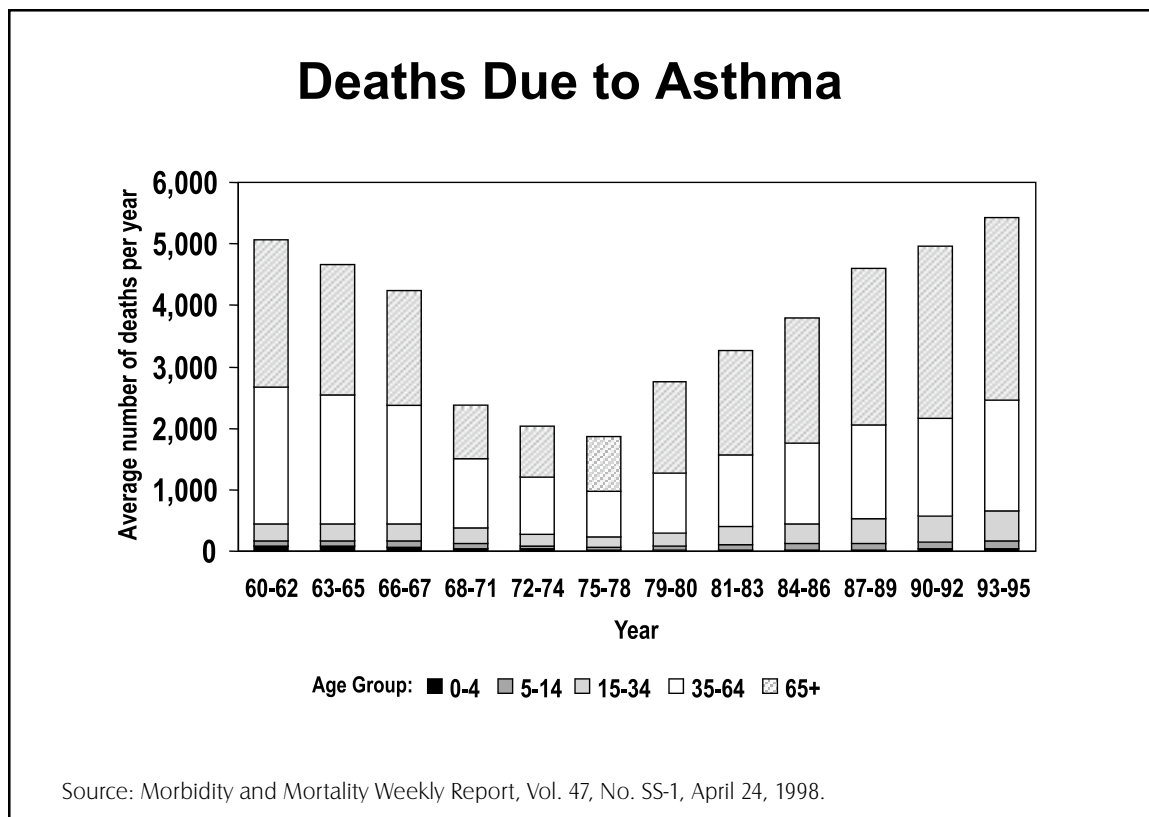


Disproportionate Burden of Asthma Among Minority Groups and Those Living in Poverty

In the most recent years for which data are available, African Americans were slightly more likely to have asthma than were whites, with prevalence rates of 58.8 per 1,000 population and 50.8 per 1,000 respectively (4). However, it is disturbing to note that African Americans are much more likely to die from asthma than whites (4). From 1993 through 1995, the death rate from asthma in African Americans of 38.5 per million was over twice the rate of 15.1 per million in white Americans (4) (see figure 4). Among children, the disparity was even greater: African American children were over four times as likely to die from asthma as were white American children (16). In the Northeast, Hispanics had a death rate of 34 per million (17).

Although asthma affects Americans of all ages, races, and ethnic groups, low-income and minority populations experience substantially higher rates of fatalities, hospital admissions, and emergency room visits due to asthma.

