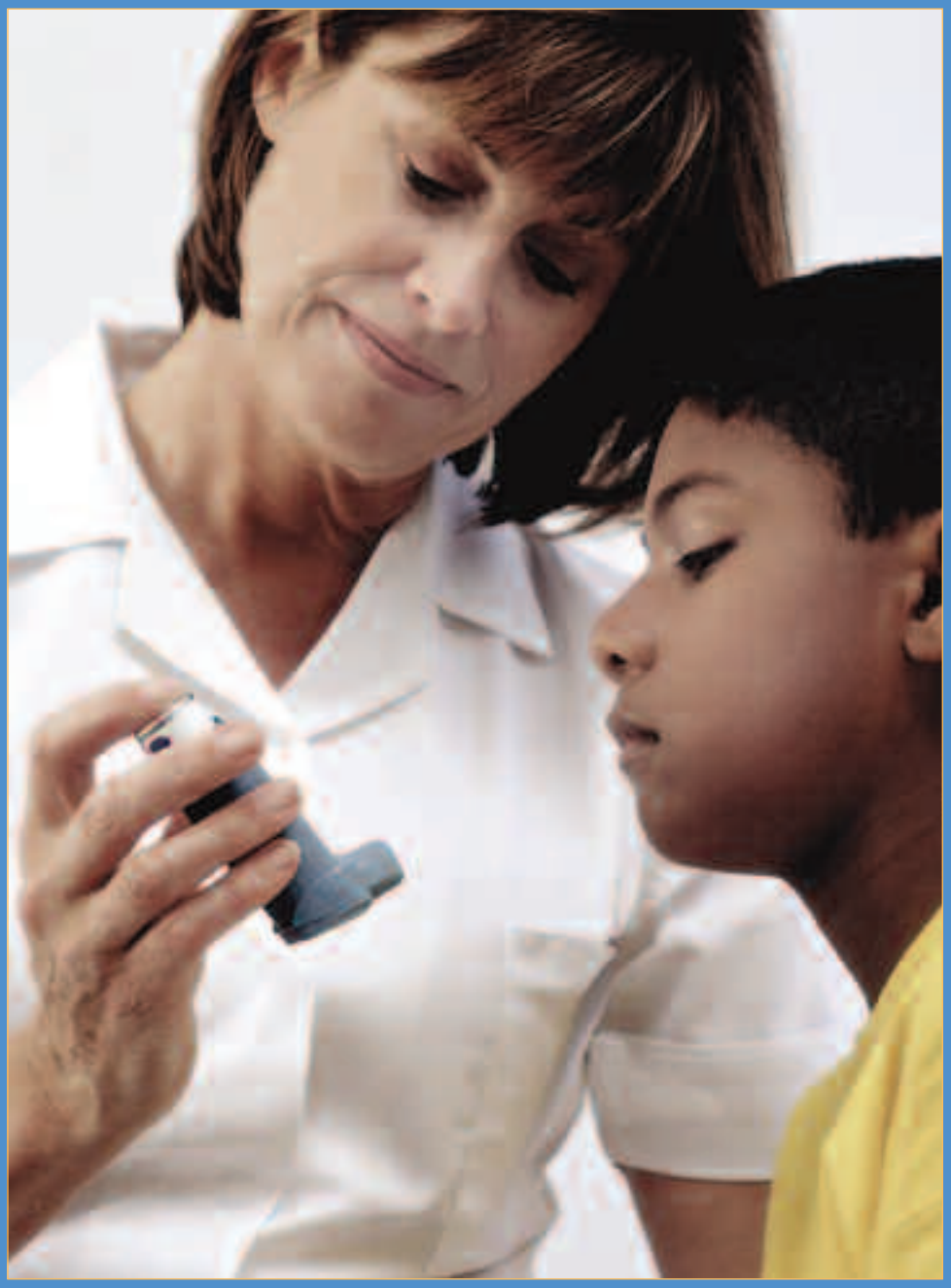
Ethnic Disparities in the Burden and Treatment of Asthma



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The National Pharmaceutical Council

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Key Findings

- In the United States the burden of asthma falls disproportionately on the black and Hispanic—largely Puerto Rican—populations, and especially on minority children. These groups have disproportionately high rates of poor asthma outcomes, including hospitalizations and deaths. This burden has environmental, socioeconomic, and behavioral causes.

- As much as 40 percent of the risk of asthma in minority children is attributable to exposure to residential allergens that could be reduced, if not eliminated. Access to care is hampered by socioeconomic disparities, shortages of primary care physicians in minority communities, and language and literacy barriers. A pattern of health care behavior characterized by the underuse of long-term control medications and a reliance on episodic and emergency care is common in black and Hispanic Americans with asthma.

- Underuse of asthma medicines, especially of long-term control medications, is more common in minority than in white children. Specifically, minority children are less likely than white children to use inhaled corticosteroids, which are recommended long-term control medications.

- Underuse of asthma medications can reflect breakdown along the sequence of behaviors required for adequate therapy: (1) under-prescribing, (2) not filling prescriptions, and (3) poor compliance with filled prescriptions. Failure at each of these stages has been reported for minority children with asthma, in some cases at a higher rate than for white children.

- Adherence to asthma medication regimens in minority children may be compromised by their parents' beliefs about the role and usefulness of medications, concerns about adverse effects, poor literacy, and distrust of and poor communication with physicians. Individualized, culturally sensitive communication with minority families can help avoid these problems.

- Increasing the use of long-term control medications is key to reducing disparities in the burden of asthma. Consistent use of such medications, especially within the context of asthma management programs, can reduce the use of emergency care and alleviate the burden of childhood asthma in minorities.

- Asthma education and management programs designed for minority groups can teach them how to use medication inhalers correctly, correct false impressions about medications, and explain the role of environmental triggers. A number of such programs have been tested, particularly among minority children, with demonstrable success. The widespread adoption of such programs could potentially alleviate a large proportion of the burden of asthma in minority children and adults.

Preamble

In the United States the burden of asthma falls disproportionately on the black and Hispanic—largely Puerto Rican—populations. This disparity is the subject of this report. Although the report is concerned with minority populations as a whole, much of the material presented applies specifically to minority children, who are most affected by asthma.

Black and Puerto Rican populations have disproportionately high rates of poor asthma outcomes, including hospitalizations and deaths. Much of this disparity has been attributed to unequal access to preventive care. Black and Puerto Rican children characteristically under-use routine health care services and overuse emergency care services for asthma. Environmental, socioeconomic, and behavioral factors all contribute. Childhood asthma is closely associated with environmental exposures, particularly to residential allergens, that could be reduced if not eliminated. Educational programs designed to control asthma and prevent symptom outbreaks focus on avoidance of environmental triggers and proper use of asthma medications.

Effective medications are available for the long-term control of asthma and for quick relief of symptom outbreaks. Underuse of these medicines, especially of long-term control medications, is more common in minority than in white children. Specifically, minority children are less likely than white children to use inhaled corticosteroids, which are recommended long-term control medications. The consistent use of these medications, especially within the context of asthma management programs, can reduce the use of emergency care and alleviate the burden of childhood asthma in minorities.

This report contains three chapters, the first of which discusses disparities in the burden of asthma on the black and Hispanic populations as compared with the white population. The second chapter discusses possible hereditary, environmental, and behavioral causes of these disparities. The third chapter discusses ways in which these asthma disparities may be lessened.

Role of medications in reducing asthma disparities

- Asthma can be controlled with medications. Quick-relief drugs are for the immediate relief of symptoms, and ‘controller’ drugs are for the long-term control of persistent asthma.
- Black and Hispanic people tend to underuse long-term control medications. They also use fewer of these medications than comparable white populations.
- Failure to use asthma maintenance medications regularly, as recommended in national guidelines, may explain the high rates of emergency department visits and hospitalizations among black and Puerto Rican populations.
- Underuse of asthma medications occurs, in part, because physicians may not prescribe long-term control medications to patients who should, according to national guidelines, receive them.
- Even when medications are prescribed, minority children do not always receive them.
- Adherence to medication is compromised by parental concern about side effects and by not understanding the importance of using long-term control medications even when symptoms are not present.
- Culturally sensitive educational programs that target at-risk minorities can reduce disparities in the burden of asthma.

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Chapter 1:
Burden of Asthma on Minorities

What is asthma?

Asthma is a chronic inflammatory disorder of the airways characterized by recurrent episodes of breathlessness and wheezing.[1] Asthma often co-exists with allergies and can be exacerbated by exposure to allergens. Allergies are immune responses that result in irritating or harmful reactions. Most allergic responses are "immediate hypersensitivities," in which contact with an allergen causes smooth muscle to contract, blood vessels to dilate, and mediators of inflammation to be released. When this happens at mucosal surfaces, it can give rise to a variety of disorders including asthma, hayfever, allergic sinusitis, and conjunctivitis. In the skin, it results in allergic eczema and hives; in the gastrointestinal tract, it gives rise to food and drug reactions.[2] With asthma, hyper-responsiveness to allergens and to other irritants triggers inflammation and constriction of the airways and recurrent symptoms of coughing, wheezing, and breathlessness that can be life threatening. Asthma is a complex syndrome, however, that eludes complete explanation or any single definition.

What therapies are available for asthma?

Asthma cannot be cured, but it can be managed by avoiding exposure to environmental triggers and by the regular use of asthma-controlling medications.[3] There are two kinds of medications: quick-relief medications for the immediate relief of symptoms and controller medications for the long-term control of persistent asthma.[4] Short-acting beta-agonists and ipratropium, which act by dilating the airways (i.e., bronchodilation), are quick-relief medications. The long-term maintenance medications are either anti-inflammatory agents (corticosteroids, cromolyn, nedocromil, and the newer leukotriene modifiers) or bronchodilators (i.e., long-acting beta-agonists and theophylline). Many of the drugs are inhaled, but some are taken orally.[4] Guidelines from the National Asthma Education and Prevention Program (NAEPP) recommend daily long-term control medications for all patients with persistent asthma.[3] The severity of the asthma determines the combinations and dosages of medications used. Figure 1.1 shows the classes of drugs approved for the treatment of asthma.

Asthma and its impact

Asthma is a chronic inflammatory disorder of the airways. Each year asthma is responsible for about 5,000 deaths and about 2.5 million hospitalizations or emergency department visits. Asthma also results in a yearly loss of millions of school and work days. The total cost is estimated to be $14 billion per year.

Figure 1.1. Classes of medicines for long-term control and quick relief of asthma[a]

Drug Class	Long-Term Control	Quick Relief
Corticosteroids	Inhaled Beclomethasone dipropionate Budenoside Flunisolide Fluticasone propionate Triamcinolone acetonide	Oral[b] Cortisone Dexamethasone Hydrocortisone Methylprednisolone Prednisolone Triamcinolone acetonide
Beta-agonists	Inhaled Formoterol Salmeterol	Inhaled Albuterol Levalbuterol Metaproterenol Pirbuterol
Anti-leukotrienes	Oral Montelukast Zafirlukast Zileuton	
Monoclonal Antibody	Injected Omalizumab	
Cromolyn	Inhaled Cromolyn Nedocromil	
Xanthines	Oral Theophylline	
Anti-cholinergics		Inhaled Ipratropium bromide

[a]Not shown are combination drugs.
[b]Oral corticosteroids are typically only prescribed in short courses.
Source: Adapted from references 4 and 42.

Impact of asthma on society

Asthma has a major impact on the health of the population as well as on the health care system.[5] Each year asthma is responsible for about 5,000 deaths, nearly 500,000 hospitalizations, and 2 million visits to emergency departments.[6] Asthma attacks restrict people's activity and are a leading cause of absence from school and work. Estimates vary from 2.1 million to 14 million work days and 3.6 million to 14 million school days lost annually.[6-8] As of 1994, the economic costs of asthma totaled $10.7 billion per year, with direct medical expenditures equaling $6.1 billion.[8] The most recent estimates (in 2002 dollars) are $14 billion per year in total costs and $9.4 billion in direct medical costs.[9] The burden of asthma falls disproportionately on some minorities and particularly on children.[6,10] Decreasing this disparity would reduce not only the impact of asthma on minorities but also the cost to society as a whole.

Impact on children

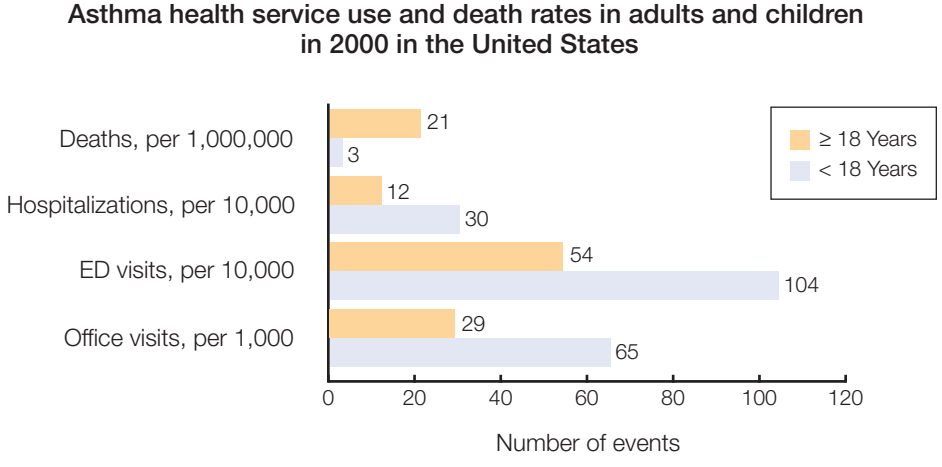
The burden of asthma falls disproportionately on children under age 18 (Figure 1.2).[10] This is reflected particularly in the rates of asthma-related use of health care services, which are two to three times higher for children than for adults.[10] Only the asthma mortality rate is lower for children.[10] The pattern of increased emergency health care use by children is accentuated for those younger than 5 years of age, who have the highest rates of emergency department visits and hospitalizations of any age category.[6]

Asthma Medicines (see Figure 1.1)

Asthma medicines can be categorized in several ways: by drug class, by mechanism of action (anti-inflammatory or bronchodilatory; mechanism of action is not indicated in Figure 1.1), by mode of use (for long-term control or quick relief), and by route of administration (oral, inhaled, or injected). Long-term control medicines should be taken daily by patients with persistent asthma, while quick-relief medicines are used for acute attacks.[4] Some medications, e.g., inhaled albuterol, are available for both long-term control and quick relief. There are fewer side effects when a medicine is inhaled than when it is taken orally, but inhaled medicines are more complicated to use.

