

The Challenge of Asthma in Minority Populations

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Abstract The burden and disparity of asthma in race/ethnic minorities present a significant challenge. In this review, we will evaluate data on asthma epidemiology in minorities, examine potential reasons for asthma disparities, and discuss strategies of intervention and culturally sensitive care.

Keywords Asthma · Minority · Populations · Race · Ethnicity

Key Points

- While asthma affects all races and ethnic groups, there is significant disparity in asthma morbidity and mortality. Minority populations suffer disproportionately higher rates of fatalities, hospitalizations, and emergency department and urgent care visits due to asthma. For example, non-Hispanic blacks have nearly three times the death rate than non-Hispanic whites for adults and eight times for children.

- Few studies have addressed ethnic differences in asthma in countries outside of the US. International survey data have shown considerable variation in asthma prevalence in both children and adults among countries, with higher prevalence in English-speaking countries, including the UK, Australia, New Zealand, and Ireland, and some Latin American countries.
- Puerto Ricans, African Americans, American Indians/Alaskan Natives, and persons of multiple races have the highest current and lifetime asthma prevalence and attack rates.
- Racial/ethnic designations may disguise important differences within groups. For example, Mexican Americans have the lowest and Puerto Ricans have the highest (comparable to and exceeding that in African Americans) prevalence of, current, or lifetime asthma among Hispanics. Thus, studies that combine Puerto Ricans and Mexican Americans as “Hispanic” are unlikely to differentiate important differences in prevalence for either or other subgroups. Similarly, Filipinos have higher asthma prevalence compared with other Asian subgroups and whites.
- Low socioeconomic status (SES) is an independent and significant factor for increased asthma morbidity and mortality for many minority groups. When controlling for SES, significant disparities in asthma morbidity and mortality generally remain for racial/ethnic minority populations.
- Barriers to care exist because of lower SES, with decreased access, inadequate care, or lack of chronic care, including under prescription of inhaled corticosteroids, increased environmental exposures in urban settings, substandard living conditions, and increased psychosocial dysfunction and cultural differences.
- Environmental intervention strategies, which are comprehensive and individualized, can be effective

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in reducing allergen environmental burden in urban settings and reduce asthma morbidities.

- Genetic variation alone or interacting with environmental exposures contributes to ethnic disparities in asthma. Asthma-susceptibility genes with different ethnic frequencies have been found; however, results have been inconsistent and not always reproducible. Pharmacogenetics has lead to the discovery of different allele frequencies between ethnic/racial groups, which are associated with the degree of response to asthma medications. Questions remain as to the degree of heterogeneity, gene–gene interactions, as well as the impact of gene–environment interactions for different race/ethnic groups.
- Culturally competent strategies can be effective in helping to reduce the disparity in asthma health care and outcomes in racial/ethnic minorities.
- Reduction of asthma disparity in racial and ethnic minority groups is an important challenge and goal.

Introduction

Minorities are individuals or groups of individuals especially qualified. The masses are the collection of people not specifically qualified.

—José Ortega y Gasset
The Revolt of the Masses (1930)

In the USA, minority groups are increasing in relative proportion of the population, especially Hispanics, Asians, and Pacific Islanders. In 2005, the Pew Research Center estimates that the US race/ethnic proportions were 67% white, 14% Hispanic, 13% black, and 5% Asian. According to a William H. Frey of the Brookings Institute analysis of the 2009 US Census estimates, whites are now a minority in California, Hawaii, New Mexico, Texas, and the District of Columbia [1]. By 2050, “minorities” are projected to become the majority, as whites are projected to comprise 47%, Hispanics 29%, blacks 13%, and Asians 9% of the US population [2].

While asthma affects all races and ethnic groups, minority and economically disadvantaged populations suffer significantly and disproportionately higher rates of fatalities, hospitalizations, and emergency department visits due to asthma. For example, blacks had about threefold more deaths for adults and eightfold more for children than whites according to the latest average annual data for 2005–2007 [3]. Asthma in minorities is important from multiple perspectives, including social, economic, as well as medical. The elimination of the disparity in asthma burden in minorities and those living in poverty has become a national priority.

Multiple federal agencies in the USA have been working to address the issues of asthma disparities. An example is the Center for Disease Control (CDC), which produces statistics in minorities in asthma as well as supporting research in asthma disparity. The Agency for Healthcare Research and Quality is involved in different areas including research, such as quality of care for children with asthma in the Medicaid program and in the State Children’s Health Insurance Program (SCHIP), guideline implementation in primary care and the emergency department, quality improvement strategies, and working with higher levels of health care such as state asthma coalitions. The National Heart, Lung, and Blood Institute (NHLBI) has funded Centers for Reducing Asthma Disparities, which are designed to research reasons for increased asthma disparity and determining methods for reducing prevalence. In addition, the NHLBI is supporting research to determine effective strategies in asthma management such as culturally sensitive change strategies for children with asthma and their families along with a variety of other innovative strategies. The National Institute of Allergy and Infectious Diseases supports the National Cooperative Inner-City Asthma Study, Demonstration and Education Research Project, and studies on the genetic basis of asthma [4].

In 2005, a national workshop with over 1,000 national experts was conducted to address the problem of disparities in asthma including issues of genetics, indoor and outdoor environment, family/social function, behavioral health, health-care delivery, health-care communications, roles of the community, private insurance, and safety net providers, and state and local policy [5].

The burden and disparity of asthma in race/ethnic minorities presents a significant challenge. In this review, we will evaluate data on asthma epidemiology in minorities, examine potential reasons for asthma disparities, and discuss strategies of intervention and culturally sensitive care. Different definitions of “minority” exist, including distinctions based on religion. For the purposes of this chapter, minority, in terms of race and ethnicity will refer to non-white US Office of Management and Budget classification of race. In addition to whites, these racial designations include Black or African Americans, Asian, Native Hawaiian or other Pacific Islander, and American Indian or Alaska native. Ethnicity refers to Hispanic or Latino and Not Hispanic or Latino. The term “race/ethnicity” will be utilized throughout this chapter, then, to refer to minority populations.

Asthma Differences among Countries

Worldwide asthma prevalence among children varies considerably. In phases I and III of the International Study

of Asthma and Allergies in Childhood (ISAAC), there were up to 15–20-fold differences in the prevalence of childhood asthma among participating countries [6–8]. Among children 13 to 14 years old who participated in phase III of ISAAC, the prevalence of current wheeze (defined as “wheezing or whistling in the chest in the last 12 months”) ranged from 0.8% in Tibet (China) to 32.6% in Wellington (New Zealand). Among those aged 6–7 years, the prevalence of current wheeze ranged from 2.4% in Jodhpur (India) to 37.6% in Costa Rica.

In general, asthma prevalence was higher in English-speaking countries and in Latin America, and lower in the Indian subcontinent, Asia-Pacific, Eastern Mediterranean, Northern Africa, and Eastern Europe [8]. However, there were significant differences in asthma prevalence among countries within a given geographic region. For example, within Latin America, asthma prevalence was low in Argentina, Chile, and Mexico, whereas the prevalence was much higher in Costa Rica. More variation was noted between countries than within countries, though this may be due to selection bias [7, 8]. Interestingly, the proportion of current wheezers who had severe asthma symptoms was higher in Africa, the Indian subcontinent and the Eastern Mediterranean than in English-speaking countries for both age groups [8, 9].

In contrast to much of Asia, several affluent Asian regions such as Hong Kong, Singapore, and Japan were found to have relatively high asthma prevalence. A notable dissimilarity was seen between Hong Kong and Guangzhou (10.1% vs. 2.0%, 12-month prevalence of wheezing via video questionnaire), two areas of China that are geographically and ethnically similar but differ in affluence [7].

In ISAAC, children living in lower-income countries tended to have a lower prevalence of current wheeze based on the written questionnaire than those living in higher-income countries [OR 0.49 (95% CI 0.37–0.66) in those aged 6–7 years old and OR 0.55 (95% CI 0.42–0.72) in those ages 13–14 year]. Similar results were seen for “asthma ever” [8].

Limitations of ISAAC include lack of objective data (e.g., lung function measures) to validate the questionnaires used across cultures and languages, and variation in the number of areas surveyed within and between countries (e.g., urban areas are over-represented), potential reporting differences, and lack of ethnic-specific data within the participating countries. Nonetheless, ISAAC has provided valuable information about childhood asthma for public health practitioners and researchers alike.

Recent worldwide findings for asthma in adults are similar but not identical to those in children. The European Community Respiratory Health Survey (ECRHS) reported a higher prevalence of asthma in adults (ages 20 to 44 years) living in English-speaking countries (including the UK,

Australia, New Zealand, and Ireland) than in those living in Eastern and Southern Europe. Overall, there was agreement between the ISAAC and ECRHS findings [10, 11]. More recently, the World Health Organization implemented the World Health Study, which provided global patterns of self-reported wheeze and doctor-diagnosed asthma among adults. The prevalence of current wheezing ranged from 2.4% in Vietnam to 24% in Brazil, and that for asthma ranged from 1.8% in Vietnam to 32.8% in Australia. There was a U-shaped pattern for the relationship between national income and either asthma symptoms or asthma diagnosis [12].

There are limited data evaluating racial/ethnic differences in asthma outside the USA. A survey indicated that many, but not all, asthma trials in the USA include racial/ethnic data on study subjects, but that this was rare in clinical studies from Europe [13]. Because of racial/ethnic differences in asthma severity and prevalence, lack of inclusion of such data may confound clinical study results and comparisons. Some examples of the studies about minorities outside the USA will be summarized.

In Sweden, Hjern et al. showed an inverse association between hospitalizations for childhood asthma and birth outside of Western Europe, the USA, and Australia. These results were significant after accounting for indicators of socio-economic status (SES) and other variables, suggesting a role for ethnicity on asthma morbidity among children in Sweden [14]. An editorial regarding ethnic differences in asthma in the UK concluded that asthma and asthma admissions may be more common in South Asians (Indian subcontinent), but also that asthma may be under-diagnosed and under-treated in this population. Possible cultural barriers might exist, as dissimilar results were noted in asthma outcomes for South Asians vs. white Europeans despite similar access to treatment and educational resources. Other potential explanations for the observed ethnic-specific differences include environmental exposures, communication problems, and host factors (e.g., genetics). The latter was considered unlikely based on lack of evidence [15]. Similar confounding variables for racial/ethnic minorities that have been studied or postulated in the USA and are discussed in the section on [Factors Contributing to Racial/Ethnic Disparities in Asthma](#).

A more recent study of children in the UK, the MRC Determinants of Adolescent Social well-being and Health, included 80% minorities and examined parent-reported asthma prevalence among 11–13 year-old children by self-reported ethnicity. Compared with whites, Black Africans, Indians, and Bangladeshis had a lower and White/Black Caribbeans, a higher prevalence of asthma. Residence in the UK for <5 years was protective against asthma in Black/Caribbean and Black Africans compared with those born in the UK. These findings are somewhat

contrary to those noted primarily in the USA, which show a higher prevalence of asthma among Blacks. This discrepant finding may be due to a diagnostic bias, as there were no differences in report of wheeze among ethnic groups in this UK study [16].

Similar to US data on American Indians and Alaska natives, a Canadian study showed an increased incidence in emergency (2.1 times higher) and office visits (1.6 times higher) for asthma among aboriginals compared with non-aboriginals. Specialty care and spirometry were underutilized in aboriginals, suggesting access barriers to quality care [17]. Data from the Canadian Community Health Survey showed that Aboriginals (North American Indians, Métis, Inuit/Eskimos) reported lower prevalence of asthma but higher rates of smoking and obesity than Non-Aboriginal Northern Canadians. However, there may be underreporting of asthma in Northern Aboriginals because of inadequate access to medical care [18].

In New Zealand, differences were noted in mortality, and asthma admission rates differed between whites and Maoris or Pacific Islander children likely because of variation in medical management, especially prescribing patterns by medical practitioners [19]. Differences in prescribing practices for minorities in the USA have been noted and are discussed in [Factors Contributing to Racial/Ethnic Disparities in Asthma](#).

Recent reports from various countries involving different age and racial/ethnic groups have shown conflicting results regarding trends in asthma prevalence. Whereas some areas have reported decrements (e.g., Rome [Italy], Saskatchewan [Canada], Melbourne [Australia], and Mexico), others have reported increments in asthma prevalence (e.g., Saudi Arabia, South Australia, and Greece). Studies are difficult to compare because of differences in asthma definition, survey techniques, time periods, and population characteristics [20]. However, a recent publication describes global trends in asthma prevalence within countries between phase 1 (early–mid 1990s) and phase 3 (early 2000s) of ISAAC (see Figs. 1 and 2). As the same validated questionnaire was used at both points and Bland-Altman plots were used to avoid the issue of regression towards the mean, these are the best data available on global asthma prevalence trends. Overall, there was a trend for lifetime asthma prevalence to increase among both 6–7 year-olds and 13–14-year-olds, although the increase was smaller in 13–14-year-olds [9].