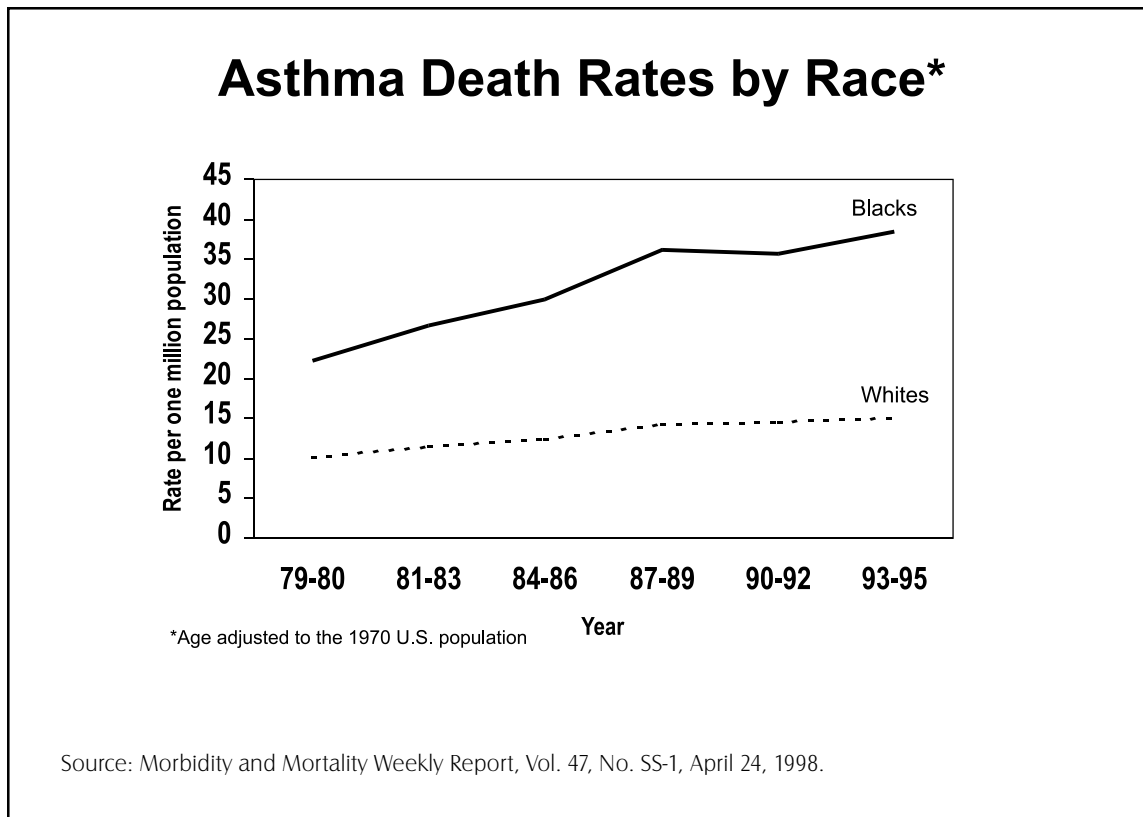
Figure 3. Average number of deaths with asthma as the underlying cause of death diagnosis, by age group, United States, Underlying Cause of Death dataset, 1960-1995.



Hospitalizations and emergency room visits for asthma demonstrate the disparity in the impact of asthma among different racial and ethnic groups. African Americans have an annual rate of hospitalization of 35.5 per 10,000, nearly four times that for whites (10.9 per 10,000) (see figure 5). African Americans are approximately five times more likely than white Americans to seek care for asthma at an emergency room (4).

Studies examining the link between socioeconomic status and asthma confirm that the impacts of asthma are greatest on low income populations (18, 19, 20, 21). For example, in the U.S. in 1996, pediatric hospitalizations for asthma were estimated to be five times higher for children in lower income families (22). The National Cooperative Inner-City Asthma study demonstrated that over 50% of study participants, who were poor children living in inner cities, found it difficult to get follow-up asthma care. Among those with severe asthma, less than half were using anti-inflammatory medication (23, 24).