- Corticosteroids are recognized as effective long-term control medicines, although they carry some risk of side effects. Inhaled beta agonists such as albuterol are the therapy of choice for quick relief of acute symptoms.
- Anti-leukotrienes are safe and can be taken orally, and hence are suitable for children, but they are a relatively new class and there is little information about their use by minorities.
- Cromolyn and nedocromil are less potent than inhaled corticosteroids, and safety is their primary advantage.
- Anticholinergics and xanthines are rarely used by children. Theophylline, for instance, has a narrow therapeutic index and can cause serious side effects.
- Omalizumab, a bioengineered antibody administered once or twice a month by subcutaneous injection, was recently approved by the Food and Drug Administration for adults and adolescents 12 years of age and older who have inadequately controlled, allergy-related asthma.

Figure 1.2. The burden of asthma falls disproportionately on children



ED, emergency department.
Source: Adapted from reference 10.

Regardless of minority status, the burden of asthma—shown here in terms of the use of health care services—falls more heavily on children. Children in the United States visit physicians' offices (including hospital outpatient departments) about twice as frequently as adults. The rates of emergency care use for asthma—visits to the emergency department and hospitalization—are 2 to 2.5 times higher for children than for adults. Only the asthma death rate is higher for adults than for children. Note that the denominators are different for different categories of health care services use.

Asthma and Minorities

Profile of the minority populations

In the 2000 census, racial groups other than the majority white made up 33 percent of the U.S. population.[11] The minority racial groups were: black 13 percent, Asian 4 percent, American Indian and Alaska Native 1 percent, and Pacific Islander 0.2 percent. "Hispanic" is not a racial category and people of Hispanic origin can belong to any race. In 2000, Hispanics (also called 'Latinos') made up 13 percent of the population. The minority populations in the United States are, thus, predominantly black and Hispanic. These two groups constitute the new majority in many American cities.*

Asthma and minorities

Black and Hispanic Americans are the largest minority groups in the United States. These minorities—both adults and children—bear the greatest burden of asthma, measured in terms of asthma mortality and the use of emergency health services, including hospitalizations. Deaths due to asthma are three times more common among black people than among white people. Hispanics are not a single ethnic group, but are culturally, genetically, and geographically diverse, and this diversity is reflected in the asthma statistics. The recorded asthma death rate among Mexican Americans is actually lower than that of whites. On the other hand, the asthma death rate of Puerto Ricans is almost three times that of whites. Similar disparities exist in emergency department visits, which are more than twice as frequent among black as among white Americans, and in asthma hospitalizations, which are three to six times more frequent among the black and Puerto Rican populations than among the white population. Minority children are especially at risk.

Hispanic subgroups

Of the approximately 35 million Hispanics in the United States, 20.6 million are Mexican American, 3.5 million are Puerto Rican, 1.2 million are Cuban, and 10 million are from other Latin countries.[11] Within the United States, Mexican Americans reside predominantly in the West and South, Puerto Ricans predominantly in the Northeast, and Cubans mainly in the South.[11]

Ancestry of Hispanic populations

The Hispanic gene pool in the United States contains contributions from European, American Indian, and African populations. The relative contributions of these three groups differ, however, in each Hispanic subpopulation (see Figure 1.3).[12] Mexican American ancestry consists of admixtures of European and American Indian genes, with very little contribution (3 percent or less) from Africa.[12-14] Conversely, Puerto Ricans are largely an admixture of African (37 percent) and European ancestry (45 percent), with a relatively small American Indian contribution (18 percent).[12] Only 12 percent of Puerto Ricans, however, report being of black race.[15] In the United States the percentage of European genes among populations of African descent ranges from 12 percent (in Charleston, South Carolina) to 23 percent (in New Orleans, Louisiana).[16]

*In the 2000 census, black and/or Hispanic people were the majority in eight of the ten most populous cities in the United States.

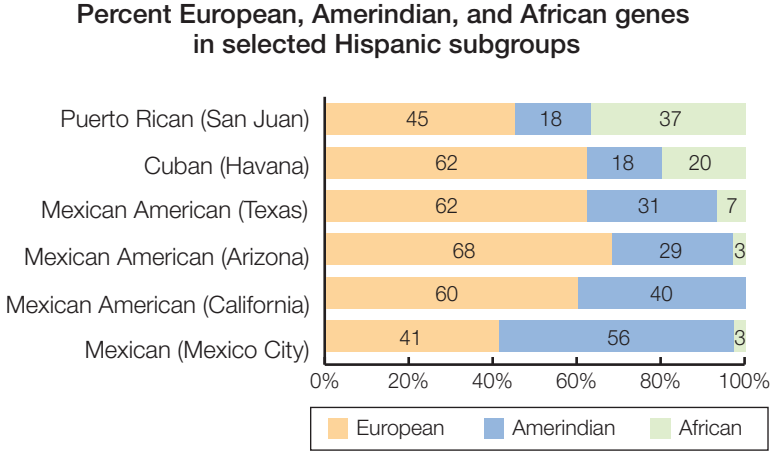
Burden of asthma on minority populations

The burden of asthma on a population may be expressed in terms of its prevalence, mortality, and rates of health services use.

Asthma prevalence

Asthma prevalence—the fraction of the population that has asthma at a point in time or within a given time period—can be expressed in several different ways (e.g., as a lifetime diagnosis, as current asthma, as having had one or more asthma attacks in the previous year, etc).[10] Measured in these ways, the prevalence of asthma in the United States seems to be only slightly higher in the black than in the white population: e.g., the lifetime prevalence is 12.1 percent in the black and 11.6 percent in the white populations.[10] The national average lifetime prevalence of asthma among Hispanics is 9.2 percent, but this figure masks wide variations between different Hispanic subgroups. In the 2001 California Health Interview Survey, the lifetime asthma prevalence among Puerto Ricans (18.9 percent) was more than twice the rate among Mexicans, Salvadorans, and Guatemalans (8.1 to 9.2 percent).[17] Similarly, the prevalence of current asthma among Hispanic adults in the island of Puerto Rico is 11.6 percent, more than twice the prevalence (5.0 percent) among adult Hispanics in the United States (data from the 2002 Behavioral Risk Factor Surveillance System survey of 19 areas, not including New York; the current asthma prevalence for the non-Hispanic black and white populations is 9.3 percent and 7.6 percent, respectively).[18] Numerous studies have shown that the prevalence of childhood asthma is greater among Puerto Ricans than in any other Hispanic subgroup—see 'Asthma prevalence in Hispanic subgroups,' on page 12.

Figure 1.3. Ancestries of Hispanic subgroups differ



Sources: Puerto Ricans, Cubans, and Mexican Americans in Texas from reference 12, Mexican Americans in Arizona from reference 13; Mexican Americans in California from reference 14; and Mexicans in Mexico City from reference 43 (cited in reference 44).

The ancestry of Hispanics has contributions from European, American Indian, and African genes, but the relative proportions of these genes differ among Hispanic subgroups. Researchers are investigating whether or not these genetic differences contribute to disparities in the burden of asthma.

Asthma mortality

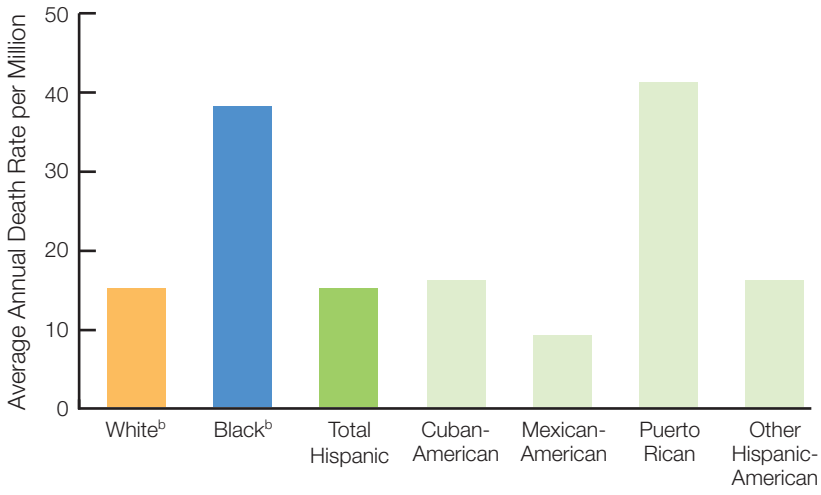
Black and white populations

The difference between the black and white populations in the national averages for asthma prevalence is minor compared with the differences in national rates of asthma mortality and health care resource use. Deaths due to asthma are far more frequent in the black population: the most recent figure for the black-to-white asthma mortality ratio for the nation overall is 3.0 (ratio of estimates of 36 and 12 per million for the 2001 age-adjusted black and white populations).[19] In Chicago, Illinois, the age-adjusted asthma mortality rate is 4.7 times higher for the black population than for the white population.[20]

Differences in asthma mortality among Hispanic subgroups

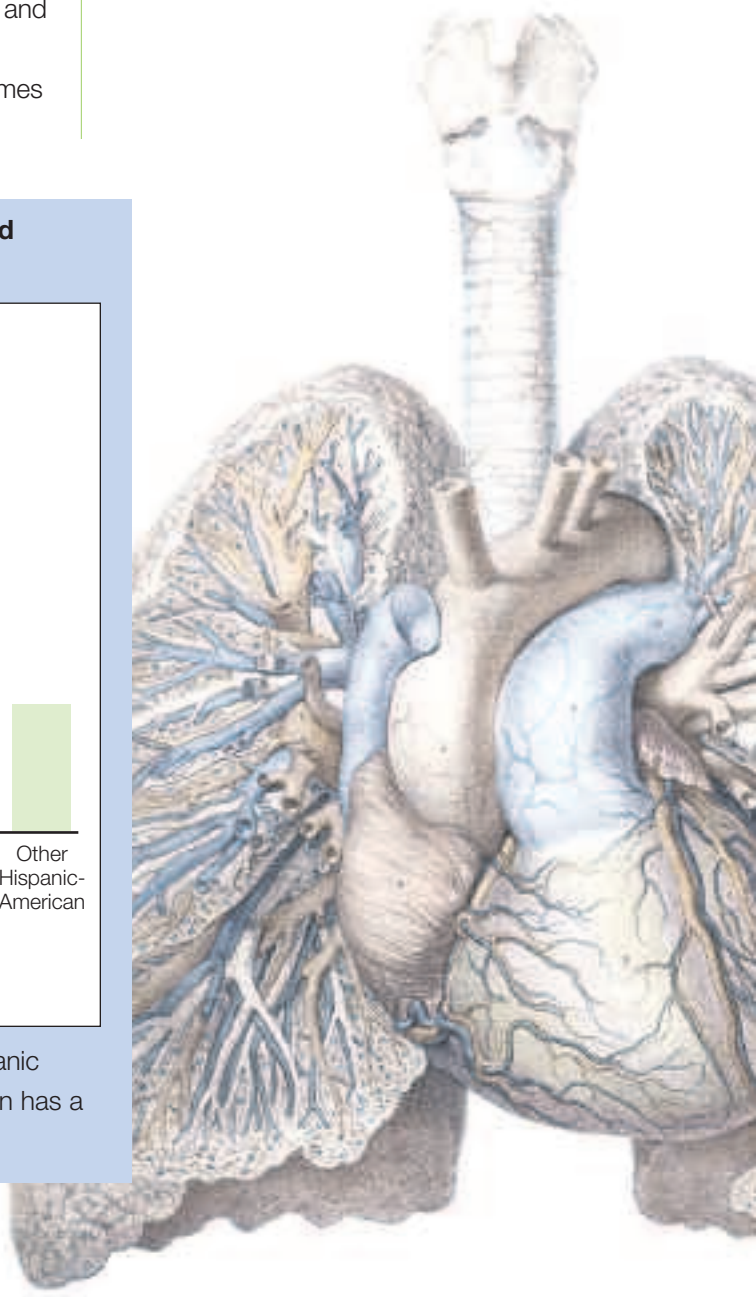
The annual asthma mortality rate varies considerably among Hispanic subpopulations (Figure 1.4).[15] It is relatively low for Mexican Americans (9 per million), whereas Puerto Ricans have the highest asthma mortality of any racial or ethnic subgroup (41 per million, almost three times the rate for white people).[15]

Figure 1.4. Asthma death rates are highest among black and Puerto Rican populations



[a]Mortality rates are age-adjusted rates standardized to the 1970 U.S. population.
[b]Non-Hispanic.
Source: Adapted from reference 15.

Asthma mortality rates are higher for the black and for most Hispanic populations than for whites; only the Mexican-American population has a lower mortality rate.



Use of emergency health care services

The pattern of health care service use for asthma is similar to that for mortality. National rates for emergency department visits and hospitalizations are two- to threefold higher for black people than for white people (see Figure 1.5; these estimates for white and black populations include people of Hispanic ethnicity, because information about Hispanic ethnicity is not consistently available in national health care utilization data).[10] Other studies have shown that asthma hospitalizations are several times more frequent among non-Hispanic black than among non-Hispanic white people (Table 1.1).[21] Among Hispanic subpopulations, Puerto Ricans in New York have a far higher rate of asthma hospitalizations than Mexican Americans in Los Angeles (Table 1.1).[21,22] Puerto Ricans are more likely than Mexicans to have been hospitalized and to have visited the emergency department for asthma, regardless of geographic location (Figure 1.6).[23]

Table 1.1. Asthma hospitilization rates are greatest for black and Puerto Rican populations

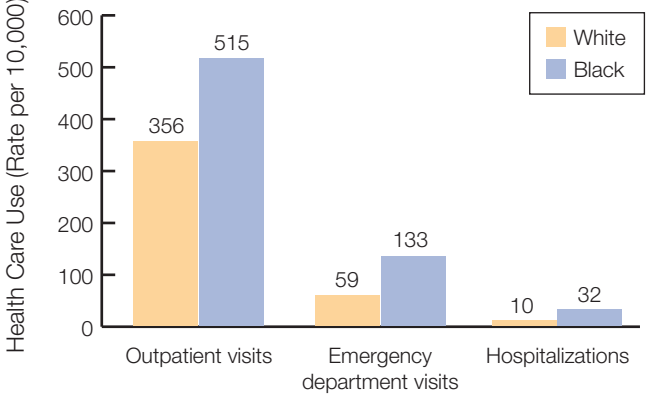
Asthma hospitalizations per 10,000

Location	White	Black	Hispanic	Asian
California	10	43	13[a]	9[c]
Los Angeles	n/a	60	14[a]	n/a
New York	n/a	40	63[b]	n/a

n/a, not available
[a]Primarily Mexican American.
[b]Primarily Puerto Rican.
[c]Primarily Filipino, Chinese, and Japanese.