Asthma Prevalence, Health Care Use, and Mortality, 1997–2008 Race/Ethnic Differences within the USA

Nationwide surveys in the USA have shown significant racial/ethnic disparities in asthma morbidity and mortality.

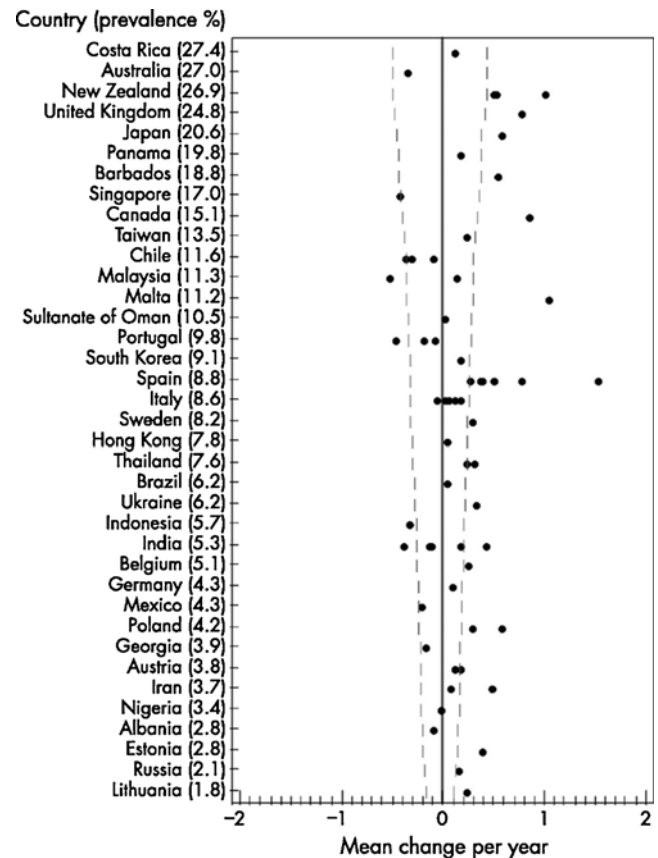


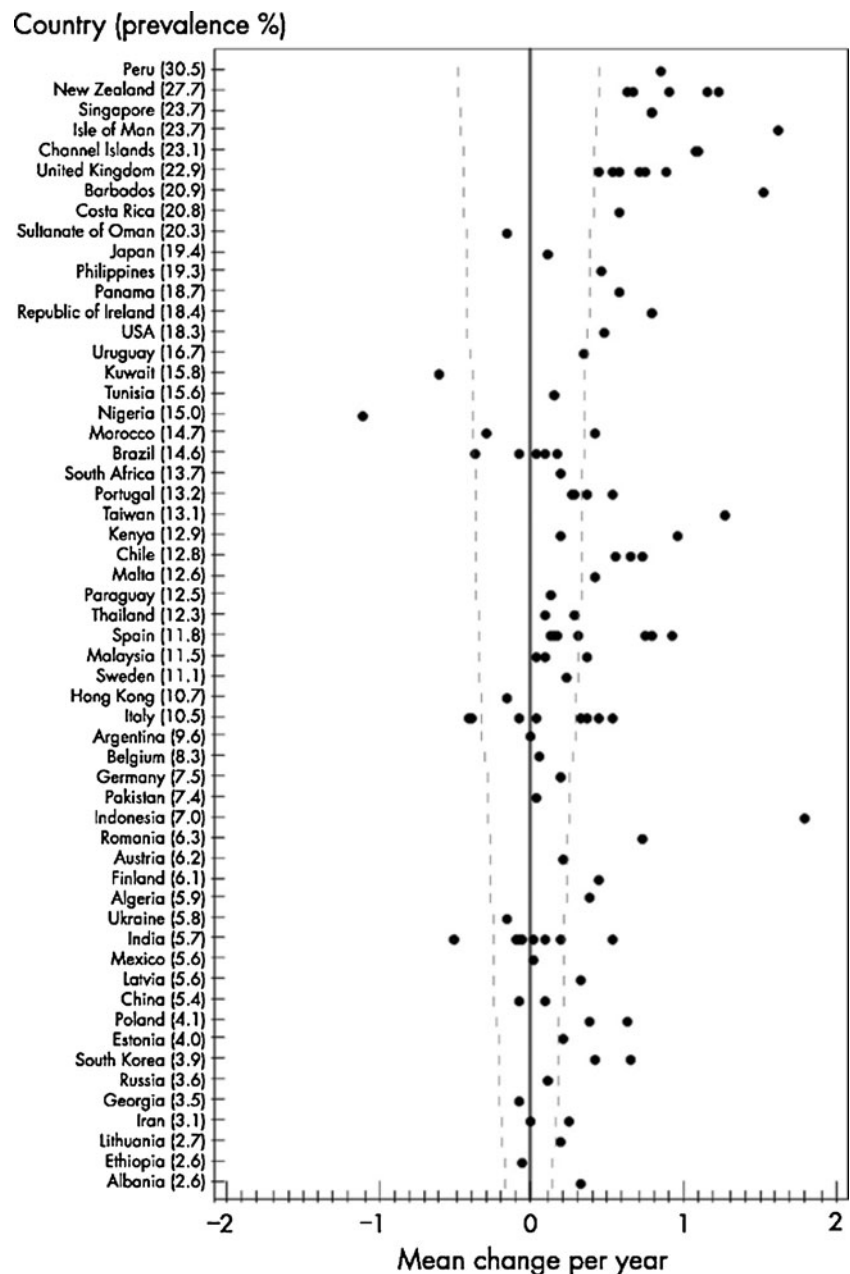
Fig. 1 International Study of Asthma and Allergies in Children (ISAAC): Change per year in lifetime prevalence of asthma between phase 1 and phase 2, in children aged 6–7 years, with countries ordered by mean prevalence current asthma prevalence (reprinted from reference [9] with permission from BMJ Publishing Group LTD)

There has been increasing data available on racial/ethnic differences in asthma, compared with earlier reports that mostly compared non-Hispanic whites, non-Hispanic blacks, and Hispanics.

The most recent (2006–2008) data from the National Health Interview Survey (NHIS) in the USA show substantial racial/ethnic differences in prevalence, morbidity, and mortality from asthma [3]. In this survey, the difference in current asthma prevalence between blacks and whites was substantially greater in children (0–17 years of age; 2006–2008 annual average) than in adults (age ≥ 18 years). Among children, the current prevalence of asthma was 14.6% (95% confidence interval [CI]=13.5%–15.9%) for blacks in contrast to 8.2% (95% CI=7.7%–8.7%) for whites. In comparison, there was only a modest difference in current asthma prevalence between black (7.8%, 95% CI 7.3–8.4) and white (7.2%, 95% CI 7.0–7.5%) adults.

Although the age-adjusted prevalence of current asthma was lower in Hispanic children and adults (6.3%, 95% CI 5.8–6.8%) than that in non-Hispanics (8.1%, 95% CI 7.8–8.4%), this is confounded by differences in asthma

Fig. 2 International Study of Asthma and Allergies in Children (ISAAC): Change per year in lifetime prevalence of asthma between phase 1 and phase 2, in children age 13–14 years, with countries ordered by mean prevalence current asthma prevalence (reprinted from reference [9] with permission from BMJ Publishing Group LTD)



prevalence among Hispanic subgroups. In fact, Hispanics of Puerto Rican ancestry had distinctively higher asthma prevalence (14.2%, 95% CI 12.5–16.2%) than Hispanics of Mexican ancestry (4.9%, 95% CI 4.5–5.5%).

Compared with the age-adjusted prevalence of current asthma in whites of all ages (7.5%, 95% CI 7.2%–7.7%), that of Asians was lower (4.8%, 95% CI 4.2%–5.6%), but that of American Indian/Alaskan Natives was slightly higher (8.5%, 95% CI 6.4%–11.2%). Persons of multiple races had a significantly higher current prevalence rate (14.8%, 95% CI 12.7–17.0%).

Similar differences among race/ethnicity groups were also noted in reported asthma attacks and lifetime

asthma diagnosis. Whereas the current and asthma attack prevalence as well as the lifetime diagnosis of asthma was greater for males in the pediatric age group (0–17 years), females had greater current and asthma attack prevalence and lifetime diagnosis of asthma in the adult (18+ years) age group for all race/ethnic groups (Tables 1, 2, and 3).

The NHIS and the National Vital Statistics System data reveal significant race/ethnic disparities for asthma in morbidity and mortality between blacks and whites. Compared with the differences in asthma prevalence, there were disproportionately higher rates of asthma emergency department visits noted for blacks compared with whites for all age

Table 1 Estimated current prevalence of self-reported asthma, self-reported asthma attack prevalence, and self-reported lifetime asthma diagnosis by sex, age-adjusted, and race/ethnicity (Annual Average 2006–2008; National Health Interview Survey—United States)

Prevalence ^{a,b,c}		Current asthma prevalence			Asthma attack prevalence			Lifetime asthma diagnosis		
Sex		All	Male	Female	All	Male	Female	All	Male	Female
Age	Race/ethnicity									
All ages (age-adjusted)	All	7.8	6.9	8.6	4.2	3.5	4.9	12.0	11.4	12.5
	White	7.5	6.6	8.4	4.1	3.3	4.8	11.7	11.1	12.2
	Black	9.6	8.5	10.3	5.0	4.2	5.6	13.8	12.9	14.3
	American Indian/Alaska Native	8.5	6.7	10.4	5.4	4.3	6.7	13.4	11.3	15.5
	Asian	4.8	4.9	4.8	2.7	2.9	2.5	9.0	8.9	9.1
	Native Hawaiian/other Pacific Islander	^d	^d	^d	^d	^d	^d	17.5	17.6	^d
	Multiple race	14.8	12.1	17.4	8.7	5.9	11.2	20.5	18.1	22.8
	Hispanic	6.3	5.5	7.2	3.6	3.0	4.3	9.9	8.9	10.9
	Puerto Rican	14.2	11.3	16.9	8.4	6.1	10.4	21.8	19.8	23.4
	Mexican	4.9	3.9	6.1	2.8	2.1	3.5	8.0	6.7	9.3
	Non-Hispanic	8.1	7.2	8.9	4.3	3.6	5.0	12.5	12.0	12.9
	Non-Hispanic White	7.8	6.8	8.7	4.2	3.4	5.0	12.2	11.6	12.6
	Non-Hispanic Black	9.5	8.5	10.3	4.9	4.2	5.5	13.7	12.8	14.2

^a Percent (The percent is calculated by dividing the weighted number of respondents identified as being within a specific category by the weighted total population that answered the relevant question(s))

^b Estimates for the races presented are for persons with one race recorded, except for the “multiple races” group which includes persons with more than one race recorded. When not otherwise mentioned, race groups include persons of Hispanic and non-Hispanic origin and those for whom Hispanic origin is unknown. Hispanic origin groups include people of any race

^c Estimates for age-adjusted to the year 2000 US standard population to eliminate differences in observed percents that result from differences in age composition

^d Unreliable data

Table 2 Estimated current prevalence of self-reported asthma, self-reported asthma attack prevalence, and self-reported lifetime asthma diagnosis by sex, age 0–17 years, and race/ethnicity (Annual Average 2006–2008; National Health Interview Survey—United States)

Prevalence ^{a,b}		Current asthma prevalence			Asthma attack prevalence			Lifetime asthma diagnosis		
Sex		All	Male	Female	All	Male	Female	All	Male	Female
Age	Race/ethnicity									
0–17	All	9.3	10.7	7.8	5.5	6.2	4.7	13.4	15.6	11.2
	White	8.2	9.6	6.7	4.9	5.7	4.0	12.1	14.2	9.9
	Black	14.6	16.5	12.7	8.1	9.0	7.2	19.2	21.7	16.6
	American Indian/Alaska Native	10.4	^c	^c	^c	^c	^c	14.0	14.9	^c
	Asian	5.8	7.3	4.3	3.9	4.9	3.0	10.2	11.7	8.8
	Native Hawaiian/other Pacific Islander	^c	^c	^c	^c	^c	^c	31.3	42.0	^c
	Multiple race	13.6	14.6	12.6	8.2	7.6	8.8	19.1	22.2	15.9
	Hispanic	8.3	9.9	6.6	5.0	5.6	4.3	12.1	14.4	9.8
	Puerto Rican	18.4	23.6	13.0	10.8	13.2	8.3	23.5	28.3	18.5
	Mexican	7.0	7.8	6.2	4.2	4.4	4.1	10.7	12.1	9.2
	Non-Hispanic	9.6	10.9	8.1	5.6	6.4	4.8	13.8	15.9	11.6
	Non-Hispanic White	8.2	9.5	6.9	4.9	5.7	4.1	12.3	14.2	10.3
	Non-Hispanic Black	14.6	16.5	12.7	8.0	9.0	7.0	19.1	21.6	16.5

