Asthma in Hispanics An 8-Year Update

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Abstract

This review provides an update on asthma in Hispanics, a diverse group tracing their ancestry to countries previously under Spanish rule. A marked variability in the prevalence and morbidity from asthma remains among Hispanic subgroups in the United States and Hispanic America. In the United States, Puerto Ricans and Mexican Americans have high and low burdens of asthma, respectively (the "Hispanic Paradox"). This wide divergence in asthma morbidity among Hispanic subgroups is multifactorial, likely reflecting the effects of known (secondhand tobacco smoke, air pollution, psychosocial stress, obesity, inadequate treatment) and potential (genetic variants, urbanization, vitamin D insufficiency, and eradication of parasitic infections) risk factors. Barriers to adequate asthma management in Hispanics include economic and educational disadvantages, lack of health insurance,

and no access to or poor adherence with controller medications such as inhaled corticosteroids. Although considerable progress has been made in our understanding of asthma in Hispanic subgroups, many questions remain. Studies of asthma in Hispanic America should focus on environmental or lifestyle factors that are more relevant to asthma in this region (e.g., urbanization, air pollution, parasitism, and stress). In the United States, research studies should focus on risk factors that are known to or may diverge among Hispanic subgroups, including but not limited to epigenetic variation, prematurity, vitamin D level, diet, and stress. Clinical trials of culturally appropriate interventions that address multiple aspects of asthma management in Hispanic subgroups should be prioritized for funding. Ensuring high-quality healthcare for all remains a pillar of eliminating asthma disparities.

Keywords: asthma; Hispanics; genetics; risk factors

Eight years ago, we reviewed potential explanations for the marked variability in asthma morbidity among Hispanic subgroups, both in the United States and Latin America (1). Given limited knowledge, we advocated for research in well-defined Hispanic subgroups, while also emphasizing the need to broaden access to healthcare for Hispanics (1).

The purpose of this review is to provide an update on asthma in Hispanics. First, we show current demographics and indicators of asthma morbidity in Hispanics. Second, we assess recent findings on selected (known or potential)

risk factors for asthma in Hispanics. Third, we review new studies on the diagnosis and management of asthma in Hispanics. Finally, we discuss future directions in this field.

The Hispanic Population

The term "Hispanic," as defined by the U.S. 2010 Census, refers to any peoples with roots in Spain or areas previously under Spanish rule, including Mexico, large parts of Central and South America, and some Caribbean Islands (2).

Hispanic America is geographically, racially, and economically diverse (Table 1) (3). Over the last decade, Hispanic America saw reductions in health and education inequalities yet continued to demonstrate substantial income inequalities (4). Most Hispanic American countries have achieved reductions in infant mortality rates in parallel with increments in their gross domestic product and human development index (3–5).

In 2010, there were 50.5 million Hispanics composing 16% of the U.S. population (2). Hispanics remain the largest growing minority in the United States (2).

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Table 1: Demographic and Healthcare Data for Selected Hispanic American Countries

Country	Per Capita GDP* (Δ from 2005)	HDI†	IMR‡ (Δ from 2005)	Life Expectancy§	Health Spending (Δ from 2005)	Asthma Mortality¶	Urban Population** (%)
Argentina	\$17,900 (18.8%)	0.811	10.2 (−5.0)	77.32	\$892 (126%)	14.7	92
Chile	\$18,200 (39.9%)	0.819	7.2 (−1.6)	78.27	\$1,075 (118%)	23.5	89
Colombia	\$10,700 (33.4%)	0.719	15.5 (−5.5)	75.02	\$432 (111%)	19.6	75
Costa Rica	\$12,500 (7.1%)	0.773	9.0 (−1.0)	78.06	\$943 (159%)	18.0	64
Guatemala	\$5,200 (1.9%)	0.581	24.3 (−11.6)	71.46	\$214 (55%)	33.0	49
Mexico	\$15,400 (32.0%)	0.775	16.3 (−4.7)	76.86	\$620 (30%)	27.1	78
Nicaragua	\$4,400 (57.4%)	0.599	21.1 (−8.0)	72.45	\$125 (76%)	41.8	57
Peru	\$10,600 (55.7%)	0.741	20.9 (−11.0)	72.98	\$289 (125%)	25.8	77
Commonwealth of Puerto Rico (possession of the United States)	\$16,300 (−20.2%)	—	8.0 (−0.2)	79.07	—	33.0	99

Definition of abbreviations: GDP = gross domestic product; HDI = Human Development Index; IMR = infant mortality rate.