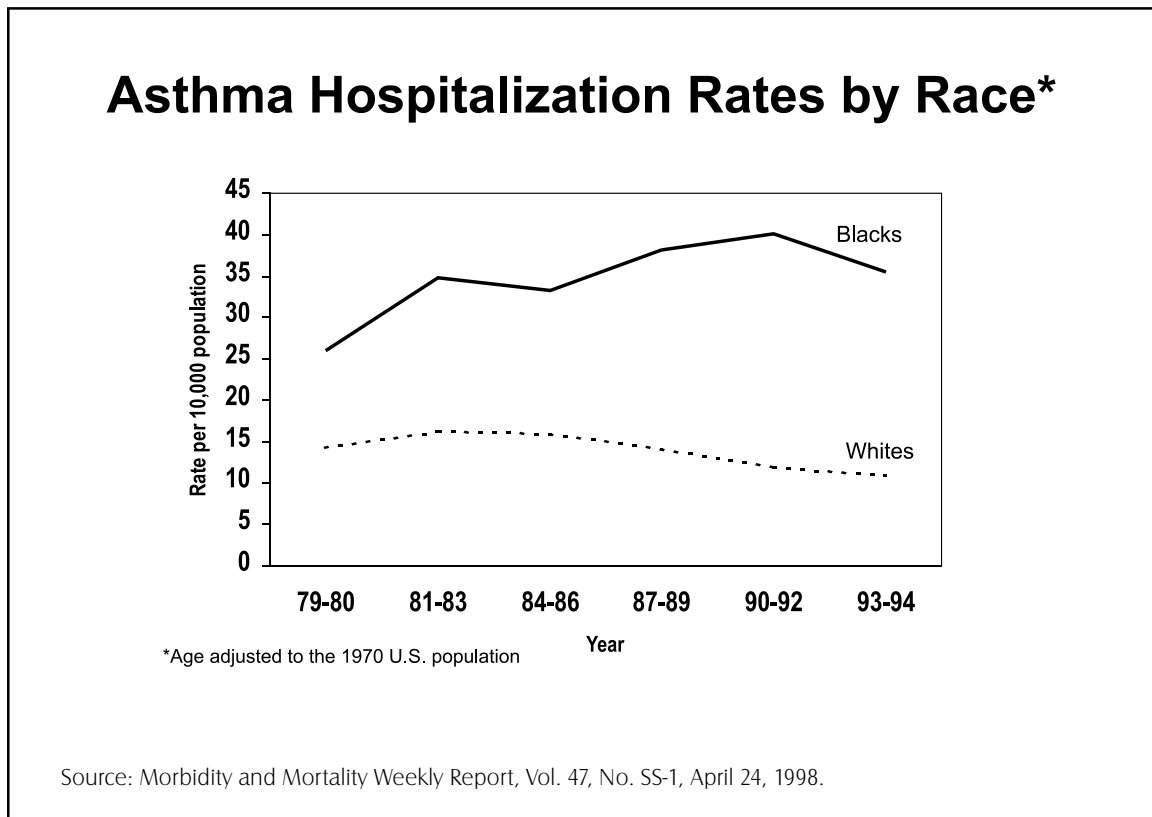
Figure 4. Rates of death with asthma as the underlying cause of death diagnosis, by race, United States, Underlying Cause of Death dataset, 1979-1995.



Health Impairment from Asthma Not Fully Captured by Hospital or Emergency Room Visits

These measures — rates of death, hospitalization, and emergency room visits — give an incomplete picture of the true burden of asthma in the United States. Asthma symptoms that are not severe enough to require a visit to an emergency room can still be severe enough to restrict activities and affect quality of life. Asthma is responsible for 10 million physician office visits and 134 million days of restricted activities per year (4, 25). Children with asthma miss over 10 million school days annually, making asthma one of the leading causes of school absenteeism (26). Asthma in children also accounts for many lost nights of sleep, disrupts family and caregiver routines, including lost work days. Asthma in adults, including occupational asthma, has consequences of lost work time, job loss, disability and premature death (23, 27).

Figure 5. Estimated average rates of hospitalization for asthma as the first-listed diagnosis, by race, United States, National Hospital Discharge Survey, 1979-1994.