^a Percent (The percent is calculated by dividing the weighted number of respondents identified as being within a specific category by the weighted total population that answered the relevant question(s))

^b Estimates for the races presented are for persons with one race recorded, except for the “multiple races” group which includes persons with more than one race recorded. When not otherwise mentioned, race groups include persons of Hispanic and non-Hispanic origin and those for whom Hispanic origin is unknown. Hispanic origin groups include people of any race

^c Unreliable data

Table 3 Estimated current prevalence of self-reported asthma, self-reported asthma attack prevalence, and self-reported lifetime asthma diagnosis by sex, age 18+ years, and race/ethnicity (Annual Average 2006–2008; National Health Interview Survey—United States)

Prevalence ^{a,b,c}		Current asthma prevalence			Asthma attack prevalence			Lifetime asthma diagnosis		
Sex		All	Male	Female	All	Male	Female	All	Male	Female
Age	Race/ethnicity									
18+ (age-adjusted)	All	7.3	5.5	8.9	3.8	2.5	5.0	11.5	10.0	13.0
	White	7.2	5.5	8.9	3.8	2.5	5.0	11.5	10.0	13.0
	Black	7.8	5.7	9.5	3.9	2.5	5.0	11.9	9.8	13.5
	American Indian/Alaska Native	7.9	5.5	10.4	5.7	^d	6.8	13.2	10.0	16.4
	Asian	4.5	4.1	5.0	2.3	2.2	2.3	8.6	7.9	9.1
	Native Hawaiian/other Pacific Islander	^d	^d	^d	^d	^d	^d	^d	^d	^d
	Multiple race	15.1	11.2	19.1	8.9	5.4	12.1	21.0	16.7	25.2
	Hispanic	5.6	4.0	7.4	3.1	2.0	4.3	9.1	7.0	11.3
	Puerto Rican	12.8	7.0	18.2	7.6	3.7	11.1	21.1	16.8	25.1
	Mexican	4.2	2.6	6.0	2.3	1.3	3.3	7.0	4.8	9.4
	Non-Hispanic	7.6	5.9	9.2	3.9	2.6	5.1	12.0	10.6	13.3
	Non-Hispanic White	7.7	5.9	9.3	4.0	2.6	5.3	12.1	10.8	13.4
	Non-Hispanic Black	7.8	5.7	9.5	3.9	2.5	5.0	11.8	9.8	13.4

^a Percent (The percent is calculated by dividing the weighted number of respondents identified as being within a specific category by the weighted total population that answered the relevant question(s))

^b Estimates for the races presented are for persons with one race recorded, except for the “multiple races” group which includes persons with more than one race recorded. When not otherwise mentioned, race groups include persons of Hispanic and non-Hispanic origin and those for whom Hispanic origin is unknown. Hispanic origin groups include people of any race

^c Estimates for age-adjusted to the year 2000 US standard population to eliminate differences in observed percents that result from differences in age composition

^d Unreliable data

Table 4 Estimated annual rate of emergency room department visits for asthma as first-listed diagnosis, by race/ethnicity, sex, and all ages, (age-adjusted; National Hospital Ambulatory Medical Care Survey—NHAMCS—United States, Annual Average 2005–2007)

Diagnosis ^{a,b}			Asthma			
Year			1996–1998	1999–2001	2002–2004	2005–2007
Age	Sex	Race/ethnicity				
All ages (age-adjusted)	All	All races	73.2	65.1	63.7	58.1
		White	56.9	54.5	46.3	42.5
		Black	183.9	150.1	186.9	167.9
		Hispanic	74.6	55.7	65.7	64.8
		Non-Hispanic White	45.5	44.8	40.1	39.3
		Non-Hispanic Black	152.9	118.4	173.4	167.7
	Male	All races	66.3	56.3	60.0	50.3
		White	50.8	43.9	40.1	35.9
		Black	168.1	154.1	196.9	155.5
		Hispanic	63.2	61.2	64.3	50.4
		Non-Hispanic White	43.4	34.0	34.1	33.2
		Non-Hispanic Black	144.7	124.0	184.5	153.8
	Female	All races	78.8	73.2	67.1	65.8
		White	62.1	64.7	52.7	49.3
		Black	194.1	144.3	175.1	177.9
		Hispanic	87.6	50.4	68.9	79.1
		Non-Hispanic White	46.9	55.1	46.0	45.3
		Non-Hispanic Black	156.5	111.7	161.7	179.2

^a Rate per 10,000

^b Estimates for age-adjusted to the year 2000 US standard population to eliminate differences in observed percents that result from differences in age composition

groups. For the annual average for the period of 2005–2007, both blacks (167.9/10,000, 95% CI 148.3/10,000–187.5/10,000) and Hispanics (64.8/10,000, 95% CI 52.8/10,000–76.9/10,000) had significantly higher rates emergency room department visits than whites (42.5/10,000, 95% CI 38.1/10,000–47.0/10,000; Tables 4, 5, and 6).

Moreover, the rates of hospitalizations (Table 7) [21] and deaths due to asthma (Tables 8 and 9) are still alarmingly higher for blacks than whites. While the age-adjusted death rate from asthma in adults (age ≥ 18 years) has generally decreased, a nearly threefold difference in average annual death rate between blacks and whites has

Table 5 Estimated annual rate of emergency room department visits for asthma as first-listed diagnosis, by race/ethnicity, sex, and age group 0–17 years (National Hospital Ambulatory Medical Care Survey—NHAMCS—United States, Annual Average 2005–2007)

Diagnosis ^a			Asthma			
Year			1996–1998	1999–2001	2002–2004	2005–2007
Age	Sex	Race/ethnicity				
0–4	All	All races	170.2	152.9	163.3	133.1
		White	115.9	123.0	115.1	101.2
		Black	479.2	343.8	467.0	325.1
		Hispanic	131.5	153.9	176.6	153.3
		Non-Hispanic White	94.6	92.4	83.1	86.2
		Non-Hispanic Black	416.1	283.8	440.1	318.1
	Male	All races	232.2	205.2	199.6	170.5
		White	155.2	167.9	140.9	136.0
		Black	664.5	464.6	577.7	381.9
		Hispanic	^b	^b	228.6	205.2
		Non-Hispanic White	130.9	131.0	107.8	115.6
		Non-Hispanic Black	580.8	392.8	545.1	367.3
	Female	All races	105.3	98.1	125.2	94.1
		White	74.7	75.8	88.1	64.7
		Black	288.8	219.2	353.0	266.4
		Hispanic	^b	^b	^b	99.1
		Non-Hispanic White	^b	^b	^b	55.3
		Non-Hispanic Black	^b	^b	332.2	267.2
	5–17	All races	96.3	78.1	75.7	73.2
		White	75.9	65.2	51.0	56.2
		Black	216.4	171.6	217.2	186.0
		Hispanic	70.8	^b	78.4	77.8
		Non-Hispanic White	62.8	52.9	44.0	50.4
		Non-Hispanic Black	185.8	139.9	198.1	186.6
	Male	All races	102.6	93.0	84.1	74.5
		White	85.9	74.4	48.0	52.9
		Black	201.0	220.7	277.8	211.7
		Hispanic	^b	^b	83.7	70.0
		Non-Hispanic White	75.8	53.9	40.4	48.9
		Non-Hispanic Black	189.7	173.7	253.2	210.8
	Female	All races	89.7	62.4	66.9	71.9
		White	65.2	55.4	54.2	59.5
		Black	232.4	120.8	154.8	159.6
		Hispanic	^b	^b	72.9	85.9
		Non-Hispanic White	49.1	51.9	47.8	52.0
		Non-Hispanic Black	181.7	104.9	141.3	161.7

^a Rate per 10,000

^b Unreliable data: Relative standard error (RSE) is defined as the standard error divided by the estimate and is expressed as a percent of the estimated value. Estimates with a RSE greater than 30% or based on less than 30 records are not reliable and are not shown

Table 6 Estimated annual rate of emergency room department visits for asthma as first-listed diagnosis, by race/ethnicity, sex, and age-adjusted group 18 years+ (National Hospital Ambulatory Medical Care Survey—NHAMCS—United States, Annual Average 2005–2007)

Diagnosis ^{a, b}			Asthma			
Year			1996–1998	1999–2001	2002–2004	2005–2007
Age	Sex	Race/ethnicity				
18+ (age-adjusted)	All	All races	58.1	53.8	51.3	47.1
		White	46.5	45.5	38.7	33.5
		Black	148.2	127.1	153.6	148.6
		Hispanic	69.2	44.7	50.8	52.1
		Non-Hispanic White	36.6	38.5	35.3	32.1
		Non-Hispanic Black	120.3	98.1	142.7	148.8
	Male	All races	41.4	33.3	40.8	32.7
		White	32.1	24.7	28.6	22.0
		Black	113.7	109.1	141.5	120.0
		Hispanic	53.5	40.3	42.1	28.9
		Non-Hispanic White	27.1	20.3	25.9	21.6
		Non-Hispanic Black	93.2	87.3	133.9	119.3
	Female	All races	73.6	73.6	61.7	61.5
		White	60.1	66.0	49.0	45.2
		Black	175.5	143.5	164.0	174.3
		Hispanic	87.1	49.9	62.2	75.3
		Non-Hispanic White	45.4	56.3	44.6	42.7
		Non-Hispanic Black	141.8	108.1	151.3	175.3

^a Rate per 10,000^b Estimates for age-adjusted to the year 2000 US standard population to eliminate differences in observed percents that result from differences in age composition

persisted (4.8 versus 1.7 per 100,000 in 1999–2001; 3.4 versus 1.2 per 100,000 in 2005–2007). This is in contrast to the relative current asthma prevalence of 7.8% (CI₉₅ 7.3, 8.4) in black compared with 7.2% (CI₉₅ 7.0, 7.5) in white adults for 2006–2008.

In addition, the race/ethnicity groups of American Indian/Alaska Native (AIAN; annual average rate of 2.3/100,000 in 1999–2001 and 1.4 in 2005–2007) and Asian/Pacific Islander (API; average annual rate of 2.7 in 1999–2001 and 1.6 in 2005–2007) had greater relative death rates (AIAN, 135% for 1999–2001 and 117% for 2005–2007; API, 159% for 1999–2001 and 133% for 2005–2007) compared with whites. However, some of these differences must be interpreted with caution due to smaller sample size and/or missing data for some of the racial/ethnic groups. In contrast to the differences in the increased rate of emergency room visits, Hispanic adults did not have a greater mortality rate from asthma deaths than white adults, with the same average annual rate of 1.2/100,000 for 2005–2007. As pointed out previously, this may be partly due to inadequately merging Hispanic subgroups into a single category (“Hispanics”).

Disturbingly, the disparity for deaths was even more marked for the 0–17 years old age group for blacks and Hispanics. The relative death rate associated for blacks

compared with whites ranged from 450% (rate of 0.9 versus 0.2/100,000) average annual rate in 1990–1992 to 800% (0.8 versus 0.1/100,000) in 2005–2007. The death rate of asthma in Hispanics was twice as high that of whites (0.2 versus 0.1/100,000) higher than that for whites in 2005–2007. In contrast, the average annual current asthma prevalence for the 0–17 years age group was 14.6% (CI₉₅ 13.5, 15.9) for blacks and 8.3% (CI₉₅ 7.5, 9.2) for Hispanics compared with 8.2% (CI₉₅ 7.7, 8.7) for whites for the period 2006–2008. Thus, there are significant racial/ethnic disparities in morbidity and mortality from asthma.

As previously discussed, similar differences in asthma prevalence and outcomes for black and South Asian minorities have been reported in the UK. In addition, for both the USA and the UK, minorities born outside these countries were reported with less asthma than those born within the USA and UK [22]. (This will be further discussed later.)