*The GDP is total market value of all final goods and services produced in a country in a given year, equal to the total consumer investment, and government spending, plus the value of exports, minus the value of imports in 2012 U.S. dollars. Change corrected for inflation based on 2004 U.S. dollars. Source: CIA World Factbook, January 2014 (3).

†The HDI is calculated using various indicators for quality of life, while also accounting for GDP per capita in terms of Purchasing Power Parity and percentage of the population below the poverty line. Source: Human Development Report 2012 rankings, August 2013. Human development = very high (0.805–0.955); high (0.712–0.796); medium (0.536–0.710); low (0.304–0.534) (4).

‡The IMR is the number of children dying under a year of age divided by 1,000 live births. Source: CIA World Factbook, August 2013 (3).

§Average number of years to be lived by a group of people born in the same year, if mortality at each age remains constant in the future. Source: CIA World Factbook, August 2013 (3).

||Health care spending per capita in current U.S. dollars. Source: The World Bank, World Development Indicators, August 2013 (5).

¶Per 10,000 deaths based on International Classification of Diseases 10th revision codes. Most recent available data used: 2009 Argentina, Chile, Costa Rica, Nicaragua; 2008 Colombia, Guatemala; 2007 Peru, Puerto Rico. Source: Pan American Health Organization Regional Health Observatory, September 2013 (167).

**Percentage of the population living in an urban environment. Information from 2010. Source: CIA World Factbook, August 2013 (3).

Persons of Mexican origin are the largest subgroup within the Hispanic population and increased by 54% since 2000 (Figure 1). The Hispanic population is diversely distributed, with persons of Mexican origin living mostly on the West Coast and the South; those of South American origin being more likely to reside in the South and the Northeast; and those of Puerto Rican, Dominican, and Cuban origin being more likely to reside in the Northeast (2).

Compared with non-Hispanic (NH) whites, Hispanics are more likely to be poor (25.4% vs. 13%) (6). Compared with other ethnic groups, Hispanics are least likely to have advanced degrees (6). Hispanics are less likely to have health insurance than NH whites or Blacks: ~29% of Hispanics are uninsured (6), with Mexican Americans least likely to be insured (7).

Prevalence, Morbidity, and Mortality of Asthma in Hispanics

Hispanic America

Phase III of the International Study of Asthma and Allergies in Childhood

(ISAAC) in Hispanic America showed continued marked variability in the prevalence of ever-asthma in school-aged children (Table 2) (8). An altitude over 2,000 m was correlated with lower asthma prevalence, a finding that could be explained by natural selection, environmental factors, or changes in trunk-to-limb ratio (8).

A study of 5,978 subjects aged 1 to 59 years in Colombia yielded nationwide estimates of the prevalence of ever-asthma and current asthma symptoms of ~23 and ~12%, respectively (9, 10). In one of few studies including rural areas of Hispanic America, a comparison of the prevalence of asthma in 6,821 Afro-Ecuadorian children living in urban and rural areas showed a strikingly similar prevalence of symptoms (10.1% vs. 9.4%, respectively) (11).

Even though assessing asthma mortality remains challenging for some Hispanic American countries, Table 1 lists such rates for selected countries. One study found that asthma mortality rates in Argentina decreased from the 1980s to the 1990s and speculated that this may be due to increased use of inhaled corticosteroids (ICS) (12).

United States

In the United States, the prevalence of asthma remains more variable among Hispanic subgroups than across broadly defined racial/ethnic groups (Table 3). Among children and adults in the National Health Interview Survey (2001–2010), the prevalence of current asthma was highest in Puerto Ricans (16.1%) and lowest in Mexican Americans (5.4%), with intermediate values for NH whites (7.7%) and NH Blacks (11.2%) (18). Other studies have estimated that the prevalence of asthma (13–17, 19) or asthma morbidity (17) is highest in Puerto Ricans and lowest in Mexican Americans or Central Americans, with intermediate estimates in South Americans, Cubans, and Dominicans (13, 16).