Sources: Data for California 1993, age-adjusted for the non-elderly population under age 65 years, are from reference 21. Data for New York City 1982-1986 for the population under age 35 years are from reference 21, based on reference 22.

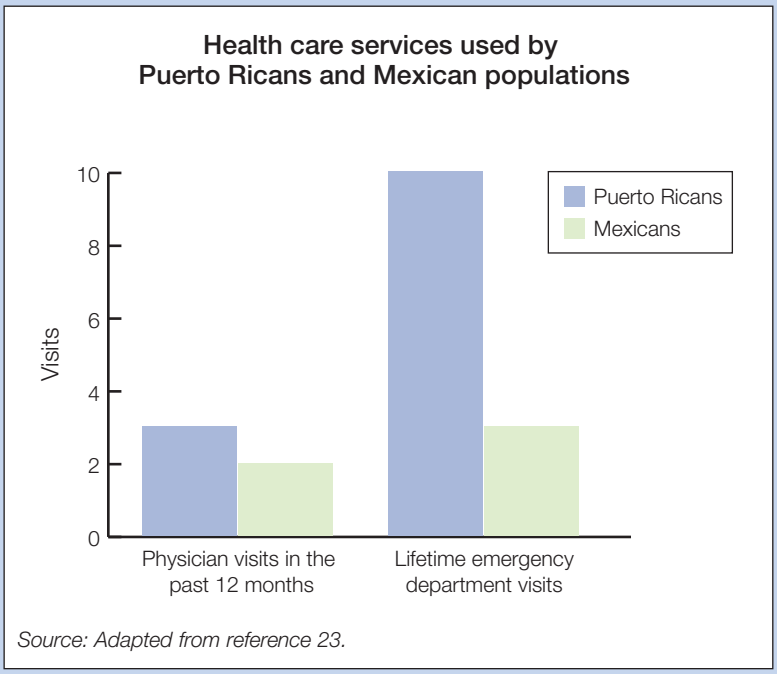
Figure 1.5. Black people use more health care services for asthma than do white people



[a]Estimates for white and black populations included people of Hispanic ethnicity. (Information about Hispanic ethnicity is not consistently available in national health care utilization data.)
[b]Annual rate age-adjusted to the 2000 population
Source: Reference 10.

Emergency services (emergency department visits and hospitalizations) are used two to three times more frequently by blacks than by whites.

Figure 1.6. Puerto Ricans use more health care services for asthma than do Mexicans



Source: Adapted from reference 23.

The median numbers of visits to physicians or emergency departments for asthma are shown for 365 Puerto Ricans (median age 12 years) and 294 Mexicans (median age 13 years) in the San Francisco Bay Area, New York City, Puerto Rico, and Mexico City. The differences between Puerto Ricans and Mexicans are highly statistically significant.

Associated mental health problems

Studies of predominantly black and Hispanic inner-city populations have shown that 40 to 50 percent of adults with asthma also had depression or other mood disorders.[24,25] In other studies of similar inner-city populations, children whose caretakers (usually their mothers) had symptoms of depression or other mental health problems were more likely to have problems using their inhalers,[26] to forget to take their medications,[26] or to require emergency care for asthma than children whose caretakers did not have these mental health problems.[27,28] Studies of the Puerto Rican island population have established a link between parental mental health problems, including depression, and asthma attacks in their children.[29] These associations between parents' mental health problems and their children's asthma were independent of any childhood psychopathology.[29] However, Puerto Rican island children who had asthma were also more likely to have co-morbid depression and anxiety.[30] Other recent findings also suggest that children (white, black, and Hispanic in New Haven, Atlanta, New York, and Puerto Rico) with asthma are more likely than children without asthma to suffer from anxiety disorders.[31] These associations suggest that mood disorders may contribute significantly to the burden of asthma in minorities.

Asthma burden in minority groups other than black and Hispanic Americans

This monograph is largely concerned with disparities among the black and Hispanic populations, which are the largest minority groups in the United States.[11] There is comparatively little information about the burden of asthma among other minorities.

Data from California indicate that American Indians and Alaska Natives have the highest lifetime prevalence of asthma, followed in descending order by Pacific Islanders, African Americans, whites, Asians, and Hispanics.[17] The asthma morbidity of East Asians in California is similar to that for whites: the asthma hospitalization rate for East Asians (primarily Filipino, Chinese, and Japanese) is about the same as that for whites (Table 1.1);[21] and a study of the Californian population during 1960 to 1989 indicated that the asthma mortality rate among Asians (again, primarily Filipino, Chinese, and Japanese) was also similar to that of whites.[32] Among Asian populations in California,

Japanese have the highest (17 percent) and Koreans the lowest (5 percent) lifetime prevalence of asthma.[17]

The 2002 Behavioral Risk Factor Surveillance System survey for 19 areas also found that American Indians and Alaska Natives have one of the highest prevalences of current asthma (11.6 percent), followed in descending order by the (non-Hispanic) black (9.3 percent), white (7.6 percent), Asian (2.9 percent), and Native Hawaiian/Pacific Islander (1.3 percent) populations.[18] The greatest prevalence of current asthma, however, occurs among individuals of multiracial background (15.6 percent).[18]

Table 1.2. Asthma burden among white, black, and Hispanic children younger than 18 years of age

Asthma Burden	White	Black	Hispanic
Asthma prevalence (%)[a]	5.3[b]	7.7[b]	4.2
Health care service use (%)[c]			
Physician office visits	5.9	7.2	n/a
Hospital ED visits	0.9	2.6	n/a
Hospitalizations	0.2	0.6	n/a
Deaths (per 1,000,000)[d]	2.2[b]	10.1[b]	1.6

n/a, not available
[a]Included are individuals with a diagnosis of asthma who had one or more asthma attacks in the previous twelve months. Data are for 2000.
[b]Non-Hispanic white and black children.
[c]Annual visits during the period 1998–1999. White and black categories include children of Hispanic origin.
[d]Annual mortality rate during 1997–1998.
Source: Reference 33.

Asthma in minority children

Burden of asthma among black and Hispanic children

In national surveys, the unequal asthma burden of black children mirrors that of black adults. National rates of asthma prevalence and physician visits are only slightly higher among black than among white children (Table 1.2).[33] In contrast, rates of asthma-related emergency department visits and hospitalizations are about three times higher and mortality rates are four to five times higher for black than for white children. Asthma prevalence and mortality rates for Hispanic children overall are slightly lower than those for white children[33] —but, again, these are national averages and differences between Hispanic subgroups exceed those between black and white children. The demographic with the greatest reported asthma burden is homeless children in New York City, almost all of whom are black or Hispanic. In a recent study of these children the prevalence of asthma was about 40 percent and about 25 to 50 percent (depending on asthma severity) of those with asthma had visited the emergency department in the previous 12 months.[34]

Asthma prevalence in Hispanic subgroups

The prevalence of asthma among children is highest in the Puerto Rican population.[35-38] National surveys conducted during 1976 to 1984 gave a current childhood asthma prevalence of 11 percent for Puerto Ricans, compared with 6 percent for blacks, 5 percent for Cubans, and 3 percent for whites and Mexican Americans.[35] The relatively high rate of childhood asthma among Puerto Ricans has been confirmed in several more recent studies set in the Northeast. In a 1993–1994 study set in Connecticut, the asthma prevalence was 18 percent in Hispanic (primarily Puerto Rican) children, compared with 11 percent among black children, and 7 percent among white children.[36] In a study of schoolchildren in East Harlem, New York City, the prevalence of current asthma was 23 percent overall, but 35 percent among Puerto Rican children.[37] On the island of Puerto Rico, 32 percent of children have been diagnosed with asthma[39] —this compares with 12.6 percent of the U.S. population under 18 years.[10]

School-age children belonging to a wide range of Hispanic groups were compared in a recent study of Passaic, an industrial town in northern New Jersey.[38,40] Three quarters of these children were Hispanic, predominantly Mexican, Dominican, and Puerto Rican (Table 1.3).[38] Asthma was epidemic among the black and Puerto Rican children, 33 percent and 26 percent of whom, respectively, had a diagnosis of asthma. Mexicans had the lowest prevalence of diagnosed asthma (6.5 percent), while 14 to 15 percent of whites, Dominicans, and other Hispanic groups had diagnosed asthma. These data are presented in Table 1.3 and in Figure 1.7.[38] (Table 1.3 also indicates that most black and Hispanic children in Passaic had health insurance. The relationship between asthma burden and health insurance coverage is discussed in the section 'Factors underlying the disproportionate burden of asthma' in Chapter 2.)

Table 1.3. Asthma morbidity of school children in Passaic, New Jersey

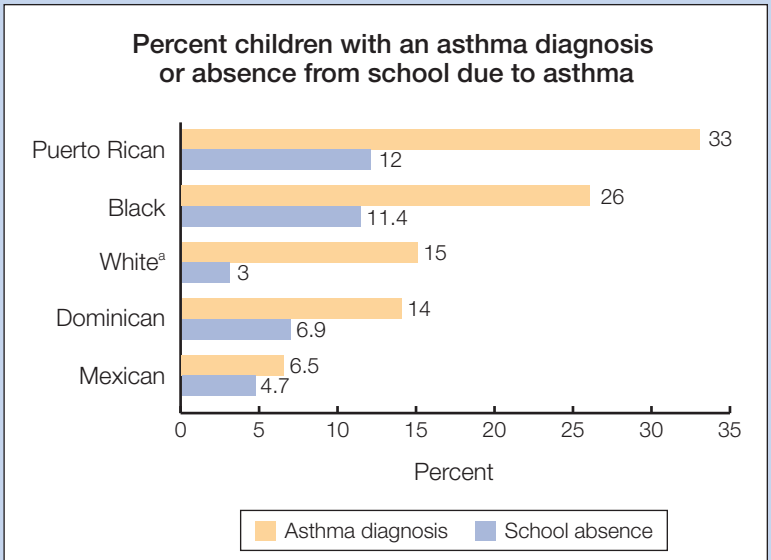
			Hispanic			
Characteristic	White[a]	Black	Puerto Rican	Dominican	Mexican	Other[b]
Percentage of study sample	12	12	19	23	24	9
Average age (y)	8.2	8.7	8.8	8.9	8.7	8.7
Asthma diagnosis (%)	15	33	26	14	6.5	15
Absent >1 day/mo (%)[c]	3.0	12	11.4	6.9	4.7	8.3
Health insurance (%)	93	91	85	72	56	73

[a]Non-Hispanic white.
[b]Hispanics from 14 Caribbean, Central American, and South American countries.
[c]Percentage of children absent from school at least once per month.
Source: Reference 38.

School absenteeism

Nationwide, childhood asthma causes absence from school for an average of about 4 days per year per child with asthma.[6] In the Passaic study, 11 to 12 percent of black and Puerto Rican children were absent from school for at least 1 day per month because of asthma, compared with 3 to 5 percent of white and Mexican children (see Table 1.3 and Figure 1.7).[38] Children in the National Cooperative Inner-City Asthma Study (see box titled 'Portrait of inner-city children with asthma' in Chapter 2) missed between 6 percent and 10 percent of school days over a 3-month period.[41] Again, Puerto Rican children bear the greatest burden. In the East Harlem study cited above, Puerto Rican children were more likely than children of other minority groups to have missed school in the past year because of asthma.[37]

Figure 1.7. Black and Puerto Rican children bear the greatest burden of asthma



[a]Non-Hispanic white.
Source: Adapted from reference 38.