Data Tracking Asthma are Insufficient

Public health officials need to understand changes in rates of disease in different locations or populations in order to target health services and public health programs where they are most needed, to help evaluate the success of intervention efforts, and to provide clues about risk factors. At the present time, surveillance of asthma — the systematic collection, evaluation and dissemination of data to track the occurrence and severity of the disease — is limited to analyses of ongoing surveys and data systems on health events such as mortality, hospitalization, and outpatient visits. These data are typically several years out of date when they become available, and only provide national estimates. With the exception of recent work in several states to examine hospitalization and emergency room visits for asthma, data that would allow comparisons among states or cities are available only for deaths due to asthma.

Cost of Asthma to the U.S. Economy: Eleven Billion Dollars Annually

Estimating the costs of asthma is one way to measure its health burden. In 1990, the cost of asthma to the U.S. economy was estimated to be \$6.2 billion, with the majority attributed to direct medical expenses, such as hospitalization, physician and nursing care, and medication (27). In 1998, the National Heart, Lung, and Blood Institute (NHLBI) estimated that the annual

costs of asthma were \$11.3 billion per year. This estimate includes \$7.5 billion in direct medical expenses and \$3.8 billion in indirect expenses, such as lost workdays for adults with asthma and lifetime earnings lost due to mortality from asthma (28).

The Science of Asthma

Over the past 15 years, biomedical research has produced major advances in the understanding of asthma. Prior to this period the role of inflammatory mechanisms in asthma was not understood. Asthma is now known to be a disease of airway inflammation resulting from a complex interplay between environmental exposures and genetic and other host factors. Left untreated, inflammation may lead to irreversible changes in lung structure, called airway remodeling. Together, these findings have changed medical treatment and environmental management of asthma.

Based on an improved understanding of asthma, inhaled anti-inflammatory medications have become the mainstay of preventive medical management for patients with persistent asthma. Development of new medications to treat and prevent the symptoms of asthma based on new insights into the cellular mechanisms of inflammation will offer options to tailor therapy to the individual patient and minimize the possibilities of side effects.

“Through scientific advances, much of the severe morbidity and mortality from asthma can now be prevented.”

-Claude Lenfant, M.D., Director, National Heart, Lung, and Blood Institute

In addition to improvements in medical therapy, better monitoring techniques now permit objective measures of lung function that are simple tools for patients and physicians to use in assessing asthma severity and monitoring changes in the disease. In a disease like asthma, which varies considerably over time, and where changes in lung function can occur before symptoms develop, objective measures provide essential information for making decisions about adjusting medications.

The Causes of Asthma and of the Asthma Epidemic Are Not Well Understood

Although the causes of the increasing rates of asthma over the past 15 years are not known, the most likely reason is an interaction between environmental and genetic factors. Atopy, the genetically inherited susceptibility to become allergic, is the most important predictor of a person developing asthma (29). A substantial research effort is underway to identify the genes responsible for susceptibility to asthma. Since the genetic make-up of the population changes slowly, genetic susceptibility alone cannot be responsible for the epidemic of asthma which has occurred in the United States over the past 15 years. Further work is needed to clarify how genetic susceptibility and environmental exposures interact to cause asthma.

Many studies have demonstrated that exposure to indoor allergens and environmental tobacco smoke are risk factors for more severe asthma (30, 31, 32, 33). Some studies suggest that indoor allergen exposure is a risk factor for the initial onset of asthma (34, 35, 36). People now spend more time indoors, thus increasing exposure to indoor allergens and pollutants. In its recent

review of the current scientific literature, the Institute of Medicine (IOM) drew several conclusions about the role of numerous indoor air exposures and the initial development of asthma (37). The findings were ranked according to the level of evidence linking any of the exposures to the onset of asthma. IOM emphasized that a particular agent may be associated with the development of asthma, but that does not mean it is the sole factor determining



Photo courtesy of
Environmental Protection Agency

whether an individual will develop the illness. The IOM Committee found that exposure to house dust mite allergen can cause the development of asthma in susceptible children. The Committee also determined that exposure to environmental tobacco smoke is associated with the development of asthma in younger children. Maternal

smoking during pregnancy was suggested to have a stronger adverse affect than exposure after birth. In

addition, limited or suggestive evidence was found by the IOM

for associations between cockroach allergen exposure or respiratory syncytial virus (RSV) infection and the development of asthma in infants. Both factors have been the subject of active research during the past few years and efforts currently underway may help shed greater light on their potential role in asthma development.