Mexican Americans have a relatively low prevalence of asthma, but those born in the United States have a higher risk of asthma than those born in Mexico (14, 20, 21). A higher degree of acculturation may also increase the risk of asthma in Mexican Americans (22). In contrast to these findings, Puerto Rican children living in Puerto Rico have higher odds of ever-asthma or hospitalizations for asthma

Figure 1. Hispanic population by origin in the U.S. Census, 2000 and 2010.

(by ~27–30%) than those living in the U.S. Northeast (23).

Puerto Ricans continue to share a disproportionate burden of asthma attacks in the United States (24). Among children with asthma in Rhode Island, Dominicans and Puerto Ricans were shown to have lower disease control but higher use of the emergency department (ED) for asthma than NH whites (25, 26). Puerto Ricans and Mexican Americans were previously reported to have the highest and lowest mortality rates from asthma, respectively, of any ethnic group in the U.S. mainland (27). Although overall asthma mortality rates have decreased in the United States (28),

ethnic minorities (including Hispanics) continued to have higher asthma mortality rates than whites in 2009 (29).

Potential Risk Factors for Asthma in Hispanics

Racial Ancestry and Genetics

Hispanic is an ethnicity and not a race: Hispanics can be of any race. Most Hispanics have variable proportions of European, Native American, and African ancestry (1). For example, Mexicans, Mexican Americans, and Costa Ricans living in the Central Valley of Costa Rica

have, on average, a higher proportion of Native American ancestry (ranging from 35–64%) but a lower proportion of African ancestry (ranging from 3–5%) than Puerto Ricans (in whom Native American ancestry ranges between 12 and 15% and African ancestry ranges between 18 and 25%) (30–32).

Recent results suggest that racial ancestry influences lung function in Hispanic subgroups (30, 31), with more inconsistent findings for asthma *per se* (33, 34). Variation in trunk-to-limb ratio is unlikely to fully account for ancestral effects on lung function (35).

Consistent with findings in African American adults without asthma (36), African ancestry was linearly and inversely associated with FEV₁ or FVC (but not with FEV₁/FVC) in Puerto Rican children (with or without asthma) (31). On the other hand, Native American ancestry has been positively associated with FEV₁ and FVC (but inversely associated with chronic obstructive pulmonary disease) in adults in New Mexico (37) and Costa Rica (30). Taken together, these results may partly explain the “Hispanic Paradox”—the wide divergence in the burden from airway diseases (asthma or chronic obstructive pulmonary disease) between subjects of Mexican descent (predominantly of

Figure 2. Potential explanations for the discrepancy in asthma or asthma morbidity between Mexican Americans and Puerto Ricans (the “Hispanic Paradox”).

Table 2: International Study of Asthma and Allergies in Childhood Phase Three: Estimated Prevalence of Asthma or Asthma Symptoms in 13- to 14-Year-Old Children in Selected Hispanic American Countries

Country	N	Current Wheeze (%)	Asthma Ever (%)
Argentina	12,716	12.5	9.3
Bolivia	3,257	13.5	12.3
Chile	13,793	15.3	15.1
Costa Rica	2,436	27.3	23.2
Cuba	3,026	17.8	30.9
Ecuador	6,096	16.6	10.9
El Salvador	3,260	30.8	24.0
Honduras	2,675	22.0	18.3
Mexico	29,723	8.7	6.9
Nicaragua	3,263	13.8	15.2
Peru	3,022	19.6	33.1

Data from Reference 8.

European and Native American ancestry) and Puerto Ricans (predominantly of European and African ancestry). Whether genetic or environmental factors underlie ancestral effects on lung function is largely unknown.

Findings from genome-wide association studies (GWAS) and other studies suggest that a significant proportion of asthma-susceptibility variants are relevant to all ethnic groups, whereas others may be more relevant to particular ethnic groups (38–42). To date, no ethnic-specific asthma-susceptibility gene or variant has been confidently identified in Hispanic subgroups. A few asthma-susceptibility loci that were initially identified in subjects of European descent have been replicated at the single-nucleotide polymorphism (SNP) level in subjects of Puerto Rican and Mexican descent (e.g., the 17q21 locus [43, 44] and *IL33* [39]). Conversely, an asthma-susceptibility locus initially identified in Costa Ricans (*TLSP*) (40, 41) has been replicated in subjects of European and African descent (38, 45) as well as in a sample of combined Hispanic subgroups (38).