The burden of asthma is expressed here in terms of prevalence (the percentage of children with a diagnosis of asthma) and absence from school (the percentage of children absent from school at least once per month) due to asthma. Black and Puerto Rican children had the highest asthma prevalence and missed more school days because of asthma than white children or children belonging to other Hispanic subgroups (Mexican and Dominican) in this study of Passaic, New Jersey from 1998 to 2001. Note that the prevalence of asthma among white children in this study (15 percent) is higher than the national average (8 percent) for this group.[10]

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Chapter 2:
Asthma Disparities Faced by Minorities

Hereditary risk factors

Household surveys have identified a maternal history or other family history of asthma as a leading risk factor for childhood asthma, highlighting the hereditary component of asthma morbidity.[1-3] A study performed in the Boston metropolitan area showed that the odds of having a child with asthma were increased three times when one parent had asthma and six times when both parents had asthma.[3] Other studies in which cohorts of children were tracked from birth have identified hereditary factors—including parental asthma, maternal hives, and a family history of rhinitis, as well as early childhood eczema and allergies—as key to the development of persistent childhood asthma.[4]

Genetic and environmental components of asthma

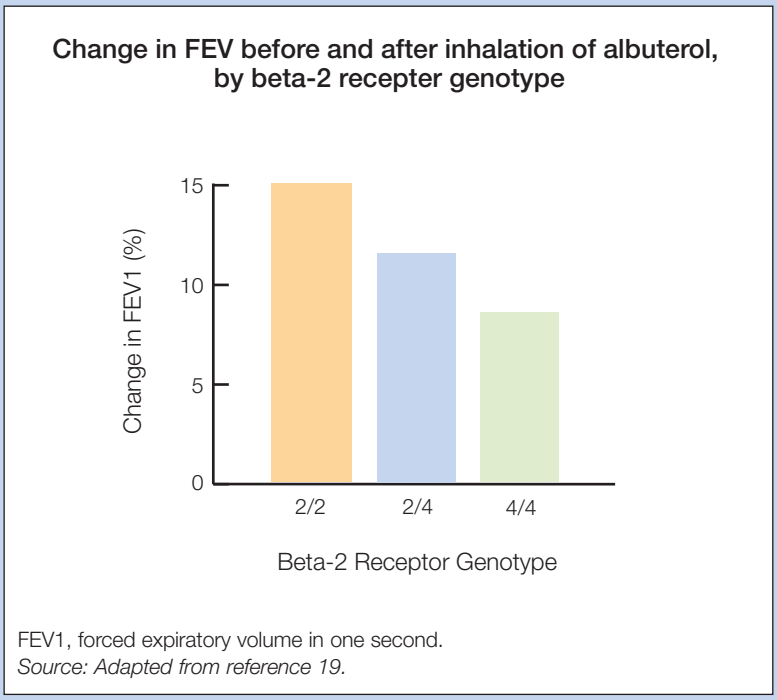
Asthma has a strong genetic component, although for this to be manifest interaction with environmental factors must occur.[5-8] At least some of the differences in asthma between black, white, and Hispanic populations, and between Hispanic subpopulations, could be due to variations in genetic susceptibility.[9,10] It seems reasonable to hypothesize that the greater burden of asthma among U.S. populations with a significant African ancestry (specifically, the black and Puerto Rican populations; see 'Burden of asthma on minority populations' in Chapter 1) is somehow related to African genes[11]—or to a combination of African and European genes. However, most of the evidence to date seems to indicate that the explanation lies elsewhere, in socioeconomic and environmental disparities, in behavioral or cultural differences, and in access to routine health care.

The genetics of asthma and allergies are being intensively researched, with two ultimate aims: first, the identification of individuals at risk of developing allergic diseases; second, the prediction of an individual's response to medication. Several genes have been linked to allergic diseases,[6,12-16] and variants of genes have been identified that control the actions of three anti-asthma medications: theophylline,[17] pranlukast (not available in the United States),[18] and albuterol.[19] Figure 2.1 illustrates how the effectiveness of albuterol in improving lung function changes when individuals have different variants of the gene encoding the beta-2 adrenergic receptor, the receptor with which albuterol interacts.[19]

Asthma risk factors

The risk of asthma is increased by both hereditary and environmental factors. A family history of asthma increases the chances of developing asthma three- to six-fold, while other genetic factors can affect responsiveness to asthma medications. In order for the genetic component of asthma to be manifest, however, there must be interaction with environmental factors. Exposure to airborne allergens and other irritants both triggers asthma attacks and is associated with the development of chronic asthma in infants. About 40 percent or more of childhood asthma is linked to residential exposure to dust mites, pets, tobacco smoke, gas ranges, humidifiers, and so forth. The higher rates of asthma in inner cities may be attributable at least in part to these and other allergens, particularly cockroaches and molds.

Figure 2.1. Gene variations affect the response to asthma medicines



FEV1, forced expiratory volume in one second.
Source: Adapted from reference 19.

Improvement in lung function after inhaling albuterol is presented in the chart as the average percent change in FEV_1—which is the average volume of air subjects can expire (forced expiratory volume) in 1 second. Albuterol improves lung function by interacting with a specific receptor (the beta-2 adrenergic receptor) in cells lining the airways. Three naturally occurring variants (genotypes) of the gene encoding this receptor can influence the effect of albuterol. These different genotypes occur at different frequencies in different racial or ethnic groups (e.g., the 2/2 genotype is quite common in white people but unusual in black people).

Differences in responsiveness to asthma medicines in minority groups

Tests of lung function before and after inhaling albuterol show that Puerto Ricans with asthma respond less well to this drug than do Mexicans (Figure 2.2).[10] This difference in responsiveness could not be accounted for by geographic location (subjects were recruited from the continental United States, Puerto Rico, and Mexico) or by factors known to affect lung function (e.g., age, tobacco exposure, etc.) and might be determined at least in part by genetic differences between these two groups.[10] Since albuterol is commonly prescribed for quick relief of asthma symptoms, its reduced effectiveness in Puerto Ricans could contribute to the excess asthma morbidity in this Hispanic subgroup. Variations in the gene encoding the beta-2 receptor may cause differences between black and white populations in the effectiveness of albuterol. The critical feature of the 4/4 genotype illustrated in Figure 2.1 seems to be a change in the beta-2 receptor protein called arg16. For people with the arg16/arg16 change, albuterol is ineffective and may be detrimental.[20] The arg16/arg16 change occurs in white and black people, but is more common among black people in the United States.[20]

Environmental risk factors

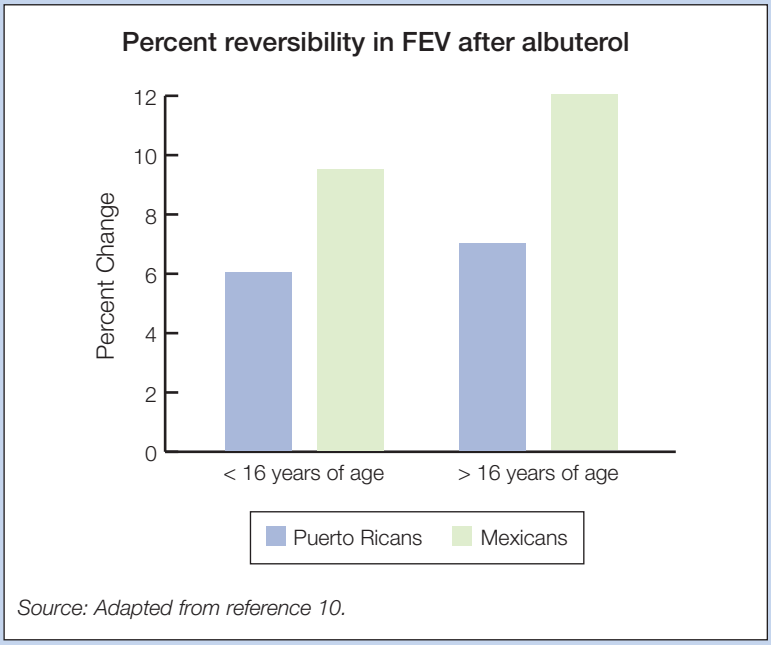
Asthma and allergies are related to environmental conditions. Airborne allergens and respiratory tract irritants found indoors, especially in substandard housing, and atmospheric pollutants contribute to asthma in two ways. First, they trigger asthma attacks in children and adults with chronic asthma. Second, children are sensitized early in life by environmental exposure, and this early sensitization is associated with the later development of chronic asthma.[21,22]

Several studies have sought to identify residential allergens and irritants. There is good evidence that dust mites, cockroaches, pets, and cigarette smoke provoke asthma attacks, as well as evidence implicating fungi, rhinovirus infection, and nitrogen dioxide (from gas appliances).[23] Similarly, exposure to house dust mite allergen and cockroach allergen is associated with the development of asthma in children,[23,24] whereas involuntary exposure to tobacco smoke is associated with increased asthma severity.[25]

Outdoor air pollutants trigger asthma attacks.[26] High levels of ozone are a leading candidate among atmospheric pollutants.[27] Nitrogen oxides, acidic aerosols, and airborne particulate matter also are associated with asthma exacerbations.[28]

Interestingly, there are differences between black, white, and Hispanics in reactivity to allergens—as well as in other clinical features of asthma.[9] Puerto Rican children, in particular, are more likely than white children with asthma to be sensitized to both indoor and outdoor allergens.[29] Puerto Ricans also differ from Mexicans in the age of onset and severity of asthma.[10] These differences could be related to different environmental backgrounds, to different genetic susceptibilities, or to interactions between the two.[9,10]

Figure 2.2. Puerto Ricans respond less well than Mexicans to the beta-agonist albuterol



Source: Adapted from reference 10.

Puerto Rican children (<16 years) and adults (>16 years) respond less well to albuterol than do their Mexican counterparts. Responsiveness to the shortacting beta-agonist, albuterol, is measured here in terms of lung function (FEV_1) before and after inhalation of albuterol.

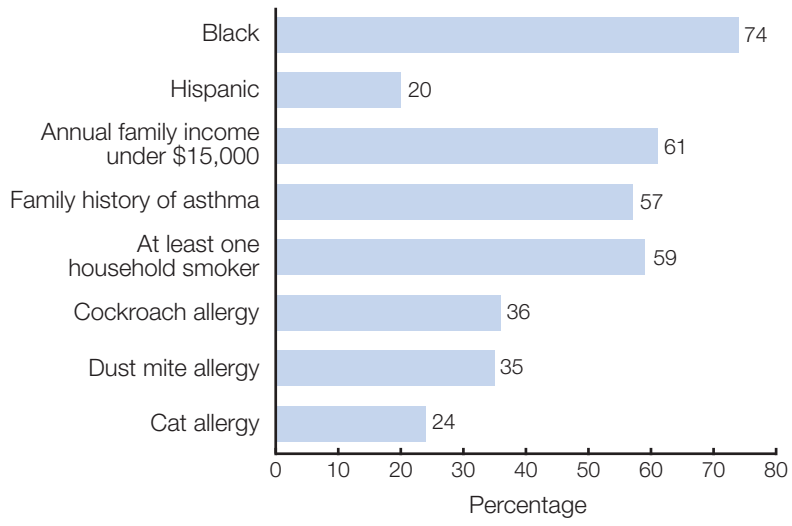
Allergic sensitization in early childhood

Most asthma begins early in life, although exactly how this happens is unresolved.[30] Rather than being caused by any specific allergen, it is thought that asthma arises out of patterns of immune responsiveness established in infancy through the interaction of genetic and environmental factors.[31] Debris from microbes, which is almost ubiquitous, contains one of these environmental factors: a substance called endotoxin. When exposed to endotoxin, infants' innate immune systems mobilize the inflammatory response.[32] Elevated levels of indoor endotoxin are associated with an increased risk of asthma symptoms in infants.[33] However, exposure to endotoxin in infancy also appears to protect against sensitization to common indoor allergens and against the later occurrence of allergy-related childhood asthma.[34-36] Because high levels of indoor endotoxin are associated with the presence of pets[37-39] (exposure to which, as previously mentioned, is positively correlated with asthma[1]), this leads to the paradoxical and controversial idea that keeping a pet in early childhood might reduce the risk of asthma later in life.[40]

Asthma symptoms in childhood

Symptoms of asthma unrelated to allergic sensitization can appear transiently in early childhood and later resolve.[41] Other occurrences of asthma symptoms in school-age children are linked to infection with a type of respiratory virus in infancy rather than with allergic sensitization, and in such cases the symptoms typically do not last into the teenage years.[42,43] Chronic asthma that persists into adult life, however, is definitely linked to sensitization to allergens in early life.[41]

Figure 2.3. Characteristics of inner-city children with asthma



[a]Data are for 1528 children in the National Cooperative Inner-City Asthma Study. The presence of allergies was based on skin tests.
Source: Adapted from reference 53.

Almost all the children the National Cooperative Inner-City Asthma Study were either black or Hispanic. The prevalence of asthma risk factors among these inner-city children is shown.

Residential allergens

Childhood asthma is linked to the presence in the home of dust mites, cockroaches, and molds.[23] In addition, surveys of thousands of households have demonstrated correlations between childhood asthma and exposure to environmental tobacco smoke,[1,2,44,45] use of a gas range,[1,2] the presence of a pet dog,[1] and use of a humidifier.[2] Lanphear et al. estimated that residential exposures account for about 40 percent of the total risk of a diagnosis of asthma in children under 6 years of age.[1] In general, studies have found that about 40 percent of childhood asthma cases can be attributed to sensitization to allergens.[46] A much greater proportion—in the range of 75 to 90 percent—of *severe* childhood asthma, defined as frequent symptoms or asthma hospitalization, can be attributed to sensitization to airborne allergens.[47]

Inner-city environment

Some studies suggest that childhood asthma symptoms are correlated with inner-city living rather than with socioeconomic status or race and ethnicity per se.[48-52] In these studies, once inner-city urban residence was controlled for, neither being black or Hispanic nor poverty were significantly correlated with the prevalence of asthma symptoms in childhood.[48,49,51] Exposure to residential allergens and irritants (in addition to maternal asthma and allergies) may largely explain urban residence as a risk factor for asthma.[2] Of the residential exposures in inner cities, cockroaches are especially important.[53]

Portrait of inner-city children with asthma

The National Cooperative Inner-City Asthma Study was a program of studies of children with asthma in seven inner-city areas in the United States.[53] These children were almost entirely black or Hispanic (Figure 2.3). About two thirds of the children's families had a household income below $15,000 and most lived in apartments (57 percent), or row houses or duplexes (24 percent). Most (85 percent) of the homes were in poor repair, as indicated by leaky roofs, broken windows, broken plaster, and peeling paint.[53] Signs of roach infestation were seen in about two thirds and mice in about one third of homes.[54] Risk factors, including a family history of asthma, exposure to cigarette smoke, and allergies, were prevalent and about one third of these children had a positive allergy skin test to cockroach and house dust mite allergens.[53] Allergy to cockroaches, in combination with high levels of bedroom exposure to cockroach allergen, was correlated with the children's asthma morbidity, measured in terms of hospitalization for asthma, unscheduled medical visits for asthma, and other measures of asthma symptoms.[53] Other studies of the inner-city environment have documented similar conditions.[55,56]

Pattern of Health Care Service Use by Minorities

Compared with whites, black and Hispanic minorities in inner cities rely less on routine care and more on episodic and emergency care for asthma. This pattern appears again and again in the studies discussed in this section.