Other possible, but less well studied, factors that may affect the development of asthma include exposures that stimulate the immune system. One hypothesis is that certain infections in early life may block the allergic immune response and thereby protect against asthma (38, 39, 40, 41). Other factors have been postulated to cause asthma, including the diet during the prenatal period and early infancy (42) and obesity in adolescents and adults (43, 44). Such hypotheses remain controversial, and more research is clearly needed to understand the remarkable rise in asthma and the causes of the disease.

The Environment, Indoors and Outdoors, Can Exacerbate Asthma

While much remains to be learned about the causes of asthma, many studies have identified factors that exacerbate asthma in those who already have the illness (33, 45, 46, 47, 48, 49, 50). Asthma exacerbations or “attacks” involve the onset or worsening of symptoms (e.g., some combination of shortness of breath, cough, wheezing, and chest tightness). Reducing exposure to certain allergens has been shown not only to reduce asthma symptoms and the need for medication, but also, in some studies, to improve lung function (37, 48).

The IOM report drew several conclusions about the role of specific indoor exposures in the exacerbation of asthma. The IOM committee found sufficient evidence to conclude that exposure to allergens produced by cats, cockroaches, and house dust mites, causes exacerbations of asthma in sensitized individuals (i.e., those who are allergic to these substances). In addition, the committee found sufficient evidence that environmental tobacco smoke causes exacerbations of asthma in pre-school-aged children (see Appendix H for executive summary of the IOM report).

People with asthma, both children and adults, can be particularly sensitive to outdoor air pollution. Common air pollutants (also known as “ambient air pollutants”) such as ozone, sulfur dioxide, and particulate matter, are known to be respiratory irritants and can contribute to an exacerbation of asthma symptoms. Air pollution also might act synergistically with other environmental factors to worsen asthma (51). For example, diesel exhaust particulates, by markedly increasing the capacity to produce IgE antibodies, may enhance responsiveness to

allergens (52). Also, some evidence suggests that exposure to ozone can enhance a person's responsiveness to inhaled allergens (53, 54).

Workplace Exposures Can Aggravate or Cause Asthma

In persons with asthma resulting from workplace exposure, clear relationships have been identified between the level of exposure to specific chemicals and allergens and rates of sensitization and symptoms (55). Over 250 agents encountered at work can cause asthma, including isocyanates, wood dusts, anhydrides, dyes, formaldehyde, metals, latex, and enzymes (56). For example, even brief exposure to more than 20 parts per billion of isocyanates is considered hazardous; isocyanates are widely used in many countries and are responsible for the most common form of occupational asthma. Many patients suffer chronic disease even after they are removed from an occupational exposure situation. However, early diagnosis and early removal from exposure increases the likelihood of recovery (56). Since workers are exposed to a wide range of possible causative agents, often at elevated exposure levels, the occupational setting offers a significant opportunity for research on asthma causes and triggers. Such research could prove to be a useful model for understanding how environmental exposures to certain chemicals and allergens might contribute to the development of asthma.

Knowledge Exists to Successfully Manage Asthma in Most Patients

Advances in the scientific understanding of the underlying mechanisms of asthma have led to treatment that can significantly improve the health of asthma patients. The *Guidelines for the Diagnosis and Management of Asthma* ("Guidelines") — developed by experts convened by the National Institutes of Health (NIH) and updated in 1997 — recommend four strategies for managing asthma that substantially reduce the frequency and severity of asthma attacks (57, 58). The *Guidelines* emphasize: 1) assessment and monitoring of symptoms; 2) control of environmental



factors to limit exposure to allergens and other triggers; 3) use of appropriate medication; and 4) education of the patient and family in asthma care. These recommendations promote a fundamentally new understanding of asthma and its treatment by emphasizing the role of inflammation in disease development, noting the importance of objective monitoring of lung function, and stressing the need to establish partnerships between patients and health care providers through patient education (see Appendix C for a summary of the 1997 *Guidelines*). In 1999, the *Guidelines* were adapted into an easily referenced pediatric document, *Pediatric Asthma: Promoting Best Practice – Guide for Managing Asthma in*

The benchmark publication by the National Heart, Lung, and Blood Institute, *Guidelines for the Diagnosis and Management of Asthma*, translates advances in scientific understanding into practical strategies for asthma care.