Specific Race/Ethnicity Data: Asthma in California

The California Health Interview Survey (CHIS) is the nation’s largest state health survey and is conducted every

Table 7 Asthma hospital data ([21]; Table 29: Estimated rate of hospital discharges with asthma as the first listed diagnosis per 10,000 population, by year, sex, race, ethnicity, age, and region—National Hospital Discharge Survey, United States 1980–2004)

Characteristics	1980	1985	1990	1995	2000	2001	2002	2003	2004
Sex									
Male	16.8	17.4	13.3	15.8	14.3	13.6	13.9	16.5	14.5
Female	19.9	22.0	21.9	18.7	18.7	18.6	19.4	23.0	18.9
Race ^a									
White	15.1	15.7	12.5	11.6	NA	NA	NA	NA	NA
Black	27.0	31.4	36.6	38.6	NA	NA	NA	NA	NA
Other	–	–	22.3	22.4	NA	NA	NA	NA	NA
Race ^b									
White	NA	NA	NA	NA	10.2	10.1	10.5	12.2	10.0
Black	NA	NA	NA	NA	31.0	31.2	35.7	39.9	33.5
Other races NTA	NA	NA	NA	NA	12.8	13.3 ^c	10.0	18.1	19.0
Age									
<18 years	21.0	25.4	27.5	34.3	29.5	26.9	26.9	31.2	27.4
≥18 years	17.0	17.4	15.8	15.8	12.2	12.7	13.4	17.0	10.2
Age group (years)									
0–4	37.1	46.9	53.4	58.3	64.0	57.6	59.0	62.7	59.9
5–14	18.2	18.0	17.8	23.9	18.9	18.4	17.3	21.6	17.0
15–34	8.6	9.6	9.3	10.2	7.6	6.8	7.0	8.4	6.2
35–64	19.0	18.8	15.4	15.0	12.7	13.4	14.5	16.4	13.4
≥65	32.6	34.2	33.1	23.2	19.6	21.6	22.5	30.5	28.7
Region									
Northeast	19.6	21.3	22.6	28.2	21.1	20.7	20.6	31.0	23.7
Midwest	19.8	19.7	22.2	22.5	17.1 ^c	16.0	15.9	19.8	16.7
South	17.8	20.8	16.9	17.8	16.8	18.0	17.7	17.4	15.7
West	16.9	17.3	15.4	14.4	12.2	13.9	13.6	14.7	13.8
Total	18.5	19.9	19.0	19.1	16.7	16.4	16.9	19.9	17.0

^a Race categorized according to Statistical Policy Directive No. 15, Race and Ethnic Standards for Federal Statistics and Administrative Reporting (1977). Multiple race was not collected in these years. Unknown race was excluded. After 1999, there is no bridging variable to maintain historic coding therefore data are not available (NA)

^b Race categorized according to the 1997 revision of Statistical Policy Directive No. 15, Race and Ethnic Standards for Federal Statistics and Administrative Reporting. Race categories “white” and “black” are comprised of persons who indicated only a single race group. “Other races NTA (not tabulated above)” includes Asian, American Indian and Alaskan Native, Native Hawaiian and Other Pacific Islander, persons reporting more than one race, and persons reporting their race as something other than those listed here and above. Unknown race was excluded. It is not possible to apply the 1997 revisions to the race categorizations to years before 2000; therefore, data were not available

^c The estimates are unreliable because the relative standard error of the estimate is 30–50%. For missing estimates, the relative standard error of the estimate exceeded 50%, and the estimate was suppressed. All other relative standard errors are <30%. Except for age groups, rate is age-adjusted to the 2000 standard

2 years. It assesses the health and access to health care for residents of California. The latest survey (2007) randomly selected 53,611 households from every county in California [23]. CHIS conducts interviews in multiple racial/ethnic groups often underrepresented in other surveys (including Latinos and Latino ethnic groups, African Americans, American Indian/Alaska Natives (urban and rural sub-samples)) and Asians (including large sub-samples for Chinese, Filipinos, Japanese, Korean, Vietnamese, and South Asians). The CHIS interviews are conducted in English, Spanish, Chinese (Cantonese and Mandarin), Korean, and Vietnamese.

More specific ethnic data are collected in this survey, which is the largest, most complete database on asthma rates among different ethnic groups. The 2007 CHIS survey included data on lifetime prevalence, current or recent asthma symptoms, emergency department or urgent care use, hospitalizations, work or school absence, receiving an asthma action plan, use of a controller medication, confidence in asthma care, and other questions.

As in the NHIS data, lifetime asthma prevalence (see Fig. 3) was significantly higher in African American children and adults than in white children and adults (lifetime asthma prevalence: African American, children

Table 8 Annual rate of deaths with asthma as the underlying cause of death diagnosis by race/ethnicity, sex, and age group 0–17 years (United States, 1990–2007, Source: The National Vital Statistics System [NVSS])

Cause of death ^{a,b}			Asthma					
Year			1990–1992	1993–1995	1996–1998	1999–2001	2002–2004	2005–2007
Age	Sex	Race/ethnicity						
0–17	All	All	0.3	0.3	0.3	0.3	0.3	0.2
		White	0.2	0.2	0.2	0.2	0.1	0.1
		Black	0.9	0.9	1.0	0.9	0.9	0.8
		American Indian/Alaska Native	c	c	c	c	c	c
		Asian/Pacific Islander	c	c	0.3	c	c	c
		Hispanic	d	d	d	0.2	0.2	0.2
		Non-Hispanic White	d	d	d	0.2	0.1	0.1
		Non-Hispanic Black	d	d	d	0.9	0.9	0.9
	Male	All	0.3	0.4	0.4	0.3	0.3	0.3
		White	0.2	0.2	0.2	0.2	0.2	0.1
		Black	1.1	1.2	1.1	1.1	1.2	1.1
		American Indian/Alaska Native	c	c	c	c	c	c
		Asian/Pacific Islander	c	c	c	c	c	c
		Hispanic	d	d	d	0.2	0.2	0.2
		Non-Hispanic White	d	d	d	0.2	0.2	0.1
		Non-Hispanic Black	d	d	d	1.2	1.3	1.2
	Female	All	0.2	0.3	0.3	0.2	0.2	0.2
		White	0.2	0.2	0.1	0.2	0.1	0.1
		Black	0.6	0.6	0.8	0.6	0.6	0.6
		American Indian/Alaska Native	c	c	c	c	c	c
		Asian/Pacific Islander	c	c	c	c	c	c
		Hispanic	d	d	d	0.1	0.1	0.1
		Non-Hispanic White	d	d	d	0.2	0.1	0.1
		Non-Hispanic Black	d	d	d	0.6	0.6	0.6

Missing values

^a Deaths per 100,000 population^b Cause of death is coded according to the appropriate revision of the International Classification of Diseases (ICD). Effective with deaths occurring in 1999, the United States began using the Tenth Revision of the ICD (ICD-10); during the period 1981–1998, cause of death was coded and classified according to the Ninth Revision (ICD-9).^c Unreliable data^d Data not available

(ages 1–17 years) 23.6%; adults (ages 18 years and older) 18.9%; overall ages 1+ years 20.1%; compared with whites: children, 14.9%; adults, 14.7%; overall, 14.8%). Compared with whites, greater lifetime asthma prevalence was found for those reporting ≥ 2 races (Lifetime asthma prevalence: ≥ 2 races, children 19.1%; adults 23.2%; overall 21.3%), American Indians and Alaska Natives (AIAN; Lifetime asthma prevalence: overall 22.2%), and Native Hawaiian and other Pacific Islanders (Lifetime asthma prevalence: NHPI, overall 16.1%). On the other hand, Latinos (Lifetime asthma prevalence: Latinos, children 14.3%; adults 9.6%, overall 11.2%) and Asians (Lifetime asthma prevalence: Asians, children 15.8%; adults 10.8%, overall 11.8%) had slightly lower lifetime asthma prevalence than whites.

Though Latinos were found to have lower rates in the CHIS survey, significant differences among Latino ethnic groups were seen. Puerto Ricans (overall 23.5%), two or more Latino/Hispanic group (18.0%) and South Americans (16.6%) were noted to have significantly higher prevalence than other Latino subgroups, including Mexicans (10.3%) and Central Americans (9.2%; see Fig. 4).

The overall low prevalence of asthma among Latinos in California is a result of most of them being of Mexican heritage (84%) [24]. Thus, evaluating both the CHIS and the NCHS data about asthma prevalence in Hispanics alone would miss important differences among Hispanic groups.

Similarly, heterogeneous differences were seen among Asian-American subgroups in California. Filipinos (19.2%)

Table 9 Annual rate of deaths with asthma as the underlying cause of death diagnosis by race/ethnicity, sex, and age adjusted 18+ years, United States, 1997–2007, Source: The National Vital Statistics System [NVSS]

Cause of death ^{a,b,c}			Asthma		
Year			1999–2001	2002–2004	2005–2007
Age	Sex	Race/ethnicity			
18+ (age-adjusted)	All	All races	2.1	1.8	1.5
		White	1.7	1.5	1.2
		Black	4.8	4.0	3.4
		American Indian/Alaska Native	2.3	1.6	1.4
		Asian/Pacific Islander	2.7	1.9	1.6
		Hispanic	2.1	1.6	1.2
		Non-Hispanic White	1.7	1.5	1.3
		Non-Hispanic Black	4.9	4.1	3.5
	Male	All races	1.6	1.4	1.2
		White	1.3	1.1	0.9
		Black	4.2	3.7	3.1
		American Indian/Alaska Native	^d	^d	^d
		Asian/Pacific Islander	3.1	2.2	1.6
		Hispanic	1.6	1.3	1.0
		Non-Hispanic White	1.2	1.1	0.9
		Non-Hispanic Black	4.3	3.8	3.1
	Female	All races	2.4	2.0	1.8
		White	2.0	1.8	1.5
		Black	5.2	4.2	3.7
		American Indian/Alaska Native	^d	^d	^d
		Asian/Pacific Islander	2.3	1.8	1.7
		Hispanic	2.4	1.9	1.4
		Non-Hispanic White	2.0	1.7	1.5
		Non-Hispanic Black	5.3	4.3	3.8

Missing values

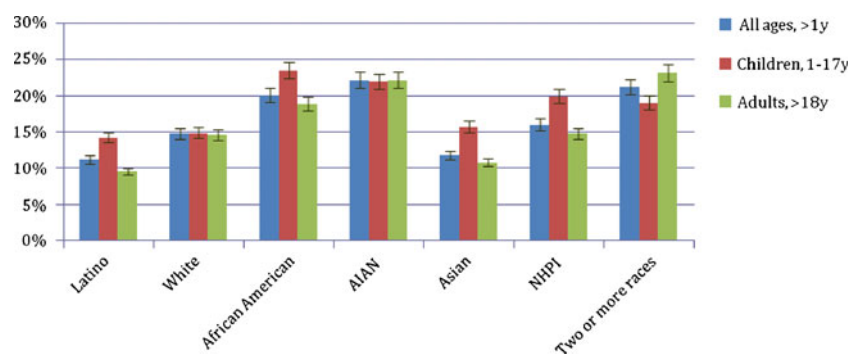
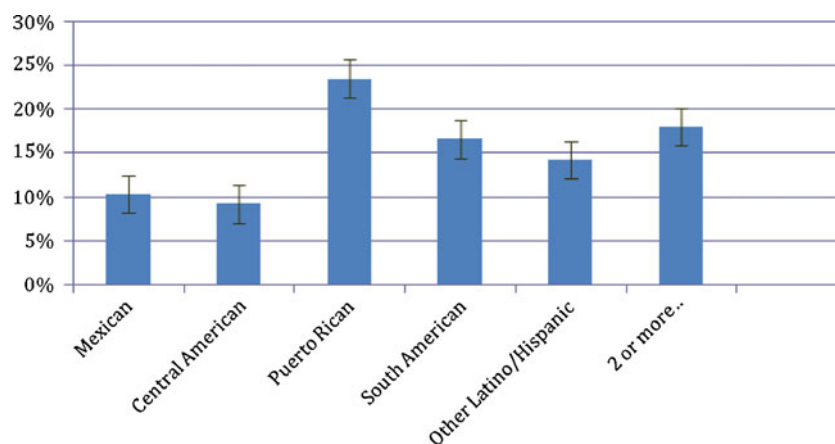
^a Deaths per 100,000 population^b Cause of death is coded according to the appropriate revision of the International Classification of Diseases (ICD). Effective with deaths occurring in 1999, the United States began using the Tenth Revision of the ICD (ICD-10); during the period 1981–1998, cause of death was coded and classified according to the Ninth Revision (ICD-9)^c Estimates for age-adjusted to the year 2000 US standard population to eliminate differences in observed percents that result from differences in age composition^d Unreliable data**Fig. 3** Lifetime asthma prevalence by age groups and race/ethnicity in California, 2007. Graphs include 95% confidence interval bars. Note: *AIAN* American Indian and Alaska Native, *NHPI* Native Hawaiian and other Pacific Islander, two or more races non-Latino. Source: 2008 California Health Survey [23]

Fig. 4 Lifetime asthma prevalence by Latino ethnic groups, all ages, 2007. Graphs include 95% confidence interval bars. Source: 2008 California Health Survey [23]



had significantly higher overall lifetime prevalence compared with Vietnamese (11.5%), Japanese (11.2%), Chinese (10.0%), South Asians (8.5%), Koreans (5.0%), and other single/multiple Asians (9.5%; see Fig. 5).