Use of emergency services

The relative overuse of emergency care and underuse of routine care services for asthma has been seen in studies of adults enrolled in managed care.[57,58] One survey showed that being black or Hispanic correlated positively with emergency department visits and hospital admissions for asthma, but negatively with the use of maintenance medications (inhaled corticosteroids).[57] Another study specifically compared health service use by black and white adults with asthma.[58] Black people with asthma were more likely to visit the emergency department or to be hospitalized with asthma and filled fewer prescriptions for inhaled corticosteroids.[58] Black patients also saw fewer asthma specialists than did white patients.[58]

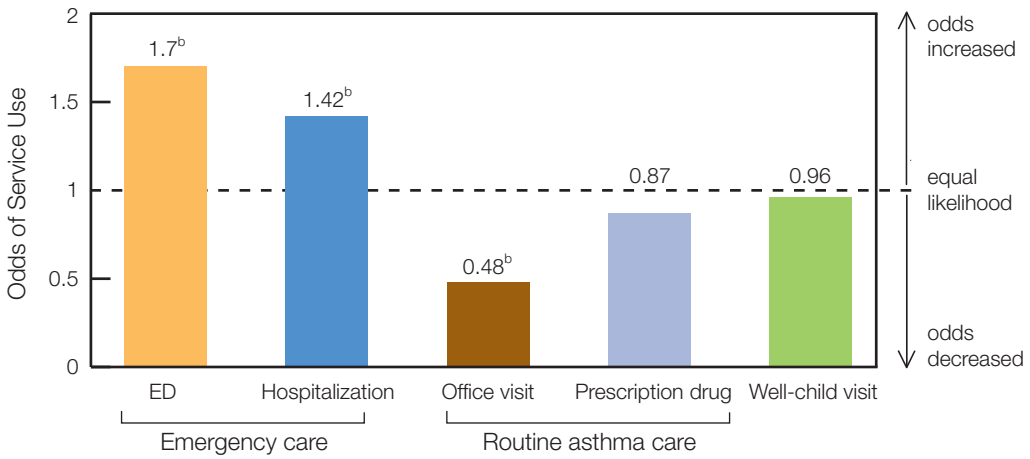
Disparities in health care

There is consistent evidence for a distinctive pattern of care among black and Hispanic people with asthma. This pattern is characterized by the use of emergency services rather than of routine care. This is the case with adults as well as with children. The crucial element appears to be the underuse of asthma maintenance medications, documented in numerous studies of minority children. This may explain the periodic loss of control of asthma symptoms and the high frequencies of emergency department visits and hospitalizations.

Episodic pattern of care among black and Hispanic children

This pattern of episodic, emergency care is seen again and again in studies of black and Hispanic children—even though these children typically do have a primary care provider.[59-63] A 1990–1991 study found that almost all children attending the emergency department of a large urban hospital for acute asthma attacks did have a primary care provider, but that black and Hispanic patients (as well as patients on Medicaid) were less likely to call their primary care provider before going to the emergency department.[59] Another study of urban, low-income black children with asthma found that 44 percent had been to the emergency department for asthma care in the previous six months, even though 73 percent had an identified provider of asthma care.[60] Similarly, a study of children on Medicaid found that black children were more likely than white children to visit the emergency department or to be hospitalized for asthma, but were less likely to visit a physician's office for asthma (see Figure 2.4).[61] In another study of Medicaid enrollees, black and Hispanic children visited the emergency department more often than white children, but had fewer specialist visits.[62] Finally, in a survey of largely black and Hispanic inner-city children previously hospitalized for asthma, about 80 percent of the children's caretakers (overwhelmingly their mothers) could identify a primary care provider.[63]

Figure 2.4. Black children use more emergency services and less routine care for asthma than do white children



ED, emergency department.
[a]The vertical axis shows the odds of health service use by black compared with white children with asthma, adjusted for children's age, sex, area of residence, person-years contributed to study, and predominant office provider type. An odds ratio of 1.0 indicates that the likelihood of the event is the same in black and white children.
[b]The difference between black and white children is statistically significant ($P < .05$).
Source: Adapted from reference 61.

Shown are results of a study of black and white children enrolled in Medicaid in the Seattle area from 1988 to 1992. Black children exhibited a distinctive pattern of use of health services for asthma. They used more emergency services (odds of ED visits and hospitalizations greater than 1) and less routine care (odds of office visits less than 1) than white children with asthma. Black children were also slightly less likely to have filled a prescription for asthma drugs, though this was not a statistically significant difference. There was essentially no difference between black and white children in the likelihood of a well-child visit, suggesting that in this study access to care was not the underlying cause of the distinctive pattern of asthma care shown by black children.

Underuse of long-term control medications for asthma by black and Hispanic children

Regular use of long-term control medications reduces the subsequent risk of needing emergency care (see Figure 2.5).[64] Conversely, the failure to routinely use long-term control asthma medications increases the risk of needing to use emergency care. Hence, the episodic use of emergency services documented above may reflect the underuse of long-term control medications for asthma.

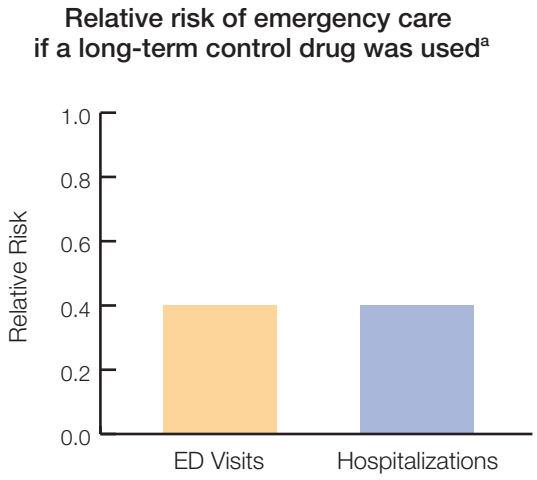
In fact, several studies have documented underuse of asthma long-term-control medications in black and Hispanic children (Table 2.1).[59,60,65,66] Early studies examined asthma medication use in children attending the emergency department or hospitalized with acute asthma attacks. A 1994 study of black and Hispanic children attending a large urban hospital for acute asthma attacks found that only 27 percent used maintenance therapy (cromolyn, theophylline, or corticosteroids).[59] In a later survey of inner-city children previously hospitalized for asthma, only 39 percent of those who met NAEPP symptom criteria for persistent asthma (and who therefore should have received daily anti-inflammatory medication according to the NAEPP guidelines) actually received daily antiinflammatory drug treatment.[66] Further, only 15 percent of children with symptoms of moderate to severe asthma were receiving the inhaled corticosteroids recommended in NAEPP guidelines.[66]

Several community-based studies of children with asthma documented similar underuse of long-term control medications. A study of low-income, inner-city black children in Baltimore, Maryland, and Washington, DC, found that only 12 percent had used inhaled anti-inflammatory medications for their asthma in the past 6 months.[60] And, in a 1997 survey of predominantly Puerto Rican and black children with current asthma in East Harlem, New York, only 22 percent used a daily anti-inflammatory medication (inhaled corticosteroid or cromolyn); even among the subset with severe asthma, only 39 percent used a daily antiinflammatory agent.[65]

Table 2.1. Underuse of asthma maintenance medications by minority children is shown in several studies

Study	Subjects	Setting	Finding
Davidson et al., 1994[59]	Black and Hispanic children with acute asthma attacks	Emergency department at an urban hospital	27% used maintenance therapy (cromolyn, theophylline, or corticosteroids)
Rand et al., 2000[60]	Low-income black children with asthma	Urban community	12% used inhaled anti-inflammatory agents
Diaz et al., 2000[65]	Puerto Rican and black children with asthma	Community (East Harlem, New York)	22% used a daily anti-inflammatory agent
Warman et al., 2001[66]	Hispanic and black children hospitalized for asthma	Community (inner city)	15% of children with moderate to severe asthma used inhaled corticosteroids

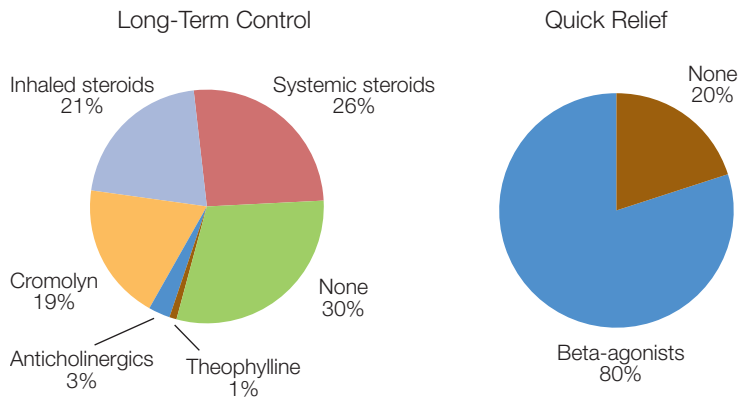
Figure 2.5. Use of emergency care by children is reduced if they use long-term control medicines



ED, emergency department.
[a]Relative risk of visiting the ED or hospitalization if any long-term control asthma medication was used, compared with no use, adjusted for age, sex, managed care organization, and quick-relief medication dispensing. Both relative risk ratios shown (ED visits and hospitalizations) were significantly less than 1.0 (the point of equal likelihood).
Source: Adapted from reference 64.

In this cohort study of about 11,000 children with asthma, the risk of requiring emergency care for asthma was lower when children used inhaled antiinflammatory medications than when they did not use these medications. When taking long-term control medications, the relative risks of hospitalization and emergency department visits were significantly less than 1.0. The children in the study were enrolled in managed care organizations in the Boston, Chicago, and Seattle areas. (The race and ethnicities of these children were not reported.) The study determined the effect of inhaled anti-inflammatory medications (cromolyn or corticosteroids) on the risk of an ED visit or hospitalization for asthma over a 12-month period.

Figure 2.6. Asthma medicines commonly used by children



[a]Any asthma drug use in the past year. The categories are not mutually exclusive, so that some patients used both long-term control and quick-relief medications and some patients may have used more than one of the long-term control medications shown. Systemic (i.e., oral) corticosteroids are usually prescribed only in brief courses, but are classified here as long-term control medications.
Source: Adapted from reference 67.

The pattern of asthma drug use shown here was recorded between 1996 and 1998 in the Childhood Asthma Severity Study, a community-based study of childhood asthma in an ethnically diverse population in the Northeast United States.[67] Eighty percent of children used beta-agonists such as albuterol. Systemic (i.e., oral) and inhaled corticosteroids and cromolyn were the most frequently used long-term control medications, whereas anticholinergics and theophylline were rarely used. At least 30 percent of children had not taken any long-term control medication in the previous year. (Note that antileukotrienes were not included in the survey.)

Asthma medications used by urban children

The asthma medications commonly used by a population of urban children in Connecticut and Massachusetts were described in the Childhood Asthma Severity Study.[67] Most of the children used beta-agonists. Inhaled corticosteroids and cromolyn were the most frequently used long-term control medications, although about 30 percent of the children were not on any long-term control medications (see Figure 2.6).[67] In addition, while 74 percent of white children in the study used long-term control medications, only 44 percent of black children and 38 percent of Hispanic children used long-term control medications.[67]

Essentially the same pattern of childhood asthma drug use was recorded in the National Cooperative Inner-City Asthma Study.[68] In that study, one quarter of the children with *severe* asthma were not using long-term control medications.[68] Underuse of long-term control medications seems to be a key factor in the greater rate of emergency department visits and hospitalizations for minority children. The issues of under-medication of childhood asthma and disparities in treatment are discussed below.

Table 2.2. Disparities in the use of asthma maintenance medications by minority children are documented in several studies

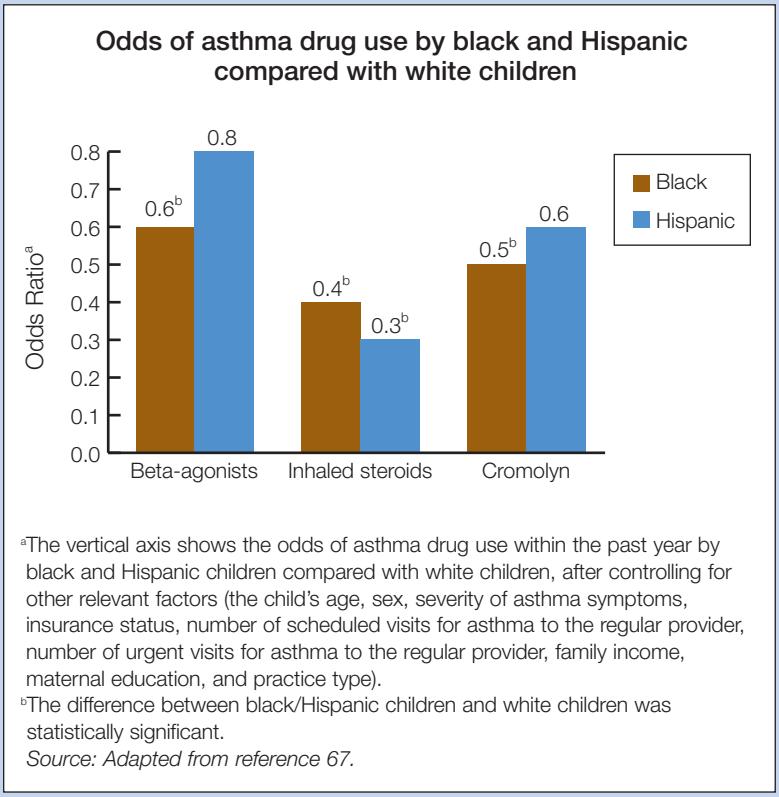
Study	Subjects	Setting	Finding
Finkelstein et al., 1995[69]	Preschool pediatric inpatients	Hospital	Black and Hispanic children were less likely than white children to have taken anti-inflammatory medications before admission and less likely to be discharged home with a nebulizer
Halterman et al., 2000[70]	Children with asthma	National survey	Spanish speaking children were less likely than white children to be using preventive medications
Ortega et al., 2002[67]	Sample of children with asthma	Community (Connecticut and Massachusetts)	Black and Hispanic children received fewer inhaled corticosteroid prescriptions than white children
Lieu et al., 2002[71]	Children with asthma	Medicaid managed care	Black and Hispanic children were less likely than white children to be using inhaled anti-inflammatory agents
Shields et al., 2004[62]	Children with asthma	Massachusetts Medicaid program[a]	Black and Hispanic children received fewer inhaled corticosteroid prescriptions than white children

[a]Non-health maintenance organization portion.