Children (59). The *Guidelines* remain the world's most comprehensive, up-to-date source of information on asthma diagnosis and management. By following the recommendations, most people with asthma should be able to lead an active life, with their asthma well-controlled.

The Challenge of Asthma

Rates of asthma as well as the burden of this chronic disease are increasing, despite important advances in research. This paradox raises two distinct issues: the increase in asthma over the last 15 years, and the continuing hardships for those who already have the disease.

If there have been breakthroughs in understanding the mechanisms of the disease, why are rates of asthma increasing? One key reason is that the cause of the asthma epidemic in the United States, which is also affecting most industrialized countries, is not known. Further research is needed to clarify the genetic basis of susceptibility to asthma, and the biologic mechanisms that

Why are rates of asthma increasing? Why is the burden of asthma still so great?

explain the interactions of susceptibility and other factors, such as environmental exposures, that lead to asthma.

While this basic research requires additional emphasis, we also need to proceed with testing possible approaches to prevent asthma based hypotheses derived from basic and epidemiological studies. Both basic research and prevention trials can help identify promising strategies to prevent the disease from occurring in the first place.

If the tools exist to manage asthma more effectively, why is the burden of asthma still so great? Although progress has been achieved in professional and patient education in the past decade, and research has shown that effective medical management and patient education reduces the use of emergency services and improves quality of life, many health care professionals and people with asthma are not making use of the *Guidelines* (60, 61, 62, 63). Various outstanding programs supported by federal and private funds have helped foster needed changes in medical practice and patient behavior, but these need to be evaluated in a greater variety of settings and implemented on a larger scale in order to have national impact. Populations and neighborhoods experiencing the greatest burden of disease often lack access to high quality medical care, including adequate education about asthma management and sufficient medications and equipment (24, 62, 64). Poor housing and environmental conditions make it difficult to control exposures that worsen asthma. In addition, lack of asthma surveillance at the State and local levels hampers public health efforts to direct quality health care toward the most severely affected populations.

In summary, we have made progress but we are not yet close to understanding the causes of the asthma epidemic nor to providing optimal care. In the meantime, we need to 1) improve the availability of quality asthma care, especially to underserved populations, which is feasible and can be done by a coordinated effort; and 2) increase research efforts to deal with chronic persistent asthma and to prevent the onset of the disease.

DHHS Capacity to Address Asthma

The Department of Health and Human Services (DHHS) has a broad mandate to advance the health and welfare of Americans (see box), and has a significant role to play in addressing the

asthma epidemic. DHHS' areas of responsibility for asthma include research, public health, and health services delivery.

In Fiscal Year 1999, the Department of Health and Human Services (DHHS) invested \$145 million in research on asthma. DHHS is uniquely positioned to enhance the scientific knowledge required to prevent the onset of asthma and to improve the quality of life for millions of asthma patients and their families. DHHS-supported grantees have been responsible for many of the scientific breakthroughs that helped shape the *Guidelines*.

Relatively few DHHS dollars – under \$10 million – were spent on public health practice for asthma. Public health practice activities are those that facilitate the work of the medical community and others to prevent disease, reduce the severity of symptoms and improve the quality of medical care. The role of government in public health includes: 1) the systematic collection and analysis of health information; 2) the development of goals and priorities based on scientific knowledge and measures to achieve them; 3) taking action through public education, advocacy, negotiation, and mobilization of resources; and 4) evaluation to determine whether policy goals are achieved (3).