In an earlier CHIS UCLA publication [25], the authors cautioned that several issues might affect estimates of prevalence among ethnic subgroups including differences in asthma diagnosis due to financial or geographic access to health care, health care-seeking behavior, physician practice patterns, and issues that particularly affect recent immigrants (barriers related to language, acculturation, and legal status). Thus, populations with higher poverty, no insurance, or underinsurance might have underestimated prevalence rates.

Racial and ethnic differences were also seen in use of the emergency room or urgent care for asthma among individuals with known asthma (see Fig. 6). African American (Emergency room or urgent care use: African American, adults 21.8%; children 29.4%; and all ages group ≥ 1 years 24.5%) and Latinos (Emergency room or urgent care use: Latino, adults 17.7%; children 22.3%; and all ages group

20.4%) of all ages with known asthma had significantly higher rates of emergency room or urgent care use for asthma than whites (Emergency room or urgent care use: White, adults 9.2%; children 11.7%; all ages ≥ 1 years 9.8%) with known asthma.

In summary, the 2007 CHIS with its more specific race/ethnicity data reveals significant disparity in asthma lifetime prevalence and/or burden, as indicated by emergency room or urgent care visits for asthma, in racial/ethnic minority groups including African-Americans, Latinos, American Indian/Alaska Natives, Native Hawaiian and other Pacific Islanders, and ≥ 2 races. Furthermore, the Hispanic/Latino subgroups of Puerto Ricans and South Americans and the Asian subgroup of Filipinos had significantly higher degrees of asthma prevalence.

For children, similar results for lifetime prevalence variation among specific race/ethnic subgroups were found in a California Healthy Kids Survey administered to California public school students from participating schools in the seventh, ninth, and eleventh grades. This study surveyed 462,147 students during the 2001/2002

Fig. 5 Lifetime asthma prevalence by Asian ethnic groups, all ages, 2007. Graphs include 95% confidence interval bars. Source: 2008 California Health Survey [23]

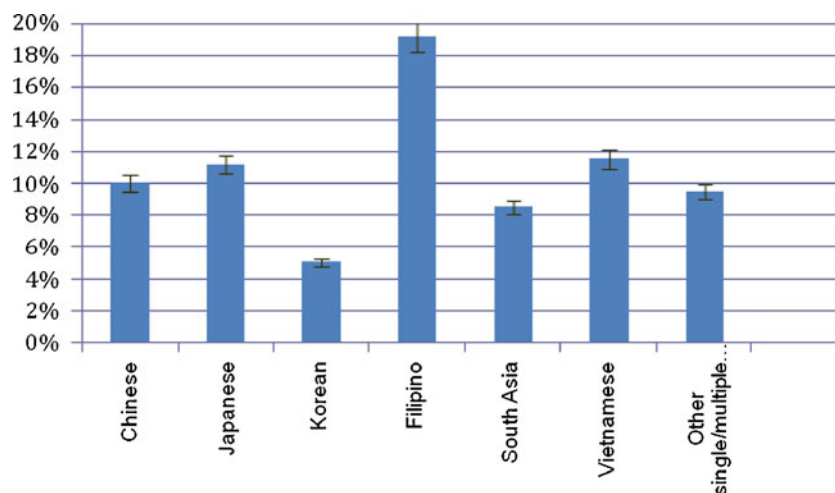
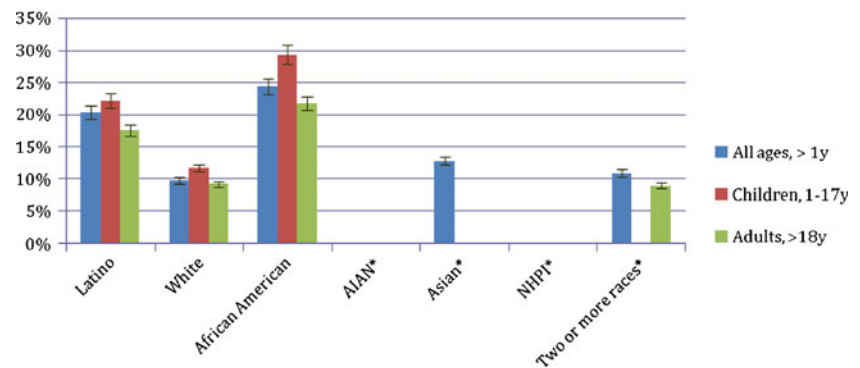


Fig. 6 Emergency room/urgent care visit for asthma within past 12 months by age groups and race/ethnicity in California, 2007. *Absent bars reflect data statistically unstable for reporting. Graphs include 95% confidence interval bars. Note: *AIAN* American Indian and Alaska Native, *NHPI* Native Hawaiian and other Pacific Islander, two or more races non-Latino. Source: 2008 California Health Survey [23]



and 2002/2003 school years. For Hispanic groups, there was a lifetime prevalence of 13.2% (95% confidence interval 12.9–13.5) for Mexican Americans, 22.8% (95% CI 20.8–24.9) for Puerto Ricans, and 23.0% (95% CI 19.7–26.4) for Cubans. The lifetime prevalence for whites, non-Hispanic, was 20.2 (95% CI 19.9–20.5) in this study. For Asian/Pacific Islander subgroups, there was a range of 10.9% (95% CI 10.0–11.8) for Koreans up to 21% (95% CI 19.2–22.8) for Pacific Islanders and 23.8% (95% CI 22.7–24.9) for Filipinos [26].

Thus, both California studies show that there is significant variation in race/ethnicity subgroups such that descriptions of asthma prevalence for “Hispanics” and “Asians” would be inaccurate for the subgroups of these racial/ethnic groups.

Factors Contributing to Racial/Ethnic Disparities in Asthma

As previously discussed, there are differences in asthma prevalence, severity, and outcomes among ethnic groups. The etiology of racial/ethnic disparities is complex and multifaceted. A study from New York State showed that hospitalization rates for asthma were highest in areas of greater poverty, unemployment, lower education, with higher proportions of blacks and Hispanics and in urban centers [27]. As many of these factors are strongly correlated, it is difficult to separate out the risk of asthma attributable to ethnicity/race. Furthermore, there are likely genetic factors playing a role, and these are discussed separately.

For many minorities, coexistent low SES affects asthma outcomes through factors including decreased or limited access to health care (e.g., lack of insurance or transportation to health care facilities), poor access to support groups, and inability to afford medications.

Low SES is an independent and important variable for poor asthma management and outcomes [27–31]. SES may be conceptualized as a chronic multidimensional state [32]. Comparing studies of SES and asthma is difficult due to

differences in indicators of SES, asthma diagnosis, health-care access, and lower response rates among impoverished and minority populations across studies [29, 32, 34, 35]. A few studies have suggested that SES differences might account for most, if not all, of the racial/ethnic associated differences in asthma. For example, Weitzman et al. evaluated data from the 1981 NHIS and found that the increased prevalence of asthma in black children and poor children was accounted for by a variety of social and environmental characteristics such as maternal smoking, low birth weight, large family, smaller home size, and young maternal age [35]. In a cross-sectional analysis in Boston, income, area of residence, and level of education accounted for a large proportion of the increased prevalence for blacks and Hispanics, though the numbers of Hispanics was small in this study [36].

On the other hand, other studies have shown differences in asthma prevalence across ethnic groups after accounting for SES. In addition, other studies have shown that higher SES status may be a risk factor for asthma.

Studies within and outside the USA have still shown increased asthma morbidity (severe symptoms, suboptimal asthma care, increased emergency department (ED) use, and increased hospitalization) in black and Hispanic children [28, 29, 31–33, 37]. The NHIS in the USA attempted to analyze the independent and joint effects of race/ethnicity and SES on asthma prevalence. The difference in asthma prevalence between non-Hispanic black children and non-Hispanic white children was only significant among the very poorest families, suggesting that social and environmental issues play an important role, as genetic effects should be seen across all income levels [39].

US national data from 1991 to 1996 show that SES and race/ethnicity exert independent effects on asthma mortality. Asthma mortality rates among blacks in the highest income quintile were nearly 400% greater, 1.29 vs. 0.26/100,000, and almost 200% greater in the lowest income quintile, 1.52 vs. 0.51/100,000, compared with whites aged 5–34 years [30]. In addition to increased mortality, epidemiologic data indicate that, after correction for

socioeconomic and environmental factors, racial/ethnic differences still remain for asthma hospitalizations [38].

Compared with non-Latino whites, other racial/ethnic groups have lower rates of employment-based insurance and higher uninsured rates. Latinos have the highest uninsured rates. Low education and income as well as lack of citizenship are significant contributing factors for Latinos. Almost one in four non-elderly African Americans is not insured, and there is a lot of variability in insurance (as well as education, income, and immigration status) among other ethnic groups. Thus, many minorities lack health insurance, which contributes to the disparity in health status [39].

Another effect of low SES is inadequate medical care, including under- or improper diagnosis, inadequate recognition of asthma severity, and under prescription of controller medications (discussed below). In addition to SES, other potential risk factors for asthma disparities include allergy, environmental exposures and air pollution, obesity, low birth weight, prematurity, increased upper respiratory tract infections for those living in poverty, smoking rates, and stress or psychosocial co-morbidities.

Environmental exposures are highly likely to contribute to asthma disparities. Both birthplace and duration of residency in the USA have been associated with increased asthma prevalence in Mexican-American adults, indirectly implicating potential environmental risk factors, particularly in early life [41]. Similar findings have been reported for Mexican-American children [42, 43]. Racial/ethnic differences in allergic diseases such as atopic asthma have been found for both children and adults. In the USA, compared with white adults, Asians had an increased risk of atopic conditions (e.g., asthma with hay fever) and blacks had an increased risk of non-atopic asthma. More specifically, Asians born in the USA had a higher risk of allergic conditions than those born outside the USA [44]. Similar findings for Asians have been reported in the UK and Australia [45, 46]. Thus, non-genetic conditions such as social and/or environmental factors and possibly acculturation may be important in determining risk of asthma and atopy in immigrants.

Among children in the Third National Health and Nutrition Survey (NHANES III), Mexican Americans and African Americans were more likely to be sensitized to cockroach and dust mite than whites [47]. Increased risk of sensitization to cockroach and dust mite allergen has also been shown in Puerto Ricans living in the USA [48]. These findings suggest that there may be ethnic/racial differences in susceptibility to allergen sensitization. These differences in allergen sensitization may partly explain ethnic/racial disparities in asthma morbidity, as certain allergies (e.g., to cockroach) have been associated with increased disease severity [49].

Other potential environmental risk factors include air pollution, exposure to tobacco smoke (ETS), diet, and stress. Smoking is more common among people of lower SES and varies significantly across ethnic groups [50]. ETS is a known risk factor for childhood asthma, and thus, differing rates of smoking among ethnic groups may contribute to asthma disparities [51]. The effects of outdoor population on different racial/ethnic groups have been less well studied; however, non-whites are more likely to live in areas of elevated air pollution [52].

Obesity has been associated with asthma in several populations, and this link could be due to many factors including diet, exercise, genetics, and SES [53–55]. Blacks and Hispanics have been shown to have higher rates of overweight among children with asthma [56]. Closely linked to obesity is diet, which in turn is also closely linked with SES. Consuming a “Mediterranean diet” was associated with a lower prevalence of wheeze and asthma ever in a recent publication from the ISAAC study [57]. Fast food consumption has also been associated with asthma and bronchial hyperresponsiveness [58, 59]. Vitamin D deficiency, which is more common in African Americans, has been recently associated with increased asthma morbidity [60].