Disparities in the use of long-term control medications

Not only do minority children underuse long-term control medications, they use fewer of these medications than comparable populations of white children. Several studies have documented disparities between minority and white children in the use of long-term control medications (Table 2.2).[62,67,69-71] A study of preschool children hospitalized with asthma found that black and Hispanic children were less likely than white children to have taken anti-inflammatory medications before admission.[69] A study of a community sample of children with asthma in Connecticut and Massachusetts found that black and Hispanic children used fewer inhaled corticosteroids than white children (see Figure 2.7).[67] Black children also were significantly less likely than white children to use cromolyn.[67]

Figure 2.7. Black and Hispanic inner-city children are less likely than white children to use long-term control asthma medicines (inhaled corticosteroids and cromolyn)

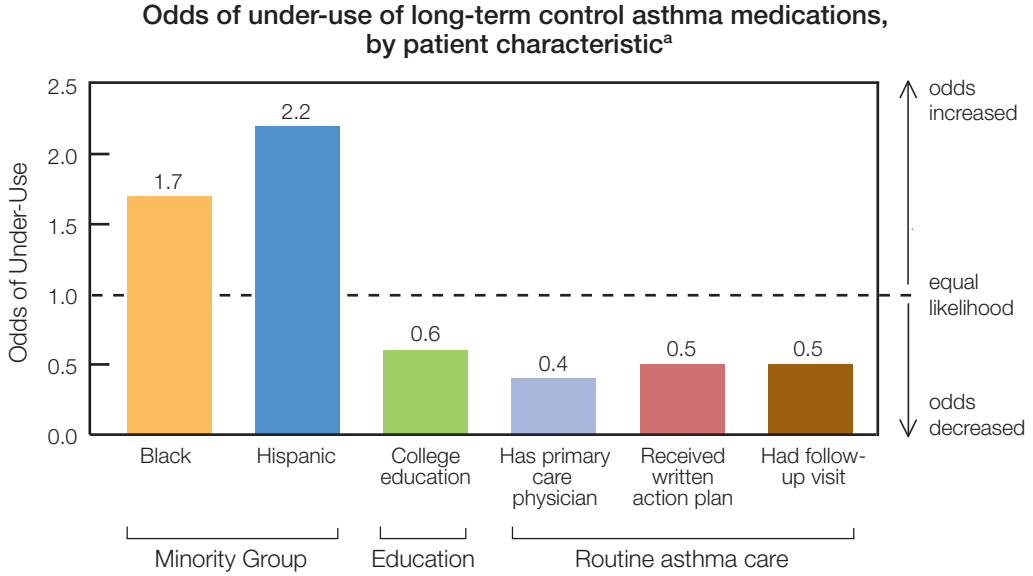


[a]The vertical axis shows the odds of asthma drug use within the past year by black and Hispanic children compared with white children, after controlling for other relevant factors (the child's age, sex, severity of asthma symptoms, insurance status, number of scheduled visits for asthma to the regular provider, number of urgent visits for asthma to the regular provider, family income, maternal education, and practice type).
[b]The difference between black/Hispanic children and white children was statistically significant.
Source: Adapted from reference 67.

In this analysis of childhood asthma in the Northeast, black children were less likely than white children to use beta-agonists, inhaled corticosteroids, and cromolyn. Hispanic children (93 percent Puerto Rican) were less likely than white children to use inhaled steroids. Hispanic children used fewer betaagonists and less cromolyn than white children, but these differences were not statistically significant. The odds of black and Hispanic children using systemic (i.e., oral) steroids were not significantly different from those for white children.

Reports of Medicaid-insured children in California, Washington, and Massachusetts produced similar findings.[62,71,72] Black and Hispanic children were 31 percent and 42 percent less likely, respectively, than white children with similar insurance and sociodemographic characteristics to be using inhaled antiinflammatory medications.[71] Figure 2.8 presents the results of this study in more detail; as indicated, the underuse of long-term control medicines was more common in black and Hispanic children.[71] The underuse of these medications was less likely, however, if the child's parent had higher socioeconomic status (here, a college education) or if the child received routine care for asthma.

Figure 2.8. Underuse of long-term control medications by children with persistent asthma is related to minority status, parental education, and access to routine asthma care



[a]White is the reference for black and Hispanic minority status. The reference for "college education" is families in which the parent had graduated from high school. "Received a written action plan" and "had a follow-up visit" refer to the 6 months before the interview. All odds ratios shown in this figure were significantly different from 1.0, the point of equal likelihood.
Source: Adapted from reference 72.

In this study of Medicaid-insured children, the underuse of long-term control medications was more likely if the child was black or Hispanic (as opposed to white). The underuse of these medications was *less* likely if the parent had some college education or if the child received routine asthma care (i.e., if the child had a primary care physician, had received a written asthma action plan, or had a follow-up visit). All of the children had persistent asthma and should, according to national guidelines, have been using long-term control medications daily.

What explains the underuse of long-term control medications by minority children?

The studies described above documented the underuse of asthma maintenance medications by black and Hispanic children, but they did not explain it. That is, the studies did not determine (1) whether doctors had not prescribed the medications, (2) whether prescriptions had been written but not filled, or (3) whether the children did not take the medications that had been obtained. There is evidence for all three explanations of underuse in minority populations.

In a study of largely black and Hispanic urban children with persistent asthma, only 40 percent of patients who should have been prescribed long-term control medications (based on the frequency of their symptoms) actually were prescribed them.[73] Similarly, in a study of black inner-city children with asthma, doctors prescribed long-term control asthma medications for only 42 percent of children.[74] These two studies showed that under-prescribing of long-term control medications to minority inner-city children is common. Under-prescribing may apply to all children in inner cities, however, regardless of race or ethnicity.[73]

Evidence of differences between minority and white children in prescription filling is conflicting. Finkelstein et al. examined asthma medication use among an economically diverse population of children within a single managed care system.[75] Low-income, predominantly non-white children were as likely as other children to have been prescribed long-term control medications for asthma, but were less likely to have filled the prescriptions. Conversely, another study found that black and white children on Medicaid were equally likely to have filled prescriptions for asthma medications.[61] Nevertheless, disparities in emergency department visits and hospitalizations persisted, suggesting differences in adherence.[61]

Poor adherence to medications was seen in a study of low-income, urban, primarily black children with asthma.[76] The average use of inhaled antiinflammatory medications in their possession was 44 percent, the inhaler technique used by 27 percent of the children was likely to be ineffective in delivering the drug, and 21 percent missed follow-up appointments.[76]

The reasons underlying these forms of underuse of long-term control medications by black and Hispanic minorities are discussed in the next section, 'Factors underlying the disproportionate burden of asthma.'

Factors Underlying the Disproportionate Burden of Asthma

Access to health care facilities

Quality of care provided

There is some evidence of disparities in the quality of asthma emergency care provided to children.[62,71] In a study of children insured by Medicaid (but not enrolled in managed care), Hispanic and black children were less likely than white children to receive timely follow-up care after visiting the emergency department for asthma.[62] Another study of Medicaid-insured children who were enrolled in managed care did not show systematic disparities in the quality of routine care for asthma—except that black and Hispanic children used fewer long-term control asthma medications.[71]

Studies of adults have not reported disparities in the quality of asthma emergency care.[77] However, a study of adults enrolled in managed care indicated that black patients were less likely than white patients to receive routine asthma care consistent with national guidelines.[78] Black patients were less likely than white patients to possess or use long-term control asthma medications, have a self-management plan, or have access to specialist care.[78] The underuse of long-term control medications—and the suboptimal routine asthma care often received by black and Hispanic patients—may be due in part to the failure of physicians to provide the treatments recommended in national guidelines.[79] However, this appears to be a general problem that is not restricted to minority populations.[80-89] For example, a study of primary care physicians in managed care found that only half of them provided their pediatric patients with a written care plan as recommended in the NAEPP guidelines,[81] while an earlier study found that the use of inhaled anti-inflammatory drugs by children with severe asthma fell short of national guidelines.[80]

Urban environment

The degraded infrastructure in many inner cities itself limits access to health care.[68,90] The availability of health care facilities, including pharmacies, is a problem, as are transportation difficulties and excessive waiting times at clinics.[90] In a 1999 nationwide survey (not restricted to inner cities), about 45 percent of black and 33 percent of Hispanic respondents cited the availability of neighborhood health care providers as a major problem.[90]

Factors underlying the diproportionate burden of asthma

The black and Hispanic populations face multiple disparities in their access to health care. These begin with reduced access to health care facilities in inner cites and a shortage of primary care physicians in minority areas—hence, poorer access to the routine care that is so important to the control of persistent asthma. Much of the health care disparity is correlated with socioeconomic inequalities, which account for most, though not all, of the differences in asthma prevalence among the white and black populations. Socioeconomic factors do not appear to account for the higher prevalence of asthma among Puerto Ricans compared with other Hispanic subpopulations. Nor do they entirely explain the differences in asthma deaths or the pattern of health care service use characterized by underuse of maintenance medications and the more frequent use of emergency care. Disparities in these indicators of the burden of asthma remain among black and Puerto Rican populations, even after accounting for socioeconomic factors. This suggests that other forces are at work. Language is a barrier to receiving proper care for Hispanics with poor English, as is poor literacy among minorities. Some research suggests that patients' attitudes towards asthma medications may be a barrier to proper care.

The National Cooperative Inner-City Asthma Study provides more information (data for 1992–1993).[68] Almost all of the children in this study had places they usually went to for asthma care—typically the emergency department for acute asthma attacks and a hospital-based pediatric clinic or health center for follow-up care—but half of the children's caretakers reported having difficulty obtaining both acute and follow-up care. The problems cited most often were: needing someone to take care of other children, having no way to get to the facility, long waiting times, and difficulty getting appointments.[68]

Shortage of primary care physicians

Areas with high percentages of black and/or Hispanic people are several times more likely than areas with lower percentages of these minorities to have a shortage of office-based primary care physicians, regardless of community income or urban or rural status.[91] About half of poor urban communities with high percentages of black or Hispanic people have a shortage of primary care physicians (defined in this instance as fewer than 30 physicians per 100,000 population; these data are from a study set in California).[91] This may explain to some extent the distinctive pattern of asthma care among black and Puerto Rican minorities (i.e., reduced access to routine care, underuse of preventive medications, and consequently more frequent use of emergency services).

Health insurance status

Several studies have found disparities in health care insurance, particularly among Hispanics.[92] A 1997 nationwide survey found that 37 percent of Hispanics were currently uninsured, compared with 22 percent of black and 13 percent of white Americans.[92] A study of inner-city Los Angeles found that almost 40 percent of Hispanic children had no Medicaid coverage or only episodic coverage.[93] In a survey of predominantly Hispanic inner-city children in San Diego, California, 63 percent did not have health insurance.[94]

A state-wide study in California found that people with asthma who lacked health insurance were less likely to have a routine care provider.[95] Lack of health insurance does not, however, explain the disparities in asthma burden. In the study of schoolchildren in Passaic, New Jersey (described in 'Asthma prevalence in Hispanic subgroups' in Chapter 1) about 80 percent of children had health insurance.[96] Although insurance coverage varied across minority groups, it did not correlate with the asthma burden: coverage of black and non-Hispanic white children was 91 to 93 percent; Puerto Ricans, 85 percent; Dominican Republicans, 72 percent; and Mexicans, 56 percent (see Table 1.3 in Chapter 1).[97] Warman et al., who surveyed inner-city children previously hospitalized for asthma, reported that about 89 percent had health care insurance and that 65 percent had Medicaid.[63] Virtually all children with asthma tracked in the National Cooperative Inner-City Asthma Study had health care insurance—in most cases, Medicaid.[54]

Socioeconomic status

The effects of socioeconomic status must be distinguished for the different measures of asthma burden.

Asthma prevalence

Some studies indicate that, when socioeconomic factors—in particular, urban residence—are taken into account, the prevalence of asthma symptoms does not differ among black, white, and Hispanic groups.[48-50,52] For example, according to a study of parents and their children in Boston, Massachusetts, a large share of the differences in asthma prevalence in different populations could be accounted for by income, education, and area of residence.[52] When these factors were taken into account, the risks associated with being black or Hispanic, as opposed to being white, decreased to a point where they were no longer statistically significant. (The countries of origin of the Hispanics in that study are not available.)

Other studies, however, found that differences in income and sociodemographic characteristics could not explain the higher prevalence of asthma among young black children[98] or among Puerto Ricans.[97,99] In a study of Brooklyn, New York, the asthma prevalence was higher among the Puerto Rican population than among other Hispanic populations (mainly Dominicans) of the same socioeconomic status and living in the same urban locations.[99] Similarly, Puerto Ricans had a much higher prevalence of childhood asthma than did other Hispanic subgroups residing in Passaic, New Jersey (see Table 1.3 in Chapter 1).[97]

It seems then that socioeconomic status largely—but not entirely—explains the high prevalence of asthma among the black population, but that Puerto Rican ethnicity is an independent risk factor.

Asthma mortality

Conversely, examination of U.S. mortality records shows that the much higher asthma death rates among black Americans cannot be explained entirely by socioeconomic factors, since the disparity in asthma mortality rates for black and white people remains after accounting for income and educational status.[100] Correspondingly, the relationship between asthma mortality and low income and education remains after controlling for black minority status.[100] Thus, black minority status and low income and education seem to be independently associated with an increased risk of asthma death. The degree to which socioeconomic status explains the high asthma death rate among Puerto Ricans has not been reported.

Health care resource use

Neither do socioeconomic inequalities entirely explain the differences between black and white children in the use of emergency care for asthma.[98] Differences between black and white people in the use of emergency services persist among children with asthma in low socioeconomic strata or in the same disadvantaged socioeconomic group (specifically, enrollees in the Aid to Dependent Children program).[61] Even among middle-class children with private health insurance, higher rates of use of emergency care for asthma persist among black children.[101] Similarly, black-white disparities in the quality of routine asthma care received by adults in managed care cannot be accounted for by differences in socioeconomic status.[78] There do not appear to be differences between black and Hispanic versus white children in the use of quick-relief beta-agonists after accounting for

socioeconomic differences, but the underuse of inhaled corticosteroids still persists.[67,71] The persistence of these patterns of health care use even after accounting for socioeconomic status suggests that cultural and behavioral factors might be important.