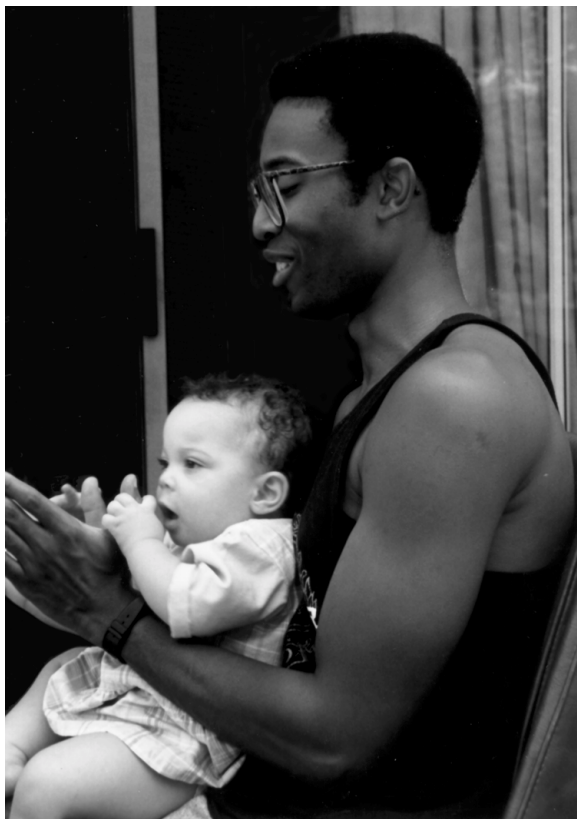
The Department has supported — and could substantially expand — partnerships and model programs that are discovering new ways to increase dissemination and use of information about how to manage asthma to communities, health care providers, patients and their families. It continues to evaluate methods that are most effective in translating important research findings into clinical practice to improve the quality of care. DHHS could expand its evaluation of asthma care, as well as its efforts to track the disease, to more fully ensure that appropriate and timely interventions are routinely provided, particularly to those in greatest need. Several DHHS agencies have undertaken activities in this area, while others have the capacity for public health practice activities on asthma but have not yet made substantial investments. Expanded collaboration at the local level will facilitate progress in eliminating asthma-related disparities. (Appendix E describes in detail the asthma-related activities of DHHS agencies.)

Mission of the Department of Health and Human Services

The mission of DHHS is to enhance the health and well-being of Americans by providing for effective health and human services and by fostering strong, sustained advances in the sciences underlying medicine, public health, and social services. DHHS' six strategic goals are:

- 1. Reduce the major threats to the health and productivity of all Americans.**
- 2. Improve the economic and social well-being of individuals, families, and communities in the United States.**
- 3. Improve access to health services and ensure the integrity of the nation's health entitlement and safety net programs.**
- 4. Improve the quality of health care and human services.**
- 5. Improve the nation's public health systems.**
- 6. Strengthen the nation's health sciences research enterprise and enhance its productivity.**

The great majority of DHHS expenditures for asthma are for direct delivery of health services. Estimates of Medicaid and Medicare expenditures for treatment of asthma exceed one billion dollars per year (65). Thousands of people receive care for their asthma at DHHS-funded health centers and hospitals, but estimates of expenditures on asthma alone are impossible because costs are covered by large block grants that support comprehensive primary care, not disease-specific programs.



For two decades, the U.S. Public Health Service has used Healthy People reports to set specific national objectives for health, to organize concerted action among the public health and private sectors to meet them, and to provide indicators for monitoring progress (22). National goals for improving asthma health outcomes have been established as part of the Healthy People initiative. In the first report, Healthy People 2000 had three objectives specifically relevant to asthma: reduce hospitalizations, reduce activity restriction, and increase the proportion of people with asthma who receive formal patient education. Results of a mid-course evaluation of progress toward Healthy People 2000 goals for asthma were disappointing. For example, by 1996, there was no progress toward eliminating disparities in hospitalization rates for African-Americans and other non-whites compared to whites (66). New goals for asthma for 2010 — with a special focus on eliminating disparities — include numerical targets for reducing hospitalizations, reducing emergency room visits, and

reducing the proportion of people with asthma who experience activity limitations (see Table 1 and Appendix G). The challenge of accelerating progress and achieving the goals set for 2010 is substantial, but the foundation for doing so is well established.

Secretary's Initiative on Asthma

In the fall of 1997, DHHS Secretary Donna Shalala called for an initiative to tackle the growing problem of asthma. Shortly thereafter, the President's Task Force on Environmental Health Risks and Safety Risks to Children, which Secretary Shalala co-chairs with Environmental Protection Agency (EPA) Administrator Carol Browner, began to address the environmental influences on childhood asthma. In April, 1998, the Secretary's Science Advisor (the Deputy Assistant Secretary for Science Policy) convened a DHHS workgroup to help guide a Department-wide initiative on all aspects of asthma, including the environment and asthma in children. The DHHS workgroup developed a draft strategic plan (*Action Against Asthma*, March 22, 1999) and solicited public comment. The draft plan was revised in response to the comments received, and this final strategy is the result. For the first year of the strategy, DHHS discretionary funding for asthma increased from \$157 million in FY 1999 to \$183 million in FY 2000.