Furthermore, among families living in poverty, there are increased rates of depression, mood and anxiety disorders, stress from exposure to crime and violence, and illicit drug use [61, 62]. Maternal stress in early life, independent of low SES, has been associated with increased risk of childhood asthma [63]. Among Puerto Rican children, physical or sexual abuse was associated with asthma morbidity [64]. Mental health problems of caretakers and children have been associated with increased asthma hospitalizations and symptoms [65].

Underutilization of inhaled corticosteroids is common in racial/ethnic minorities. A prospective ED study, the Multicenter Airway Research Collaboration (MARC), found that inadequate prescription of inhaled steroids for members of ethnic minorities was prevalent among ED physicians, who often provide asthma care for these patients. The explanation for this pattern is unclear but might relate to unfamiliarity with controller medications and/or perceptions of cost [32]. Similar racial/ethnic differences in ED discharge prescriptions are seen among adults [28, 66]. This difference in anti-inflammatory prescriptions filled by minority populations is larger among those who have not received specialist care [67].

A discrepancy in controller/preventative asthma medication use across ethnic groups has been shown outside of the ED [33, 68–70]. In general, rates of long-term controller medication use for persistent asthma in children are lower than what is recommended by current guidelines. Having Spanish-speaking parents, African-American ethnicity, and

lack of health insurance have been associated with reduced use of controller medications [68]. Among children enrolled in different health plans across three US states, blacks and Latinos had lower use of preventative asthma medications than whites, even after adjusting for asthma severity and indicators of SES. Since financial access to health care (including prescription coverage) was adequate, this suggests non-financial barriers to use of preventive therapy exist for minorities [33]. In the National Asthma Survey, Hispanic and black children were less likely to be on controller medications, and blacks had significantly higher use of daily beta-agonist use and health-care utilization despite adjusting for symptom severity, household income, and other potential confounders (gender, age, BMI, tobacco smoke exposure, and family history). These results and other findings suggest that symptoms alone may under represent asthma control in certain minorities, in contrast to other measures of disease control such as beta-agonist use and ED visits [71].

Closely related to discrepancies in the use of controller medication are racial/ethnic disparities in medical care. The National Survey of Children's Health showed that having no usual source of medical care was a barrier to healthcare access in Latinos, African Americans, and Native Americans. Whereas lack of insurance was a common problem in Latinos and Native Americans, this was not the case in African Americans [72]. Minority populations are more likely to use the ED as the primary site of care for their asthma, likely because of factors including type of health insurance, marital status, asthma severity, and lack of access to primary care medical home [73–77]. This may result in inadequate overall asthma care because ED facilities are less likely to focus on chronic disease management, including asthma action plans and disease-specific education [78]. White children are more likely to have asthma action plans than black or Hispanic children, leading to under-utilization of controller medications [79]. This is thought to be due to language barriers and/or SES. Interventions enhancing literacy and asthma self-management skills of minority children have been shown to improve asthma outcomes [80].

Another explanation for lower rates of inhaled steroids use among African Americans is that physicians underestimate disease severity and thus under-treat members of this ethnic group [81]. Individual patients' perceptions and parental perceptions and expectations of their child's asthma, as well as belief in the benefits and fear of adverse effects of inhaled corticosteroids play an important role adherence to medications [82, 83]. Despite these potentially modifiable barriers, adherence in a study on adults with asthma was primarily affected by immutable factors such as income, education, having commercial insurance, and recent symptoms [84].

In summary, current evidence suggests that increasing the use of preventive medications in minority populations could help reduce racial/ethnic disparities in asthma. Indeed, studies have indicated that asthma status and severity had no difference in measurements of quality of life in young urban children, indicating that other factors, such as the social and emotional milieu, are also important in understanding the adaptation and functioning to a chronic disease such as asthma within the context of low SES [85]. Thus, a number of co-existing factors further affect and complicate the burden of asthma in racial/ethnic minorities [29].

Intervention Strategies

While there are many studies on the impact of culture-specific asthma education programs on asthma-related outcomes in minorities, few have been clinical trials. A Cochrane review of four trials showed greater effect of culture-specific programs compared with usual or generic programs in improving asthma knowledge in children and caregivers, asthma control in children, self-reported asthma related quality of life in adults, and reducing asthma exacerbations of ED visits and hospitalizations in children [86].

A different Cochrane review evaluated the effectiveness of an indigenous health care worker targeted for their own indigenous adults and children to improve asthma outcomes. Two small randomized, controlled trials showed benefit in several outcomes, including asthma knowledge in parents and children, parents' asthma skills score, and days of school loss. However, no differences were noted in asthma exacerbations. As noted by the authors, this area should be subject to further randomized controlled trials [87].

Inhabitants of inner cities in the USA are more likely to be poor and of minority race/ethnicity groups with greater asthma morbidity and mortality. This has been a focus of the National Institute of Allergy and Infectious Diseases, which has been funding initiatives focusing on inner-city asthma [88, 89].

As a result of the environmental exposures in urban settings, inner city inhabitants with asthma are exposed to multiple indoor allergens (e.g., cockroach, rodents) and irritants such as environmental tobacco smoke. Most inner city children with moderate to severe asthma are sensitized to multiple indoor allergens. The Inner-City Asthma Study Group evaluated a multi-faceted, home-based, environmental 1-year intervention for urban children with asthma. The intervention was individualized and comprehensive. A successful reduction in allergen burden was achieved, which included an approach based on social learning theory. This reduction was remarkable, in contrast to

previous studies, which often targeted only one allergen or environmental factor such as cockroach or tobacco smoke. The success of this study's approach emphasizes the importance of the intervention strategy, especially in such a high-risk population.

Moreover, the reductions achieved were associated with reduced asthma morbidity. Continued improvement, compared with the control group, was noted in days of symptoms and caretaker sleep loss in the follow-up year after intervention [90].

Thus, environmental risk factor reduction can be a successful strategy to reduce asthma complications in high-risk, inner-city patients, who are mostly minorities, with asthma. In addition, the National Cooperative Inner-City Asthma Study multifaceted intervention program has been analyzed to be cost-effective when compared with usual care [91].

Other intervention strategies and models have been evaluated in inner-city populations including an individualized approach with an asthma counselor, school-based programs (e.g., the Breathmobile™ program), patient and family asthma education (including addressing patient and family beliefs, attitudes, and behaviors), comprehensive healthcare provider education programs, community-based social networking and education, a citywide asthma management program, enhanced access to specialty care, and structured transition from acute care to outpatient care [29]. In addition, a recent systematic Expert Panel 3 guidelines-based approach was noted to improve asthma control in adolescents and young adults [92].

On the other hand, an evaluation of a more general program of community health centers in the USA participating in quality-improvement collaboratives, The Health Disparities Collaboratives sponsored by the Health Resources and Services Administration, did not find improvement in urgent care or hospitalizations for asthma, though greater increase in use of asthma anti-inflammatory medications was noted [93]. This study evaluated diabetes and hypertension outcomes, in addition to asthma. Many patients from racial/ethnic minority groups and uninsured patients receive care in these centers.

In addition to community centers, another health care intervention approach has been with improving access for children with the SCHIP. Improvement in access, continuity, and quality of care with increased use of primary care in those receiving SCHIP has been demonstrated [94].

General strategies for quality improvement of health care quality for racial/ethnic minorities have been reviewed. Many of these strategies have focused on improving provision of preventive services through techniques including multifaceted approaches (e.g., using culturally and linguistically competent nurses or community health promoters to provide

direct preventive services and educating providers). Variable outcomes were noted, with the best evidence noted for a provider reminder/tracking system [95]. Additional strategies have included use of incentives approaches, including pay-for-performance and awards programs [96].

Community-based interventions to affect behavior changes and improved asthma management as well as improved education have been successful in reaching high-risk, low-income minority populations and affecting asthma management with potential reduction in acute care rates in more active participants. However, these outcomes have been noted in relatively small numbers of patients in controlled trials. Whether these changes can be incorporated and sustained within inner city health-care delivery systems in a cost-effective manner will be a challenge.

Because of the complexity of factors affecting asthma outcomes in minorities, comprehensive, multi-faceted intervention strategies will be needed to reduce asthma disparities. This will involve addressing (1) access to care; (2) adherence to asthma guidelines, including increased use of controller medications and asthma action plans, and practice policies; (3) health provider/clinician factors such as bias/stereotyping and cultural competence; and (4) individual/family factors such as health beliefs, adherence with therapy, and health literacy; and (5) social/environmental factors such as allergen burden, environmental pollutants and environmental tobacco smoke, stress/violence, and depression. A framework of asthma disparities model with implications for research and clinical practice has been proposed [97] (see Fig. 7).

Genetics

Genetic variation, alone or interacting with environmental exposures, is highly likely to contribute to ethnic disparities in asthma. Asthma is a complex and heterogeneous disease with estimates of heritability from twin studies between 36% and 79% [98]. Although there has been a recent explosion in the number of studies of asthma genetics (including genome-wide association studies), relatively few of these studies have been conducted purely in ethnic minorities.

Research by the Collaborative Study for the Genetics of Asthma showed differences in candidate genomic regions for asthma among ethnic groups but did not confidently identify asthma-susceptibility loci in any of the participating ethnic groups [99–104].

Several other studies have been recently conducted among African Americans, Mexican Americans, and Hispanics from Costa Rica. A recent genome-wide association study (GWAS) in two independent population of African ancestry from the USA and Barbados found three genes to be significantly associated with asthma: α -1B-

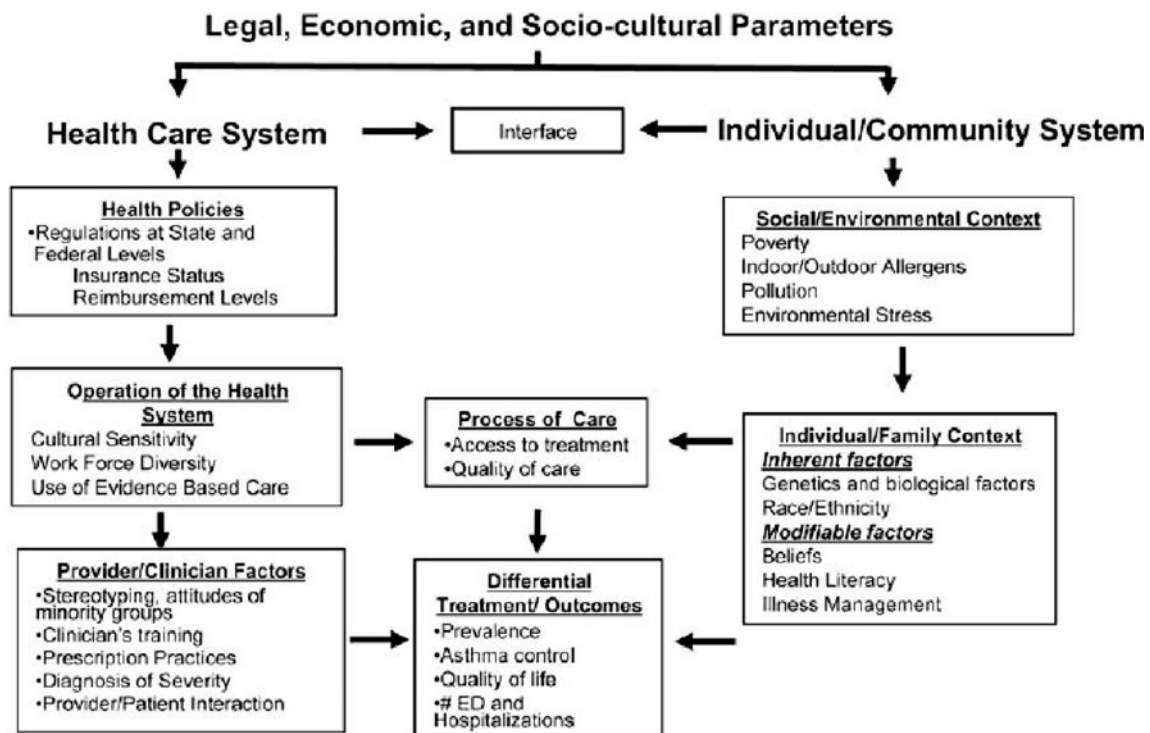


Fig. 7 Model of framework of asthma disparities (reproduced from [97] with permission from Elsevier Ltd)

adrenergic receptor on chromosome 5q33, prion-related protein in chromosome 20p12 and dipeptidyl peptidase 10 (DPP10) on chromosome 2q12-14. However, these results could not be replicated in either case-control populations of African Americans or Europeans [105]. A GWAS conducted in nuclear families of children with asthma in Mexico identified a candidate chromosomal region (9q21.31) but no specific asthma-susceptibility gene [106]. In that study, the candidate genes most significantly associated with asthma include transforming growth factor β , IL-1 receptor-like 1, IL-18 receptor 1, and DPP10 [107]. An association between a gene initially identified in subjects of European descent (*ORMDL3*) [108] and asthma has been replicated in African Americans, Mexicans, and Puerto Ricans [109, 110]. Table 10 summarizes findings from additional candidate-gene studies of asthma genetics in ethnic minorities.