Insufficient statistical power and false-positive results may explain lack of replication of some GWAS findings or discovery of ethnic-specific loci for asthma in Hispanics. However, common variants identified by GWAS explain only part of the heritability of complex diseases such as asthma (46), with likely modest additional gains from studying rare variants (47). Thus, studies of gene-by-gene and gene-by-environment interactions, as well as epigenetics, are needed in Hispanic subgroups.

A few studies have focused on interactions between genetic variants and environmental or lifestyle (EL) factors (including sex [41, 48], SHS [49], allergens [50, 51], and air pollution [44]) on asthma in Hispanics. Using a candidate-gene approach, interactions between SNPs in *IL10* or *TGFB1* and dust mite allergen on asthma exacerbations or airway responsiveness were reported in Costa Ricans, with replication in NH whites (50, 51). Limited statistical power or insufficient replication has precluded confident identification of gene-by-environment interactions on asthma in Hispanic subgroups, in whom epigenetics has also been insufficiently studied.

Socioeconomic Status and Urbanization

Hispanic America faces unique challenges, as a high proportion of its population is now urban in the context of high rates of poverty, a polluted environment, and limited access to sanitation (4, 52). Consistent with worldwide literature (53), low socioeconomic status (SES) in/near urban areas, high levels of inequality, and urbanization are associated with childhood asthma in Hispanic America (54–57).

In the United States, Puerto Ricans and Mexican Americans are disproportionately represented among the poor but have widely divergent burdens from asthma (58, 59). SES was shown to be inversely associated with asthma in Mexican American children and young adults in San Francisco, California (60). In another report, Puerto Rican ethnicity was associated with asthma

in children in the U.S. mainland, even after adjustment for multiple indicators of SES (61). Together with previous results (1), these findings suggest that low SES is differentially correlated with unidentified factors affecting asthma risk in Puerto Ricans and Mexican Americans.

Stress

A growing body of literature strongly supports an association between stress and asthma (62–64) or asthma morbidity (62, 65–70).

Hispanics in the United States are disproportionately exposed to stressors such as poverty (6), unequal access to social benefits (71), discrimination (72), and physical or sexual abuse (73). Caregiver's stress or mental illness has been associated with asthma or asthma morbidity in Mexican American (74) and inner-city (~41% Puerto Rican and ~33% Mexican American) children in Chicago (75), minority children (~74% Hispanic) in New York (76), and Puerto Rican children in Puerto Rico or the Bronx (77, 78). Among school-aged children in Puerto Rico, physical or sexual abuse was associated with approximately twofold increased odds of asthma or asthma morbidity (70). The mechanisms underlying this association are unclear but may include dysfunction of the hypothalamic-pituitary-adrenal axis, cortisol insensitivity via down-regulation of receptors (79), abnormal production of inflammatory cytokines (80, 81), and increased susceptibility to environmental exposures (63, 82–84).

Signaling of the pituitary adenylate cyclase-activating polypeptide regulates physiologic stress responses and, together with corticotrophin-releasing hormone, modulates anxiety-related behavior (85). The gene for the PAC1 receptor (*ADCYAP1R1*) has been implicated in post-traumatic stress disorder (85) and childhood anxiety (86). Exposure to violence was associated with increased DNA methylation of *ADCYAP1R1* in Puerto Rican children, in whom such methylation changes were also associated with asthma (87). Moreover, an SNP in the promoter of *ADCYAP1R1* (rs2267735) was associated with asthma. Although these findings must be cautiously interpreted pending replication, they suggest that SNPs or DNA methylation in genes involved in stress regulation impacts asthma in Puerto Ricans.

Table 3: Estimates of the Prevalence (as Percentages) of Asthma or Asthma Outcomes in Hispanic and Hispanic Populations in the United States