Culture

Language

National survey data from 1988–1994 indicated that the risk of receiving inadequate asthma therapy when Spanish was the preferred language was 1.4 times greater than if English was the preferred language.[70] The U.S. census conducted in 2000 indicated that about 14 percent of the urban population spoke only Spanish at home.[102]

Language concordance between the physician and patient is important to the patient's ability to understand and follow the prescribed asthma therapy.[103,104] In a 1998 study of Spanish-speaking people with asthma, there was a greater likelihood of missed follow-up appointments and missed medications if the physician spoke only English rather than being bilingual.[103]

Language is a significant barrier among Hispanics seeking health care services for any condition, not just for asthma. In a study of an urban Hispanic community, 47 percent of those who had poor English or used a translator said that medication side effects were not explained to them, compared with about 16 percent of those with good English skills.[104] Similarly, in a study of Hispanics attending an inner-city pediatric care clinic, immigrant parents cited language as the single greatest barrier to health care access for their children.[105] Medical interpreters were frequently not called when needed or were unavailable.[106]

Literacy

Poor literacy compounds the threat to health. Inadequate literacy is common among patients presenting to the emergency department because of asthma exacerbations and is strongly correlated with poorer knowledge of asthma and improper use of inhalers.[107] People with poor health literacy also have higher rates of hospitalization for any cause.[108]

Attitudes and beliefs

Caretakers of black inner-city children

According to a study of inner-city children (almost all black) in Baltimore, Maryland, about one third of the children's caregivers did not report, when asked, that the child had a prescription for a long-term control medication, even though the child's physician reported that such a prescription had been written.[74] This discordance between physicians and caregivers was related to the caregivers' lack of appreciation of the importance of the use of long-term control medications on days when the child appeared asymptomatic and concern about side effects of treatment.[74]

Results of the National Cooperative Inner-City Asthma Study indicated that children's caretakers demonstrated a high level of knowledge about asthma, but that limited problem-solving skills, multiple asthma managers, child and adult adjustment problems, and high levels of life stress appeared to be related to poor asthma management.[109] Furthermore, parental doubts about the usefulness of medications and concerns about adverse effects were common barriers to adherence to prescribed asthma medications.[110] Failure to take medications or to keep appointments was predictive of subsequent asthma morbidity.[111]

Focus groups of urban black parents of children with asthma agreed that the most common barriers to care were related not to issues of access or insurance but to patient and family characteristics.[112] Specific concerns were voiced about the long-term safety of medications and the effects of limitations on exercise on their child's quality of life.[112] Focus groups of low-income, urban black adults with persistent asthma have uncovered several health beliefs influencing their use of medications: mistrust of the medical establishment, reliance on their own assessments of asthma control rather than those of their providers, and concern about the adverse effects of inhaled corticosteroids.[113]

Attitudes and beliefs of Hispanics

A study of four Hispanic communities in the United States and Central America indicated that beliefs about asthma were generally consistent within each community and to a lesser extent across the four communities.[114] Beliefs in many aspects of the biomedical model of asthma were shared, in addition to traditional Hispanic ethno-medical beliefs.[114]

A study of a predominantly Puerto Rican inner-city community found that perceptions of asthma were based on the presence of symptoms, regardless of the patient's asthma status.[115] Similarly, in a study of Dominican-Americans, most mothers of children with asthma thought that their child did not have asthma in the absence of an acute episode.[116] There was distrust of physicians in America, and most used folk remedies rather than prescription medicines to prevent acute episodes of asthma.[116]

A study performed by researchers in Georgia suggested that Hispanic mothers have limited knowledge about asthma and other respiratory illnesses.[117] Another study carried out in Mexico found widespread misperceptions about asthma among parents of children with asthma.[118]

American Indians

There is little published research about American Indians' knowledge and beliefs about asthma. A study of Navajo children with asthma and their families found that asthma was generally perceived as a transient symptomatic episode.[119] Furthermore, there was concern about becoming dependent on medicines.[119]

The belief that use of asthma medicines is only necessary when there are overt symptoms appears to be recurrent. The underuse of long-term control medications might, to some extent, reflect this belief.

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Chapter 3:
Opportunities to Reduce Asthma Disparities

Expanding Education and Outreach Programs in Asthma

Asthma racial and ethnic disparities are characterized by the underuse of long-term control medications and a reliance on episodic and emergency care. Increasing the use of long-term control medications to mitigate significant patterns of morbidity is of particular importance, therefore, in reducing disparities in the burden of asthma. However, a number of interrelated factors need to be addressed to improve such access to quality care in asthma. Fortunately, there are a number of approaches and opportunities that already exist in reducing asthma disparities. Asthma education programs are one promising strategy. There are also opportunities in the organization of care delivery systems to better guarantee access to quality asthma care. Finally, the U.S. government has invested heavily in addressing the disproportionate burden of asthma on minority populations. Although an exact prescription for reducing asthma disparities remains elusive, it is within these three areas that some progress has been made and from which new avenues could emerge to lessen the burden.

Model programs for asthma education and management

Much of the burden of asthma on black and Hispanic minorities can be attributed to allergens in the environment, lack of access to appropriate health care, and behavior regarding asthma medications—factors that are potentially modifiable. Asthma education and management programs designed for minority groups can address many of these factors. A number of such programs have been tested with demonstrable success and the widespread adoption of such programs could potentially alleviate a large proportion of the burden of asthma on the black and Puerto Rican populations.

Asthma education programs focus on teaching patients about asthma, environmental triggers, the importance of asthma medications, and the proper use of inhalers.[1] Such programs appear to be effective for adults.[2] An asthma educational program for adults, two thirds of whom were black, visiting the emergency department with acute asthma attacks was tested in a randomized trial.[2] Those who received the asthma management program subsequently decreased the number of emergency department visits they made.

School-based asthma management programs

Most asthma management programs targeting minorities have focused on children (Table 3.1).[3-10] Some of these programs have been carried out in schools.[3,4,10,11] One such program improved asthma knowledge and inhaler technique among Hispanic inner-city schoolchildren,[3] although another school-based program did not appear to affect the number of emergency department visits or school absenteeism among black schoolchildren.[4] A study of largely minority children with asthma demonstrated that providing daily long-term control medications at school improved symptoms and reduced absenteeism.[10] Importantly, these outcomes were seen only among schoolchildren not exposed to secondhand smoke. Asthma education programs for minorities should therefore emphasize the harmful effects of secondhand tobacco smoke in the home of a child with asthma, since minorities are less likely to participate in smoking cessation programs and to receive cessation advice from health care providers.[12]

Some asthma education and outreach initiatives targeting minority populations focus primarily on case identification at inner-city schools. A study of the Los Angeles Breathmobile Program, which visited 71 different school sites in 2001 and used a clinically validated survey to compare parental reports of their child's asthma to actual physician diagnosis, concluded that the program was effective in identifying both inner-city schoolchildren who were undiagnosed and children whose asthma may not have been optimally controlled.[13]

Table 3.1. Asthma education and management programs for black and Hispanic children

Study[a]	Patients	Setting	Asthma Management Program	Design	Results
Christiansen et al., 1997[3]	Hispanic, inner-city	School	Bilingual group education	Before-after study	Improved asthma knowledge and inhaler technique
Persaud et al., 1996[4]	Black (69%)	School	Individualized education by school nurse	Controlled trial	No effect on ED visits or school absenteeism
Greineder et al., 1995[5]	Inner-city (70% black)	Managed care	Personalized asthma education and regular contact with outreach nurse	Before-after study	ED visits and hospitalizations reduced
Evans et al., 1999[6]	Inner-city (75% black, 17% Hispanic)	Community	Group education of caretakers and children, reduction of environmental exposures, individual follow-up	Randomized, controlled trial	Asthma symptoms and hospitalizations reduced
Kelly et al., 2000[7]	Medicaid (95% black)	Allergy clinic	Asthma education and regular contact by outreach nurse	Controlled trial	ED visits and hospitalization reduced
Hendricson et al., 1996[8]	Hispanic	Clinic	Individual education and follow-up contacts	Before-after study	N/A
Jones et al., 2001[9]	Hispanic	Patients' homes	Individual education	Before-after study	Increases in asthma knowledge and maintenance medication use; decrease in environmental triggers
Halterman et al., 2004[10]	Urban	School	School-based provision of daily inhaled corticosteroids	Randomized, controlled trial	Fewer school absences; more symptom-free days

ED, emergency department; N/A, not available.
[a]Includes studies published since 1990.

Other asthma management programs for children

Clinic-based asthma education programs, consisting of asthma education and follow-up by an outreach nurse, appear to have reduced emergency department visits and hospitalizations among low-income, inner-city black children in managed care or tertiary clinic settings (see Table 3.1).[5,7] The results of one of these studies are presented in Figure 3.1.[7] A randomized trial carried out as part of the National Cooperative Inner-City Asthma Study demonstrated that an individually tailored, multifaceted intervention carried out by social workers could reduce asthma symptoms among inner-city children.[6] Finally, an asthma education program carried out in Hispanics' homes improved medication use and reduced exposure to allergens.[9]

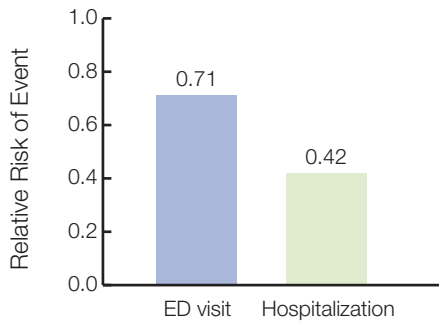
Programs to reduce exposure to allergens

Reducing exposure to cockroach allergen is particularly important in inner cities.[14] A sustained decrease in cockroach allergen levels can be accomplished with insecticides—preferably poison baits, boric acid, or traps rather than sprays—and cleaning.[15,16] Dust mite allergen exposure can be reduced by cleaning upholstered surfaced and stuffed toys, using dust-proof bedding covers, and limiting the number of stuffed toys around sleeping areas.[16]

Strategies designed to reduce or eliminate exposure to known indoor allergens have not, until recently, been shown to decrease asthma morbidity. Clinical trials showed that elimination of cockroach allergen, although more difficult than insect extermination, could be achieved, but these trials did not specifically address whether this reduced the asthma burden.[17,18] Trials of measures designed to reduce exposure to dust mite allergens in the home via use of impermeable bed covers did not demonstrate any clinical benefit.[19,20] It is possible that elimination of only one allergen may be of limited value. Consistent with this, a recent trial has shown that reducing exposure to multiple allergens in the homes of inner-city children reduces asthma-related morbidity.[21] The trial

Figure 3.1. An asthma management program can reduce the use of asthma emergency services by children

Relative risk of emergency care for asthma in the asthma management group compared with the control group[a]



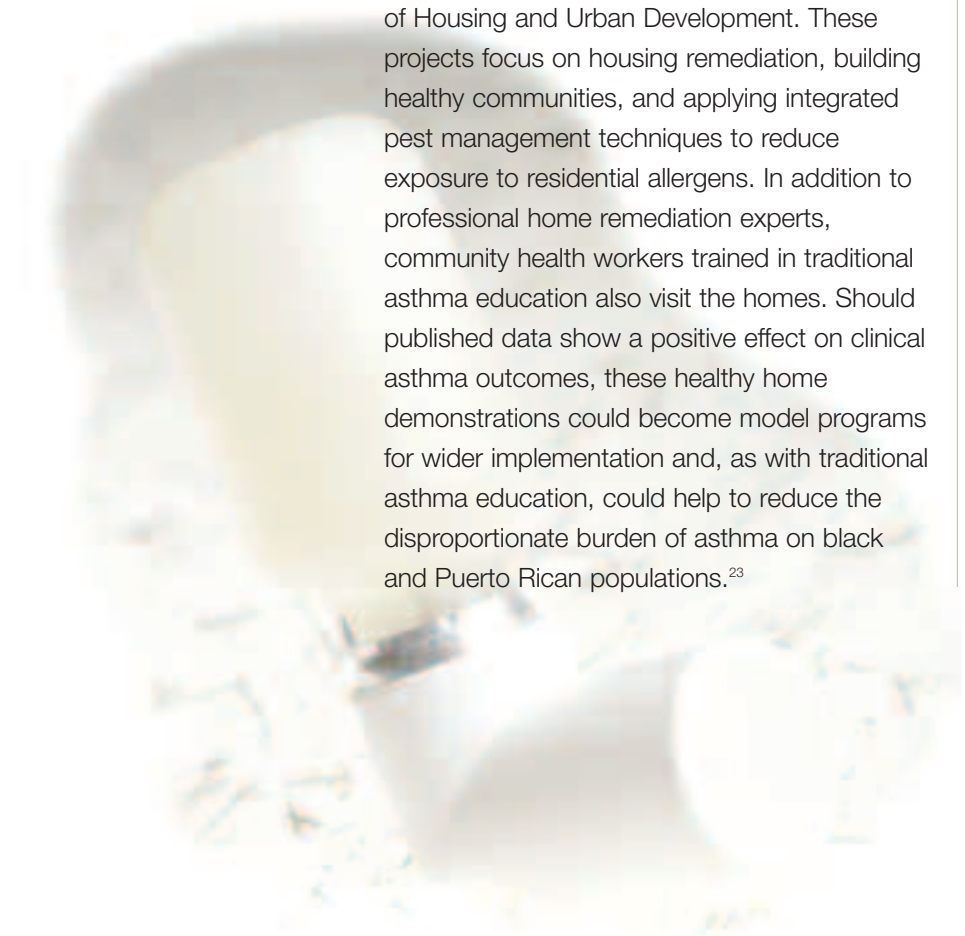
ED, emergency department.
[a]The vertical axis shows the relative risk of an emergency care event in the group who received the asthma management program compared with the control group, adjusted for the occurrence of emergency care episodes before the trial. Both relative risks shown (ED visits and hospitalization) were significantly less than 1.0, the point of equal likelihood.
Source: Adapted from reference 7.