Several centers from ISAAC participated in a candidate-gene study of asthma. Significant associations were noted between current wheeze and variants in the genes for the interleukin 4 receptor α chain, Toll-like receptor 4, FC ϵ receptor 1 β (MS4A2), and Toll-like receptor 9 with odds ratios generally <1.3. Although there was no significant heterogeneity across countries, no information was available on ethnicity [111].

Genetic variation in treatment responses may partly explain ethnic disparities in asthma. For example, blacks have diminished T-lymphocyte response to glucocorticoids

[112], and Puerto Ricans may be less responsive to albuterol than Mexicans [113]. A recent study among Latinos and African Americans found a gene-by-gene interaction between IL-6 and IL-6R that resulted in increased bronchodilator responsiveness (BDR) in Latinos but decreased BDR in African American [114, 115]. Additionally, a study in Koreans found a significant association between response to leukotrienes and IL-13 polymorphisms in children with asthma [116]. Thus, genetic polymorphisms in drug receptors may help explain phenotypic differences in asthma variability among different racial/ethnic populations [117].

Despite the significant advances in asthma genetics over the past decade, questions remain regarding the degree of heterogeneity, gene-gene interactions, and gene-environment interactions for different race/ethnic groups.

Culturally Competent Care

Many racial/ethnic minority populations face unique health care barriers in addition to those imposed by low SES, including language and communication challenges, different customs, taboos, folk beliefs, and religious concepts. To help overcome these barriers, health care delivery systems and providers need to avoid medical ethnocentrism and develop awareness, under-

Table 10 Candidate gene studies for asthma and associated phenotypes by ethnicity

Study	Ethnicity	Trait	Gene	Results
Howard [118]	African American Hispanic	Asthma	ADAM33	Weak association with 1 SNP in each population, although different SNPs
Raby [119]	African American Hispanics	Asthma AHR FEV1	ADAM33	No significant associations of 17 SNPs in either group
Lind [120]	Hispanic Puerto Rican and Mexican	Asthma	ADAM 33	No association
Su [121]	Asians Chinese	Asthma	ADAM 33	Three SNPs associated with asthma
Lee [122]	Asians Koreans	Asthma	ADAM33	No association
Choudhry [113]	Hispanic Mexican Puerto Rican	Bronchodilator response FEV1 Bronchodilator response	ADBR2	+79 G/C(GLu27Gln) positive association −654 A/G and +46 A/G (Arg16Gly) positive association
Santillan [123]	Hispanics Mexicans	Asthma	ADBR2	Inverse relationship between Glu27 and haplotype (Gly16Glu27) and asthma
Burchard [124]	African American	FEV1	IL4 promoter	No association in African Americans but C-589 T associated with low FEV ₁ in whites
Ober [125]	African American Hispanic	Asthma	IL4 receptor α	One SNP significantly associated with asthma in Hispanics
Basehore [126]	Hispanic African American	Asthma	IL4	One SNP with borderline association with asthma in Hispanics One haplotype associated with asthma in African Americans
Oguma [127]	African American	Asthma	PTGDR promoter	One SNP weakly associated with asthma Haplotypes with low transcriptional efficiency of PTGDR inversely associated with asthma
Raby [128]	African American Hispanic	Asthma	TLR-4	No association
Lazarus [129]	African American	Asthma	TLR-9	No association
Barnes [130]	African Caribbean	Asthma	Acyloxyacyl hydroxylase	SNPs and haplotypes associated with increased risk for asthma
Wu [107]	Hispanics Mexicans	Asthma	TGFB1 IL1RL1 DPP10 IL18R1	SNPs on each gene associated with childhood asthma
Via [131]	Hispanic Mexican Puerto Rican	Asthma Asthma	LTA4H ALOX5AP	One SNP significantly protective for asthma One SNP protective against asthma but associated with lower FEV1
Sharma [132]	Hispanic Costa Rican	AHR Asthma exacerbations	TGFB1	rs2241712 and rs1800469 associated with $\uparrow$ AHR rs1982073 associated with $\downarrow$ asthma exacerbations Effects modified by dust mite exposure.
Pistiner [133]	Hispanics Costa Rican	Asthma	IL12A	No significant association
Hunninghake [134]	Hispanic Costa Rican	Asthma exacerbations	IL10	Three SNPs associated with $\uparrow$ exacerbations in children exposed to high levels of dust mite allergen
Hersh [135]	Hispanic			

Table 10 (continued)

Study	Ethnicity	Trait	Gene	Results
Hunninghake [136]	Costa Rican	Asthma	Neuropeptide S receptor 1 (NPSR1 or GPR154)	Three SNPs associated with asthma in Costa Rican children and replicated in CAMP but with opposite allele
		AHR(PC20/PD20)		One SNP associated with ↑ AHR in both cohorts
	Hispanic			
	Costa Rican	Asthma exacerbations	IL13	No significant associations with asthma or exacerbations
		AHR		One SNP associated with ↓ AHR

AHR airways responsiveness, *FEV1* forced expiratory volume in 1 s, *CAMP* childhood asthma management program, *ADBR2* β-2 adrenergic receptor, *GPR154* G protein coupled receptor, *TGFB1* transforming growth factor beta-1, *ADAM33* disintegrin and metalloproteinase domain-containing protein33, *PTGDR* protanoid DP receptor, *LTA4H* leukotriene A4 hydroxylase, *ALOX5AP* arachidonate 5-lipoxygenase-activating protein

standing, and acceptance of racial and ethnic differences in order to be more effective health care providers for diverse populations.

These issues have been acknowledged in the NHLBI Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, with a section on “Racial and Ethnic Disparity in Asthma” [137].

Poor patient/provider communication may lead to disease underestimation and therefore inadequate treatment and poor clinical outcomes. Potential factors in poor communication may include patient health literacy, health beliefs, adherence, physician’s expectations, bias and stereotyping, concordance/discordance in provider/patient race, communication skills and styles, and type of health-care system [138].

Appropriate and sensitive attitudes, behaviors, and policies are vital for effective, cross-culturally appropriate, and effective health care delivery. Some examples of asthma-specific culturally competent care will be mentioned. Further details are available in the review by George [139] and the section enclosed within this review listing selected books on culturally competent care.

An example of health care barrier is communication not only because of language but also the specific expressions used for the condition being assessed. For example, the language and perception of and response to breathlessness and its management vary among racial/ethnic groups (see [Appendix](#)). In a study evaluating description of airway obstruction by induced bronchoconstriction, African-Americans reported symptoms of breathing discomfort with upper airway descriptors. A Puerto Rican relative might be noted to fan or blow on a patient in the belief of providing oxygen or relief of dyspnea. Having a clear, understandable, and culturally sensitive dialog between patient and health care provider is required for more effective symptom assessment, monitoring, and

management [140] (see also Lipson JG & Dibble SL in selected books).

Many cultures use medicinal teas and herb supplements. Awareness and asking about these may elicit information about different patients’ beliefs. This may lead to a better acceptance and understanding of the role of prescription medications. In addition, effective communication may elicit information on potentially harmful therapies being used, such as use of ginseng, which can cause bronchoconstriction, or royal jelly (bee saliva and pollen), which can lead to anaphylaxis in bee allergic patients.

Awareness of religious beliefs, such as possible abstinence of oral and inhaled medications during the fasting month of Ramadan for Muslims, may help the provider and patient arrive at a more effective, alternative treatment program.

In addition, there are a number of cultural beliefs regarding body function, such as the “hot–cold” theory of health and disease and the “cleansing model” of body function (in which sputum production, coughing, sneezing, and rhinorrhea act as natural cleansing mechanisms). Consequently, believers would feel that agents that might decrease mucus drainage such as topical corticosteroids and antihistamines might be counterproductive.

Asians, Islamic, East Asians, and Latinos perceive asthma as a “cold” disease. Puerto Rican mothers have been reported to dress their children and heat their homes warmly as an attempt to treat this “cold” disease. In addition, other home-based remedies commonly used in Puerto Rican communities for asthma exacerbations might include rubbing the chest and back, use of Vicks VapoRub or alcanfor (camphor rubs), having the child rest and kept calm, the administration of fluids, and prayer. Awareness of the belief in this humoral, “hot–cold”, theory may then help the provider to avoid use of an inhaler with a

“cold” blue casing and prescribe one with a “warm” orange casing instead [141]. Sensitivity to the issues of alternative health viewpoints should improve understanding, communication, and allow for a more culturally consistent and acceptable medical care plan.

Systematic reviews of the effectiveness of cultural competence training interventions designed to improve the quality of healthcare in racial or ethnic minorities have shown evidence that such interventions are effective [142]. A prospective cohort study of childhood asthma in five health plans revealed that certain policies could predict higher quality of care (e.g., decreased under prescription of preventive medication, parental ratings of care) for children with asthma in managed Medicaid. The policies included promotions of cultural competence, asthma reports to clinicians, and access and continuity. Cultural competence policies evaluated in this study included recruitment of ethnically diverse or bilingual nurses and providers, attempts to minimize cultural barriers through printed materials, provision of cross-cultural or diversity training, and training in communication skills. In addition, communication-related practices such as access to interpreters and low-literacy health education materials were also assessed [143].

Thus, culturally competent strategies can be effective in helping to reduce the disparity in asthma health care and outcomes in racial/ethnic minorities. These strategies must include improvement over barriers to effective communication, understanding and acceptance of patients’ health beliefs, and more effective approaches to improvement in treatment adherence.

Conclusions

There are disparities in health and health care of minorities. The Institute of Medicine consensus report, “Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care” found a large body of evidence for disparities in the quality of health services, such as routine medical procedures, by race, even when insurance status, income, age, and severity of conditions are comparable [144].

The reasons for racial/ethnic differences in increased asthma morbidity and mortality are complex and include factors related to SES such as limited access to medical care, inadequate care, co-morbid conditions, inadequate asthma education, low level of literacy, lack of social support, increased environmental triggers, poor living conditions, and psychosocial dysfunction. In addition, asthma disparities may partly be explained by variation in genetic determinants and gene–environment interactions as well as by language and cultural differences across racial/ethnic groups.

Asthma disparities have significant direct and indirect economic as well as societal costs and represent an important challenge. Research on the effects of specific genotypes, gene–environment interactions, environmental exposures, health care quality improvement, symptom perception and adherence, response to therapy, and culturally competent care should lead to better understanding and treatment for different racial/ethnic minority groups. Understanding the reasons for these disparities may and should lead to more specific recommendations for improved prevention, disease modification, greater specificity in treatment with pharmacogenetics, and improved management of all persons with asthma.

A comprehensive approach by government, researchers, health care providers and organizations, pharmaceutical companies, community and racial/ethnic organizations, and patients will be necessary in order to overcome the disproportional burden of asthma. Improved health care access, culturally appropriate communication and interventions, adequate education and empowerment, and improvement of living conditions within the context of a supportive community environment can reduce current asthma disparities.

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Appendix

Dyspnea: Description and symptom management in different racial/ethnic groups

- **Afghans:** Women may experience dyspnea in a panic or anxiety attack. Persons with dyspnea tend to report it immediately, fearing they are dying. Most can use a numerical scale for dyspnea, but elderly might use words such as “my heart is about to stop” or “I have difficulty breathing.” They want immediate oxygen and medications. As with pain, prayer and listening to the Koran are useful.
- **African-Americans:** Descriptors—tight throat, scared—agitated, voice tight, itchy throat, tough breath; “Difficulty catching breath”; acceptance of oxygen and/or opiates to control dyspnea if explained (fear of addiction is strong).
- **American Indians/Alaskan natives:** Lungs are associated with freedom, so tightness of breath may be construed as a hindrance. Wide use of oxygen to alleviate symptoms, especially among elders.