Study	Age Range of Participants	Outcome	Non-Hispanic White	Non-Hispanic Black	Hispanic (A/I)	Puerto Rican	Mexican	Dominican	Cuban	Other Hispanic	South American	Central American
Leong et al. (13)	NHIS (2006–2008) all ages	Lifetime asthma	12.2	13.7	9.9	21.8	8					
		Current asthma	7.8	9.5	6.3	14.2	4.9					
		Asthma attacks	4.2	4.9	3.6	8.4	2.8					
	CHIS (2007) all ages	Lifetime asthma	14.8	20.1	11.2	23.5	10.3			18.0*	16.6	9.2
Lara et al. (16)	Ages 2–17 yr, n = 46,511	Lifetime asthma	12.7	15.8	12.4	25.8	10.1	14.9	14.9	11.6		
	Ages ≥ 18 yr, n = 19,400	Asthma attacks	5.8	7.5	5.13	11.8	4.0	5.3	5.9	4.7		
Dumanovsky and Matte (17)	All ages	Asthma attacks	3.3	5.9	6.6	11.8		5.4†		10.4†		
Akinbami et al. (18)	All ages	Current asthma	7.7	11.2	~6.5	16.1	5.4	3.8‡		2.2‡		
Rose et al. (19)	Ages ≥ 18 yr	Lifetime asthma	9.2	9.6		17.0	7.5			7.3		
Eldeirawi et al. (21)	Ages 2 mo–16 yr	Current asthma	3.5	3.6		9.2	3.0			2.4		
		Lifetime asthma					8.5†					
		Wheezing (last 12 mo)					2.8‡					
		Lifetime asthma					21.4†					
		Hospitalized for asthma, ever					12.6‡					
Cohen et al. (23)	Ages 5–13 yr					35.3§						
						41.3						
						36.5§						
						48.7						

Definition of abbreviations: CHIS = California Health Interview Survey; NHIS = National Health Interview Survey.

*Two or more Hispanic subgroups.

†Born in the United States.

‡Born in home country.

§Puerto Ricans living in the Bronx, NY.

||Puerto Ricans living in Puerto Rico.

Tobacco Smoke and Air Pollution

Consistent with findings in NHs (88–91), those in Hispanics support a causal association between smoking (including environmental tobacco smoke) or air pollution and asthma morbidity.

Hispanic America. The prevalence of current smoking varies among Hispanic countries and the United States (see Table E1 in the online supplement). A study in Argentina showed that ~33% of the population (and ~13% of adolescents) currently smokes and that ~60% of the population is exposed to secondhand smoke (SHS) at home (92). In that study, current smoking was associated with current asthma (odds ratio [OR] = 1.8; 95% CI, 1.4–2.4). A study of Mexican adolescents found an equally high prevalence of current smoking in subjects with and without asthma (~34%) (93).

Residential proximity to a major road (a proxy for traffic-related pollution) has been associated with asthma (94), asthma symptoms, and atopy (95) among children in Lima, where particulate matter (PM) levels are higher than in rural areas of Peru (55). Exposure to aggregate or individual components of traffic exhaust (NO₂, ozone, and PM) is common and associated with wheezing (96) and reduced lung function (97) in children in Mexico City, where a sound emissions control policy could prevent as many as 2.99 million asthma attacks (98). In contrast to the prominent role of traffic-related pollution in Mexico City, exposure to volatile organic compounds had a relatively greater estimated effect on asthma morbidity in a study of urban Argentinean children (99).

United States. Hispanic children are more than 2.5 times more likely to live near heavy traffic than white children in California (100). In a study of a combined sample of Hispanic (n = 3,343) and African American (n = 977) children in five cities in the U.S. mainland and in Puerto Rico, exposure to NO₂ (estimated from residential history and prior air monitoring data) in the first year of life was associated with asthma (OR = 1.17; 95% CI, 1.04–1.31) (101). In Puerto Rico, exposure to PM less than 2.5 µm in diameter (PM_{2.5}) or SO₂ during the first 3 years of life was also associated with asthma. In another study, yearly mean PM_{2.5} exposure was not significantly

associated with asthma or asthma attacks among Hispanic adults (not differentiated into subgroups) (102).

Few studies have examined interactions between genetic variants or environmental exposures and air pollution on asthma. In a study of 3,023 children (including ~30% Hispanics, without differentiation among subgroups), homozygosity for the *TGFB1*-509T allele was associated with asthma in subjects exposed to traffic-related emissions or maternal smoking in early life (103). In another study including 349 Dominican and African American children without asthma, prenatal or early postnatal exposure to cockroach allergen was associated with atopy, particularly among children exposed to polyaromatic hydrocarbons. In a subgroup analysis, this association was stronger in children who were null for a mutation in the gene for glutathione-S-transferase (*GSTM1*) (104). In another study of urban children (~50% Hispanic), traffic-related pollution was associated with asthma only in those exposed to violence (63).