Table 1. Healthy People 2010: National Goals for Asthma

Healthy People 2010 is designed to achieve two over-arching goals: 1) to increase quality and years of life, and 2) to eliminate health disparities. Progress toward the goals will be monitored through specific objectives in 28 focus areas. Respiratory diseases, including asthma, are covered in Focus Area #24. The asthma objectives are:

24.1 Reduce asthma deaths	1998 (baseline)	2010 Target
	<i>Rate per million</i>	
a. Children under age 5 years	1.7	1.0
b. Children aged 5 to 14 years	3.2	1.0
c. Adolescents and adults aged 15 to 34 years	5.9	3.0
d. Adults aged 35 to 64 years	17.0	9.0
e. Adults aged 65 years and older	87.5	60.0
24.2 Reduce hospitalizations for asthma	1998 (baseline)	2010 Target
	<i>Rate per 10,000</i>	
a. Children under age 5 years	60.9	25
b. Children and adults aged 5 to 64 years	13.8	8
c. Adults aged 65 years and older	19.3	10
24.3 Reduce hospital emergency department visits for asthma	1995-97 (baseline)	2010 Target
	<i>Rate per 10,000</i>	
a. Children under age 5 years	150.0	80
b. Children and adults aged 5 to 64 years	71.1	50
c. Adults aged 65 years and older	29.5	15
24.4 Reduce activity limitations among persons with asthma		
Target: 10%		
Baseline: 19.5 percent of persons with asthma in 1994-96.		
24.5 (Developmental) Reduce the number of school or work days missed by persons with asthma due to asthma.		
24.6 Increase the proportion of persons with asthma who receive formal patient education, including information about community and self-help resources, as an essential part of the management of their condition.		
Target: 30%		
Baseline: 6.4 percent of persons with asthma received formal patient education in 1998 (preliminary data).		
24.7 (Developmental) Increase the proportion of persons with asthma who receive appropriate asthma care according to the NAEPP guidelines.		
24.8 (Developmental) Establish in at least 15 States a surveillance system for tracking asthma death, illness, disability, impact of occupational and environmental factors on asthma, access to medical care, and asthma management.		

(See Appendix G for additional data and data sources for these objectives.)

This strategy is designed to help achieve the national Healthy People goals for asthma. Over the next five years, this strategy will guide the development of budget proposals of DHHS agencies. Annually, budget proposals from each agency will be evaluated to ensure that they address the priority areas identified in this plan. Representatives from DHHS agencies will continue to coordinate and collaborate on key asthma programs. The agencies will assess progress in addressing the priorities of this strategy and contributions to achieving the Healthy People goals. The agencies will also continue to reach out to external constituencies to convey information on DHHS efforts and to receive advice on future directions.

The strategy envisions close coordination between DHHS initiatives and activities led by professional societies, universities, non-governmental and community-based organizations, providers of medical care, businesses, and other federal, state, local and tribal government agencies in pursuit of progress in these areas over the next five years (see Appendix F for a description of asthma programs outside of DHHS). A primary forum for coordination of education and public health programs with these entities is the National Asthma Education and Prevention Program (see Appendix F for a list of member organizations).

As described in the following chapters, **the priority areas for investment over the next five years** are:

- **Determine the causes of asthma and develop interventions to prevent its onset.**
- **Reduce the burden for people living with asthma.**
- **Eliminate the disproportionate health burden of asthma in minority populations and those living in poverty.**
- **Track the disease and assess the effectiveness of asthma programs.**

The remainder of this strategic plan expands on these priorities. For each, it provides examples of current and relevant DHHS-supported activity to illustrate the breadth and depth of work underway, as well as the most urgent needs for additional investment. The plan concludes with detailed recommendations for activities to be undertaken in each priority area over the next five years. The recommendations represent the most urgent needs to control asthma and the DHHS' capacity to address those needs.