- Arabs: (*deekat nafas*) Panic accompanies feeling of not being unable to breathe. Tend to hyperventilate. Need careful coaching about meaning of oxygenation, associated with severity and urgency of situation. May be unable to translate dyspnea discomfort into numbers. Prefer medications to control dyspnea, believing they are the best method. Clinician needs to rehearse oxygenation, including timing and length of use.
- Brazilians: (*falta de ar*—lack of air) Attributed to both emotional and physical causes. Generally accept oxygen, although its use may suggest increase in gravity of illness.
- Cambodians (Khmer): (*pibak dok dong hoem*) Become anxious if cannot breathe. Some Khmer have died from sudden, unexpected nocturnal death syndrome, characterized by an inability to breathe plus cardiac symptoms. They describe dyspnea as no air to breathe or shortness of breath. Will use inhaler and oral medications.
- Central Americans: (*corto de respiracion*) Anxious when dyspneic. View the use of oxygen or other “high tech” interventions viewed as sign of increasing gravity of illness. Very commonly apply Vicks VapoRub™ to help improve breathing.
- Chinese: Too much Yin or a stressful event can cause it. Patients readily accept oxygen. Some patients treat it by eating hot soup/broths and wearing warm clothes.
- Columbians: Express “being without air” or “unable to breathe” as “*quedarse sin aire*” or “*no poder respirar*”. Patient/relatives may be very anxious. Expect and accept oxygen when this occurs; may accept other medications if need for them is explained. Non-pharmacological approaches, such as prayer or relaxation techniques, acceptable.
- Cubans: (*corto de aire*, or “short of breath”) May express fear and anxiety by becoming very verbal or crying, by a great show of emotions. Readily accept oxygen. Useful for clinician to suggest non-pharmacological control methods.
- Dominicans: (*falta de respiro*) If a person thinks something seriously wrong, he/she will go to physician and accept treatment, including oxygen. Sometimes, family members pour cold water over his/her head. Family may take the person outside for fresh air to see if this improves the breathing problem.
- East Indians (*san ukhrna* and *swasan muttal* [breathlessness]). May become very anxious and frightened, and hyperventilate; consider dyspnea a sign of death. Accept oxygen without hesitation. Some use home remedies such as licorice and ginger tea.
- Ethiopians and Eritreans: Will hyperventilate and panic. Family members also panic and hover over the sick person. Will use oxygen, but need reassurance as they associate oxygen and other major intervention with grave disease. Clinician should explain necessity of oxygen to family members because their panic increases patient’s anxiety level.
- Filipinos: (*mahirap huminga* or *hindi makahinga*—“hard to breathe” or “cannot breathe”) Clinician may need to explain use of numbers to describe level of dyspnea. Patient may be anxious about using oxygen because it implies more serious illness. May be receptive to relaxation techniques to ease symptoms.
- Germans: (*Atemnot*) May get anxious. Use of, and response to, non-pharmacological treatments vary.
- Greeks: (*duspnoia*) Manage symptoms same way as the dominant culture does. Use words better than numerical scale to describe activity limitations. Likely to accept opiates for dyspnea because they believe that opiates cure it. May use prayer as a non-pharmacological treatment.
- Haitians: A primary respiratory ailment is *oppression*. Haitians use this term to describe asthma, but it includes more than that. Also seems to describe a state of anxiety and hyperventilation. Consider *oppression* (like many respiratory conditions) a “cold” state. Patient says “I am suffocating” (*M ap toufe*) or “I can’t breathe” (*Mwen pa ka respire*). Clinician should offer oxygen only when absolutely necessary, as Haitians associate it with serious disease.
- Hawaiians: (*ka’apa ka hanu I ka houpou*, or “pant for breath”) Believe that dyspnea or severe shortness of breath may be caused by someone stealing their breath (i.e., their life force or spirit). Patients may not report dyspnea; health care providers should look for respiratory distress. Patients may use words and/or number ratings to express dyspnea. Clinician can offer oxygen after explaining its purpose and the potential outcome. Patients may accept medication if they cannot “catch their breath.” Hawaiians encourage no-pharmacological treatments, such as relaxation, prayer, and meditation.
- Hmong: (*txog txog siav*) May describe shortness of breath as “tired” or “difficulty breathing”. Incidence of asthma increasing among adults and children. Patients infected with human lung fluke (*paragonimus*) or exposed to biological/chemical warfare may have lung disease. Instead of using numerical scale, clinician should ask patient if dyspnea is mild, moderate, or severe.
- Iranians: (*tange-nafas* or *nafas-tange*—“tight breath”) May overtly show signs of anxiety. Readily accept medication and oxygen to control dyspnea and to relieve accompanying fear. Clinician should reassure patient and family that dyspnea can be controlled to a degree. Should also suggest relaxation exercises.
- Irish: Commonly describe dyspnea as shortness of breath or an uncomfortable awareness of breathing. Traditional home remedies include herbs such as

angelica, coltsfoot, horehound, and thyme, all of which are expectorants. The Irish add licorice tincture to tea to dilate the bronchi and break up phlegm.

- Italians: (*manca il respiro, non posso respirare, or manca il fiato*) May equate difficulty breathing or need for oxygen with dying. In most cases, readily accept oxygen but may fear artificial means of respiration. Clinician should reassure patient and family, and educate them about the need for, and use of, respiratory treatment.
- Japanese: (*iki-gurushii* or *iki-ga-dekinai* means “cannot breathe”) Will accept oxygen. Less likely to accept or use narcotic medication.
- Koreans: (*soomi-chap-nida* means shortness of breath or dyspnea) Frightening for Koreans; perceive shortness of breath or dyspnea as a sign of serious disease. May not welcome oxygen, fearing that they have progressive disease or that their condition is worsening.
- Mexicans: (*Me falta la respiracion* means “I lack breath”; *No pueda respirar* means “I cannot breathe”) May fear being short of breath, interpreting it as a sign of imminent death. Words may be easier than numbers to describe the degree and intensity of dyspnea, but this depends on the patient’s level of education and comprehension. May interpret use of oxygen as a bad sign. May readily accept oxygen and medications to calm or relieve dyspnea if these are explained. Reassurance and emotional support allay fears of suffocation and death.
- Nigerians: Sometimes families contribute to patient’s hyperventilation and panic by hovering over him/her. Creating calm and providing assurance are key to reducing anxiety. May accept medications.
- Pakistanis: (*sans ukhrna*, or breathlessness) May get very anxious and hyperventilate. Accept oxygen if explained. Clinician should explain approach patient calmly. Some Pakistanis may use home remedies, such as ginger and herbal teas. Some patients prefer to keep themselves warm with extra clothing to avoid getting cold, as Pakistanis consider dyspnea to be a “cold” disease. For patient’s comfort, family caregiver usually recites Koran or reads special prayers from it.
- Polish: (*trudno oddychac*’, pronounced trud-no o-de-hach) After immigrating, Poles often worked in large industrial settings. Air pollution and respiratory problems common, exacerbated by high incidence of cigarette smoking. Believe that respiratory problems are due to inadequate air or poor ventilation and that breathing fresh air in the sun helps alleviate them. Older patients seek medical help only when other methods do not work. May seek care or express dyspnea only when severe. Accept oxygen and other physician recommended remedies. Treatment in Poland often included visits to spas. For example, at Tezniowy Park in Ciechocinek, built in 1824, windmills pump mineral water into an extensive, elevated system of twigs that release a vapor believed to heal respiratory ailments. Poles also may breathe vapors prepared from steamed herbs, but this practice is less common in USA.
- Puerto Ricans: (*asfixiao*, or shortness of breath) Believe that fanning or blowing into a patient provides oxygen or relieves dyspnea. Also believe that tea made from alligator’s tail, snails, or a plant leaf (*savila*) improves or heals dyspnea-related illnesses such as asthma and congestive heart failure. Some apply hot, wet compress and/or Metholatum™ to reduce dyspnea.
- (Roma) Gypsies: Prone to excitement and hyperventilation. Usually accept oxygen but generally fear anesthesia, which Roma refer to as “little death”. May mistake oxygen mask for administration of anesthesia.
- Russians: (*odish’ka*) (dyspnea) Non-English speakers grasp chest and moan to express dyspnea. Most use words instead of numbers to describe level. Prefer pharmacological methods to relaxation techniques. May get more anxious because of language barrier. Accept oxygen.
- Samoans: (*faigata le manava*, pronounced faye-gah-TAH leh mah-NAH-vah, means trouble with breathing; *sela*, pronounced SAY-lah, means shortness of breath). It is okay to administer oxygen after explaining the procedure. Shortness of breath may cause anxiety. If clinician knows the primary cause of dyspnea, he/she should explain it and the treatment to the patient. Prayer, massage, or presence of intimates may help reduce patient’s anxiety.
- Vietnamese: (*khó tho*—means difficulty breathing). Family more likely than patient to report dyspnea. May understand numerical scale but using it might be difficult as patient becomes anxious and begins hyperventilating. Accept oxygen. Reassuring words are helpful.
- West Indians/Caribbeans: Viewed as serious medical condition, generally associated with asthma. Seek conventional medical help. Accept oxygen and opioids to control dyspnea and, if asked, will express their breathing discomfort, using words to describe discomfort level.
- (Former) Yugoslavians: (*otežano disanje*) Consider dyspnea a very serious condition that requires immediate reporting, especially in a child. Describe it, as “I cannot breathe or “I’m going to die”. Seek immediate medical attention on the assumption that it is a heart attack. Accept oxygen and any medication. Need strong assurance that dyspnea can be controlled to a certain degree.

(Adapted from Lipson & Dibble with permission from UCSF Nursing Press)

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- Lipson JG, Dibble SL. Culture & Clinical Care. San Francisco: UCSF Nursing Press; 2005
- Purnell LD, Paulanka BJ, Eds. Transcultural health care. A culturally competent approach. 3rd Ed. Philadelphia: FA Davis Company; 2008
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- <http://minorityhealth.hhs.gov/templates/browse.aspx?lvl=3&lvlid=533> \US Department of Public Health, Office of Minority Health (OMH) link to “Asthma Data/Statistics” for African-Americans, American Indians/Alaska Natives, Asian-Americans, Hispanic Americans, and Native Hawaiians/Pacific Islanders. This site also has additional information and resources on cultural competency from OMH. The Office of Minority Health, part of the U.S. Department of Health and Human Resources, mission is “to improve and protect the health of racial and ethnic minorities through the development of health policies and programs to eliminate health disparities”
- <http://www.medlineplus.gov/esp/> MEDLINE plus: NIH’s National Library of Medicine (NLM) offers MEDLINE plus, the Spanish-language companion health Web site to NLM’s MEDLINE, which provides authoritative, full-text medical resources
- <http://www.cdc.gov/asthma/>
- <http://www.cdc.gov/spanish/enfermedades/asma.html> Center for Disease Control and Prevention Asthma Website and hyperlink in Spanish to extensive resources on asthma
- <http://www.healthfinder.gov/espanol/> Healthfinder en Español: This Spanish-language Web site helps consumers access reliable information quickly and easily on the Internet
- <http://www.mhcs.health.nsw.gov.au/topics/Asthma.html> This is the Weblink on asthma from the New South Wales Multicultural

Health Communication Service. It is part of a rich web resource dedicated to providing information and services to improve communication of health care providers with non-English speaking patients. The site has a translated health information base in 64 languages. There are several resources for asthma, but not in all 64 languages

<http://www.nlm.nih.gov/medlineplus/languages/asthma.html>

<http://www.nlm.nih.gov/medlineplus/languages/asthmachildren.html>
U.S. National Library of Medicine hyperlinks to translated documents on asthma and asthma in children in multiple languages

http://www.asthma.org.uk/health_professionals/translated_resources/
Translated “frequently asked questions” in multiple languages from UK Asthma, a charity dedicated to improvement of asthma care in the United Kingdom

<http://spiral.tufts.edu/index.html> SPIRAL (Selected Patient Information Resources in Asian Languages) web link, which includes

Cambodian Khmer, Chinese, Hmong Hmoob, Japanese, Korean, Laotian Lao, Thai, and Vietnamese Tì ng Vi t

<http://ethnomed.org/patient-education/asthma> Translated patient education on asthma information in Amharic and Tigrinya, from EthnoMed, Harborview Medical Center’s ethnic medicine website. In addition at this website are Somali and Cambodian cultural profiles on asthma addition to Amharic and Tigrean

<http://www.hhs.gov/ocr/civilrights/resources/specialtopics/lep/> Office for Civil Rights: The HHS Office for Civil Rights drafted written policy guidance to assist health and social services providers in ensuring that persons with limited English skills can effectively access critical health and social services

<http://www.aaaai.org/espanol/> Patient information in Spanish from the American Academy of Allergy & Immunology

<http://www.asthmacontrol.com/hcp.html> Asthma Control Test and Childhood Asthma Control Test in Spanish