Although tobacco use is lower in Mexican Americans than in African Americans or whites, SHS is associated with asthma and nocturnal awakenings from asthma in Mexican American children (105, 106). In a study including African American, Mexican, and Puerto Rican children, *in utero* SHS was associated with persistent asthma (107) and poor asthma control (108).

Vitamin D

Findings in Hispanic and NH populations have motivated ongoing clinical trials of vitamin D supplementation to prevent asthma or asthma morbidity (109, 110).

Vitamin D insufficiency (a serum 25[OH]D < 30 ng/ml) is common among Hispanic Americans in Argentina, Mexico, and Costa Rica (111–114). In a study of 1,025 Mexican children, 28% of subjects aged 6 to 12 years had vitamin D insufficiency (113), which was more common in urban (43%) than rural (25%) areas. Vitamin D insufficiency was common and associated with asthma morbidity in a study of 616 Costa Rican children (114).

In two studies, vitamin D insufficiency was found in ~90% of Mexican Americans aged 12 years and older (110) and in

more than 44% of school-aged children in Puerto Rico (115). Among 273 children with asthma in Puerto Rico, vitamin D insufficiency was associated with severe exacerbations, with a greater effect estimate in nonatopic children (OR = 6.2; 95% CI, 2–21.6) than in atopic children (OR = 2.0; 95% CI, 1–4.1) (115). Although preliminary, these findings suggest that vitamin D partly impacts asthma exacerbations through nonatopic mechanisms (e.g., steroid responsiveness or immune modulation of viral infections).

Obesity

Obesity is associated with asthma (116, 117), asthma morbidity (118–121), and reduced response to ICS (122, 123) in children and adults, with most—but not all—studies showing a stronger link in female than in male subjects. The explanation for these observations is the subject of intense research (124, 125).

Obesity is becoming increasingly more common in Hispanic America (126–129). In the United States, overweight or obesity is common and associated with asthma in Mexican Americans and Puerto Ricans (130–134). A study of 681,122 children in California found that body mass index was more strongly associated with asthma in Hispanics (predominantly Mexican Americans) than in other ethnic groups (135). Of relevance to Mexican Americans and other Hispanic subgroups with substantial Native American ancestry, a recent systematic review found obesity rates in the United States to be highest in American Indians (136).

Few reports have examined obesity and asthma morbidity in U.S. Hispanics. Among African American and Hispanic (~29% Mexican and ~40% Puerto Rican) children, obesity was associated with poor asthma control in boys, regardless of ethnicity. Among girls, however, obesity was more strongly associated with poor asthma control in Mexican Americans (OR = 1.91; 95% CI, 1.12–3.28) (137). Of note, only 17.6% of participants in that study had well-controlled asthma. In a study of Puerto Rican children, adiposity measures other than body mass index (percent body fat, waist circumference, and waist-to-hip ratio) provided a better assessment of obesity and asthma in Puerto Ricans, in whom atopy may mediate the effect of obesity on asthma morbidity (132).

Parasitic Infections

Few studies have examined the complex relation between parasitic infection and asthma in Hispanics (138–141). Data from Hispanic America indicate that chronic parasitic (11, 138, 142) and other infections (142) of childhood are associated with lower risk of atopy, but the effects on asthma are less clear. Allergic sensitization to *Ascaris*, but not active infections *per se*, appears to be a risk factor for asthma symptoms (140, 143), an observation that could be explained by migration of *Ascaris* larvae to the lungs with periodic exposures (140). Sensitization to *Ascaris* has been associated with asthma morbidity or airway responsiveness among children in Costa Rica (where parasitism is rare) (139) and rural Venezuela (144). A study of Ecuadorean schoolchildren provided some evidence that active parasitic infections might attenuate the association between atopy and wheeze (140) and is supported by the observation of a lower prevalence of atopic wheeze among children with heavy parasite burdens with *Trichuris trichiura* (145).

A study comparing schoolchildren living in Ecuadorean communities who were and were not treated with antihelminthics over 15 to 17 years found that treatment was associated with a higher prevalence of atopy but did not appear to affect asthma symptoms (138). Ongoing longitudinal studies (146) and clinical trials should help advance this field.