Shown are the results of a controlled trial in which an asthma management intervention was given to a test group, but not to a control group, of children attending an urban allergy clinic. All of the children were on Medicaid, and 95 percent were black. The intervention consisted of asthma education—including information about medicines and how to use them—and regular contact with an outreach nurse. Children given the asthma management program had a lower risk of visiting the ED or being hospitalized for asthma than children in the control group in the year after the program.

included education and interventions to reduce cockroach, dust mite, and other asthma triggers, with intervention efforts tailored to the child's specific atopic profile.[21] The interventions included impermeable pillow and mattress covers, vacuuming with a HEPA filter, HEPA air filtration in the child's bedroom, and professional pest control.[21]

Healthy Homes Initiative

In the long run, initiatives involving housing agencies and elected officials, as well as health care professionals, are needed to reduce residential exposures.[22] Indeed, data is forthcoming from collaborative, community-based demonstration projects conducted in mostly minority homes with support from the Healthy Homes Initiative at the U.S. Department of Housing and Urban Development. These projects focus on housing remediation, building healthy communities, and applying integrated pest management techniques to reduce exposure to residential allergens. In addition to professional home remediation experts, community health workers trained in traditional asthma education also visit the homes. Should published data show a positive effect on clinical asthma outcomes, these healthy home demonstrations could become model programs for wider implementation and, as with traditional asthma education, could help to reduce the disproportionate burden of asthma on black and Puerto Rican populations.[23]



Sources of information about asthma management programs

Other studies of asthma education programs, not specifically targeted to minority children, have been reviewed,[1] and the U.S. Centers for Disease Control and Prevention have summarized information about effective asthma education programs.[24] Efforts to evaluate the impact of these interventions and to identify which components of asthma education work best are important. In recommendations concerning state policies to address racial and ethnic asthma disparities, the Commonwealth Fund places a high priority on the evaluation of asthma intervention and prevention program effectiveness.[25] Along these lines, *Allies Against Asthma*, a Robert Wood Johnson Foundation program at the University of Michigan, is currently working with support from the U.S. Environmental Protection Agency to identify successful asthma programs that may be replicable, to analyze factors that contribute to their success, and to report on best practices.[26] The American Public Health Association maintains a database of community projects and interventions in health disparities, which can be searched to isolate a number of programs that include asthma as a priority focus.[27]

The gap between accepted best practice for asthma care and the care delivered in the primary care setting should be closed by provider education and the implementation of primary care performance measures. In addition, measures to improve coordination between primary and specialty care are necessary.[28]

Community-based quality-of-care improvement programs

A number of community-based programs designed to improve the quality of care of childhood asthma have been implemented recently,[31] some in disadvantaged inner-city neighborhoods.[32,33] In some cases these programs use specific process-of-care measures—e.g., prescription of long-term control medications to all children with persistent asthma, and provision of an Asthma Action Plan to all children with asthma—to track improvements in the care provided and measure the program's success by monitoring asthma outcomes, such as emergency care visits for asthma.[32]

Improving access to quality care in asthma in order to reduce or eliminate the disproportionate burden of asthma on black and Puerto Rican populations will most likely require a combination of approaches in the system of health care delivery. The role of community health centers and community health workers, targeted disease management efforts, a team-approach to asthma care using the chronic care model, and improvements to Medicaid and State Children's Health Insurance Programs are some potential focus areas for such a combined approach.

Culturally sensitive care

For several years, federally funded community health centers have been important targets for minority health disparity reduction efforts aimed at improving clinical performance and health outcomes for several diseases, including asthma. To the extent that health education programs and health care provision should be sensitive to the cultural values and attitudes of the minority group and use strategies that are acceptable and credible to the group,[12] community health centers are recognized as pioneers of culturally sensitive and appropriate care. Physicians have recommended providing bilingual education for Hispanic children with asthma and their families[34] and stress the importance of addressing attitudes and beliefs that lead to reliance on episodic care and the belief that daily use of long-term control medication is not necessary during periods without asthma symptoms. Cultural sensitivity is particularly important in the management of asthma, where the establishment of a partnership between the patient and the health care provider has been stressed.[35] Community health centers typically have led the way in demonstrating the importance of cultural sensitivity in the provision of quality care.

Minorities need more access to routine health care services

The availability of routine health care services, especially of primary care physicians in minority communities should be improved. Researchers at Harvard Medical School have concluded that "increasing the use of preventive medications would be a natural focus for reducing racial disparities in asthma."[29] Physicians can help achieve this by encouraging patients to use written care plans, by optimizing the dosing of antiinflammatory drugs, and by providing routine follow-up care.[30]

The Asthma Collaboratives

In 1999 the Bureau of Primary Health Care of the Health Resources and Services Administration launched a series of Health Disparities Collaboratives for community health centers as part of a goal to eliminate health disparities for 12 million underserved Americans and guaranteeing them 100 percent access to quality health care by the year 2010. The Collaboratives are designed to provide disease management and education by multidisciplinary teams in health centers using the "chronic care model."[36]

Forty health center care teams participated in the Asthma Collaboratives in 2000.[37] Since 2002 the White House and Congress have supported an expansion of the community health centers program to add 1,200 new and expanded health center sites by 2006. In 2002 and 2003, 220 new centers were added and 250 more were expanded.[38] Federal funding for the program is expected to increase to $2 billion and reach an estimated 6.1 million additional patients.[39] To the extent this expansion continues, it would be important that growth of community health centers in both number and capacity leads to wider involvement in and adoption of the goals of the Asthma Collaborative to reduce the disproportionate burden of asthma on minority populations by improving quality of care.

Efforts at the state and city levels

One of the central themes of the chronic care model and the Asthma Collaborative in community health centers is coordination and maintenance of close relationships with local health authorities and community stakeholders. A number of states—Illinois, New Jersey, California, and New York—have adopted this vision of collaboration as a key to quality care and are moving ahead with promising initiatives of their own to coordinate statewide efforts to address racial and ethnic disparities in asthma.[25]

New York City recently launched *Creating a Medical Home for Asthma*, an outreach program targeting public health clinic staff (physicians, nurses, lab technicians, and clerical staff) with training in a team-based approach to pediatric asthma management and care. Based on research funded originally by the National Institutes of Health, the program responds to studies demonstrating asthma under-diagnosis, a lack in continuity of care, and insufficient patient education—particularly for low-income minority children. The premise of the new program is that effective communication between public health clinic staff and families about asthma management and treatment will reduce symptoms, reduce reliance on episodic care, and decrease the use of emergency health services.[40]

The need for health insurance

Community health center expansion will also need to be met with an expansion of health insurance coverage, mainly through increased enrollment of eligible individuals in Medicaid and State Children's Health Insurance Programs. This combination of insurance coverage plus customized clinic care is becoming recognized as an effective strategy for reducing health disparities.[41] Also, because Medicaid financing is the largest and most important source of funding for community health centers, efforts to curb Medicaid spending in a number of states

could have a negative impact on the ability of community health centers to play a central role in further reducing racial and ethnic disparities in asthma.[41]

Cuts in Medicaid funding could also threaten the viability of disease management programs for low-income beneficiaries. More than twenty states are currently implementing Medicaid fee-for-service disease management programs in asthma.[42] Results from early adopters of these programs in Virginia, Mississippi, North Carolina, and Florida generally show that asthma disease management in Medicaid can save health care dollars while improving clinical outcomes, such as reducing hospital visits and increasing rates of adherence to medicines.[43] In one analysis of Medicaid patients receiving asthma education, care management, and home health visits over a one-year period in southwest Pennsylvania, emergency care utilization and lost work days were reduced while quality of life indicators increased.[44] Early results are promising for asthma disease management programs, though further analysis is clearly needed. Nevertheless, if these programs can be shown to reach at-risk populations to make sure long-term control medication prescriptions are filled and follow-up doctor's visits scheduled—thus reducing reliance on episodic care at the hospital—targeted disease management efforts could be effective model programs for addressing racial and ethnic health disparities in asthma.

Community health workers

The role of community health workers in promoting access to quality care represents another opportunity to meet the specific needs of minority populations and potentially to help reduce or eliminate the disproportionate burden of asthma. Known as health advisors, outreach workers, or *promotoras* in various Hispanic communities, these individuals are vital links between health care providers and the communities they serve. Community health workers provide informal health-related education and services, including translation, scheduling, and transportation for at-risk patients.[45,46] Evidence exists of improved asthma outcomes with community health worker intervention in at-risk populations. In one analysis of a pediatric asthma outreach program in Hawaii, both health care costs and asthma-related emergency department visits decreased following just one community health worker intervention.[47] In another recent study, community health workers were found to be effective in reducing asthma trigger exposure in homes of low-income children in Seattle, WA.[48] Finally, as mentioned above, results of the National Cooperative Inner-City Asthma Study demonstrated that Masters-level social workers trained in asthma management can improve asthma symptoms in inner-city children.[6] Clearly, there should be more direct research on the role of community health workers and asthma outcomes in predominantly black and Puerto Rican communities. At the same time, there should be a detailed exploration of the obstacles (e.g. establishing appropriate credentialing and reimbursement mechanisms) that may exist limiting the expanded use of community health workers in helping at-risk populations access quality asthma care.

Federal Efforts to Reduce Asthma Disparities

Existing federal programs

The U.S. Government's *Action Against Asthma: A Strategic Plan for the Department of Health and Human Services*, published in 2000, includes four priority areas for investment over five years, including the elimination of the disproportionate burden of asthma in minority populations and those living in poverty.[49] The document is in line with the goals of Healthy People 2010, which also emphasizes reducing the burden of asthma on minorities. Both plans recommend accelerated research on the reasons for disparities and an expansion of public health programs to eliminate the disproportionate burden.[50]

The programs that have since been implemented by respective agencies of the U.S. Department of Health and Human Services (DHHS) to reach the goals outlined in *Action Against Asthma and Healthy People 2010* collectively represent an extraordinary opportunity to reduce the burden of asthma on minorities. The recent, first-ever *National Healthcare Disparities Report* by the Agency for Healthcare Research and Quality (AHRQ) should add significant momentum by documenting the continuing challenges in asthma.[51] The National Institutes of Health (NIH) has a strategic plan that outlines budgets and initiatives in health disparities for fiscal years 2002-2006, with an estimated $3 billion devoted to this topic in fiscal year 2003 alone.[52] The Centers for Disease Control and Prevention (CDC) and Health Resources and Services Administration (HRSA) also have programs with specific asthma disparity reduction objectives (see Table 3.2).

Future needs and aims of federal programs

Most federal health agencies are currently facing bleak fiscal and budgetary outlooks—at least for the foreseeable future. Moreover, programs to reduce disparities in asthma for the most part remain unaligned and are generally focused on research instead of on translating what is already known into practice. On the other hand, there are promising multi-agency collaborative asthma projects underway, both within DHHS agencies and between these agencies and programs under the jurisdiction of the EPA and HUD.

In order to build on what is already known about the many environmental and socioeconomic factors that contribute to the burden of racial and ethnic disparities in asthma, as well as to further expand programs and policies that show promise in reducing this burden, a thorough assessment of government sponsored programs is needed with the overall aim of prioritizing existing resources and sharing best practices. Along with the knowledge base of existing asthma education programs and new, combined approaches in the delivery of quality care, such an assessment at the highest levels of health care research and preventative decision-making would likely lead to a more concerted national effort to reduce the disproportionate burden of asthma on minority populations.

Table 3.2. Principal DHHS programs for asthma disparity reduction

DHHS Agency	Program/Focus Area for Asthma Disparity Reduction	Related Agency Priorities
CDC / National Asthma Control Program	23 sites in 15 states and DC for inner-city asthma education	Asthma tracking and various surveillance efforts with state health departments
NIH / NHLBI / NAEPP	Centers for Reducing Asthma Disparities (cooperative research network)	Collaborative research on severe asthma
	Asthma Coalition Network Awards (funds 7 local coalitions targeting at-risk communities)	Recruitment of minority subjects into existing clinical research networks
	Collaborative Studies on the Genetics of Asthma	Research on genetics of asthma (with NCMHD)
NIH / NIAID	Inner-City Asthma Consortium (collaboration with NIEHS)	Research on asthma pathobiology, severity, and immune-based therapies in the inner-city
	Asthma and Allergic Disease Research Centers	Research on asthma pathobiology, severity, and immune-based therapies in the inner-city
NIH / NIEHS	Environmental Intervention in Primary Prevention of Asthma in Children (clinical research study)	National home allergen exposure data collection, monitoring and reduction efforts (collaboration with EPA, CDC and NIAID)
	Centers for Children's Environmental Health and Disease Prevention Research	National home allergen exposure data collection, monitoring and reduction efforts (collaboration with EPA, CDC and NIAID)
		Environmental genome project (government-wide collaboration)
AHRQ	Excellence Centers to Eliminate Ethnic/Racial Disparities	National health care disparities monitoring and reporting
		Health literacy and language tools and training in asthma for health care workers
	Primary Care Practice-Based Research Network (collaboration with HRSA community health centers)	National health care disparities monitoring and reporting
	Asthma case management for Head Start	Developing a model for asthma management training in Head Start (collaboration with HRSA)
ACF / Head Start Bureau	Head Start Program	Asthma management training for child care workers
HRSA / BPHC	Community Health Centers - Health Disparities Collaboratives	Asthma Collaborative (with CDC, AHRQ and EPA assistance)

CDC, Centers for Disease Control and Prevention
NIH, National Institutes of Health
NHLBI, National Heart, Lung, and Blood Institute
NAEPP, National Asthma Education and Prevention Program
NCMHD, National Center on Minority Health and Health Disparities
NIAID, National Institute of Allergy and Infectious Diseases
NIEHS, National Institute of Environmental Health Sciences
EPA, Environmental Protection Agency
AHRQ, Agency for Healthcare Research and Quality
ACF, Administration for Children and Families
HRSA, Health Resources and Services Administration
BPHC, Bureau of Primary Health Care
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