Diagnosis and Management of Asthma in Hispanics

Hispanic America

Recent studies continue to suggest that barriers to diagnosis and management of asthma in Hispanic America include inadequate disease-specific education and healthcare access (e.g., spirometric testing or use of controller medications), both of which can lead to poor asthma control (147). Only 8% of participants in a study of adults and adolescents with current asthma in four Latin American countries and Puerto Rico could be objectively classified as having well-controlled disease, even though ~60% believed that their asthma was completely or well controlled (147).

Over the last few years, implementation of nationwide programs that focused on

improving education, diagnosis, and (particularly) treatment has been correlated with reduced use of specialty care (148), increased use of controller medications (149), and decreased morbidity/mortality from asthma (148, 149) among children and adults in El Salvador, Chile, and Costa Rica.

United States

Recent studies suggest that language barriers (150), lack of health insurance (151, 152), inadequate health literacy (153), and cultural beliefs continue to contribute to asthma morbidity among U.S. Hispanics.

Hispanics continue to be less likely to be prescribed or adhere to controller medications such as ICS (154–156). A nationwide study of 2,499 children showed that although the use of preventive asthma medications increased in all ethnic groups from 1988 through 2004 to 2005 through 2008, Mexican Americans were 40% less likely to use preventive asthma medications than whites at the end of follow-up (95% CI for OR, 0.4–0.9), even after accounting for health insurance and other covariates (154). In a study of 277 children who were prescribed controller medications for asthma, Puerto Ricans or Dominicans in Rhode Island and Puerto Ricans in Puerto Rico were less likely to adhere to treatment than NH whites in Rhode Island (156). Among all children, family organization and parental beliefs were associated with medication adherence after accounting for SES (156). Nonadherence with controller medications may also be due to concerns about side effects, medication costs, language barriers, and low expectations for asthma control (157, 158).

Inadequate literacy or numeracy (understanding of basic mathematics) may be a barrier to asthma management in children of Mexican (159) and Puerto Rican (153) descent. Among Puerto Rican children (153), low parental numeracy was associated with visits to the ED or urgent care for asthma. Among participants not using ICS, low parental numeracy was associated with nearly threefold increased odds of one or more hospitalizations for asthma (95% CI, 1.4–5.6; $P < 0.01$) (153).

Subjective perception of lung function may differ by ethnicity (160). In a study of school-aged children, NH whites in Rhode Island had a more accurate

perception of their peak flow measurement than either Puerto Ricans in Puerto Rico or Hispanics in Rhode Island. More accurate perception of lung function was in turn associated with decreased healthcare use for asthma (160).

The efficacy of asthma medications may vary across Hispanic subgroups. Puerto Ricans have lower bronchodilator responsiveness than subjects of Mexican descent (161). Genetic variants may explain this finding, but confirmatory studies are needed (162).

A home-based study in Puerto Rico assessed an intervention consisting of educating families of low-income children on culturally appropriate asthma management (163). Such intervention was associated with decreased ED use, hospitalizations, and nighttime symptoms. Findings from this and another study (164) support further assessment of culturally tailored interventions to improve asthma management in Puerto Ricans and other Hispanic subgroups.

Future Directions

Considerable progress has been made in identifying or better understanding potential protective or risk factors for asthma in Hispanic subgroups (Table E2), but many questions remain unanswered.

Studies of asthma in Hispanic America should focus on EL factors that are more relevant to asthma in this region, including urbanization, parasitism, SHS, air pollution, obesity, and stress.

In the United States, studies of asthma in Hispanic subgroups other than Puerto Ricans or Mexican Americans are needed. Further understanding of the “Hispanic Paradox” can be gained by identifying genetic, epigenetic, and EL factors that predispose Puerto Ricans or protect Mexican Americans against asthma (Figure 2). Such factors may include but are not limited to rare genetic variants, DNA methylation, prematurity (165), SHS, diet, and stress. In parallel with this effort, studies of factors that are common in both Puerto Ricans and Mexican Americans and may affect asthma (obesity or vitamin D insufficiency) are needed. Regarding clinical trials, culturally appropriate interventions that address multiple aspects of asthma management should be prioritized for funding.

The Affordable Care Act (ACA) should improve healthcare access and asthma management in previously uninsured Hispanics (166). However, several barriers may preclude optimal asthma care for those

newly insured or those not covered by the ACA (e.g., migrants without legal residency status, children in states not approving Medicaid expansion). Removing residual barriers to care for the insured, coupled with advocacy for

broader healthcare access, are essential to optimize asthma care in Hispanics. ■

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