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Asthma prevalence among Hispanic adults in Puerto Rico and Hispanic adults of Puerto Rican descent in the United States – results from two national surveys

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Abstract

Objective—To assess whether asthma prevalence differs between Hispanic adults living in Puerto Rico and Hispanic adults of Puerto Rican descent living in the United States.

Methods—We used 2008–2010 Behavioral Risk Factor Surveillance System data, administered in Puerto Rico for Hispanic adults living in Puerto Rico (Hispanics in Puerto Rico), and 2008–2010 National Health Interview Survey data for Hispanic adults of Puerto Rican descent living in the United States (Puerto Rican Americans). We used 95% confidence intervals (CIs) to compare asthma prevalence between corresponding subgroups; non-overlapping CIs indicate statistical significance. Chi-square test and multivariate logistic regression were used to assess the association between current asthma status and socio-demographic factors and health risk behaviors within each Puerto Rican population.

Results—Current asthma prevalence among Hispanics in Puerto Rico (7.0% [6.4%–7.7%]) was significantly lower than the prevalence among Puerto Rican Americans (15.6% [13.0%–18.1%]). The prevalence among almost all sociodemographic and health risk subgroups of Hispanics in Puerto Rico was significantly lower than the prevalence among the corresponding subgroups of Puerto Rican Americans. Adjusting for potential confounders did not alter the results. Asthma prevalence was significantly associated with obesity among Puerto Rican Americans (adjusted prevalence ratios [aPR]=1.5 [1.1–2.0]), and among Hispanics in Puerto Rico was associated with obesity (aPR=1.6 [1.3–1.9]), smoking (aPR=1.4 [1.1–1.9]) and being female (aPR=1.9 [1.5–2.4]).

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Declaration of interest

The authors report no conflicts of interest.

Conclusion—Asthma was more prevalent among Puerto Rican Americans than Hispanics in Puerto Rico. Although the observed associations did not explain all variations in asthma prevalence between these two populations, they may lay the foundation for future research.

Keywords

Adults; asthma; asthma prevalence; hispanic; non-Hispanic; Puerto Rican; risk factors

Introduction

Asthma is a chronic disease of the airways in the lungs and affects nearly 8.4% of the US population [1,2]. Race and ethnicity are important determinants of asthma prevalence and associated morbidity [2,3]. The disease disproportionately affects some racial and ethnic groups more than others, and risk factors for asthma differ by race and ethnicity [2-5]. According to 2009–2010 Behavioral Risk Factor Surveillance System (BRFSS) data, asthma prevalence in US adults was higher among blacks (10.0%) and American Indians/Alaska Natives (13.0%) and was lower among Asians/Pacific Islanders (4.8%) and Hispanics (6.7%) compared with Whites (8.6%) [4].

Hispanic populations in the United States are diverse with regard to race, age, socioeconomic status, country of origin and exposure to environmental factors. Differences in the prevalence of and risk factors for asthma among Hispanic subgroups may be related to these varying demographic and socioeconomic characteristics and environmental factors [5-7]. Recent studies have shown that asthma prevalence is lower among Hispanics of Mexican descent, but higher among Hispanics of Puerto Rican descent, compared with the rate among all Hispanics and non-Hispanics in the US population [2,3,6]. Asthma-related adverse health outcomes and health care access and use also vary among Hispanic subgroups [6]. Among Hispanic subgroups in the United States, Puerto Ricans living in the United States more frequently report poor or fair health, activity limitation and hospitalization than do Cubans, Mexicans, Mexican Americans and other Hispanics [7]. In addition, Puerto Ricans have been reported to have the highest asthma mortality rates, followed by Cuban–Americans and Mexican–Americans [8].

Most of the previously referenced studies were conducted among Puerto Ricans living in the United States [2,3,5]; few studies have examined asthma prevalence among Hispanic adults living in Puerto Rico [6,9]. To the best of our knowledge, no previous comparison between asthma prevalence among Puerto Ricans in Puerto Rico and Puerto Ricans in the United States has been made using two surveys from the same time period. Therefore, we aimed to assess whether asthma prevalence differs between Hispanic adults living in Puerto Rico and Hispanic adults of Puerto Rican descent living in the United States by analyzing data from two national surveys: BRFSS and National Health Interview Survey (NHIS).

Methods

We assessed current asthma status among Hispanic adults (aged 18 years and older) living in Puerto Rico (Hispanics in PR) using 2008 through 2010 data from the BRFSS that was administered in Puerto Rico and among Hispanic adults of Puerto Rican descent living in the

United States (PR Americans) using 2008 through 2010 data from the NHIS. We used these surveys because the different information was available in each. The BRFSS data from Puerto Rico had information on Hispanics in PR. The BRFSS data from 50 states and the District of Columbia (DC) did not have information on PR Americans, while the NHIS data from 50 states and the DC had information on PR Americans. However, data for both Hispanic and non-Hispanic adults living in the United States (50 states and the DC) were available in both surveys, BRFSS and NHIS.

In addition, we examined the effects of the data source on asthma prevalence because of the differences in survey methodology (survey modes and sampling design) between these two surveys. We performed similar analyses for Hispanic and non-Hispanic adults living in the United States using both national surveys for each population to assess internal consistency and the effects of the data source on asthma prevalence in these populations with the assumption that if asthma prevalence among Hispanics or non-Hispanics does not differ by data source, then it is more likely that the source of data could not contribute to the observed difference in asthma prevalence between Hispanics in PR and PR Americans. Combining three years of survey data provides a larger sample size for analysis to obtain reliable estimates. Both NHIS and BRFSS are cross-sectional national surveys; however, they use different survey methodologies and cover somewhat different populations.

The BRFSS is a state-based, continuous, random-digitdial telephone survey of the non-institutionalized civilian adult population conducted in all 50 states, the DC and the US territories (Guam, Puerto Rico and US Virgin Islands). The BRFSS median response rate was 53.3% in 2008, 52.5% in 2009 and 54.6% in 2010. BRFSS collects self-reported data on key health-related behaviors, preventive health practices and disease status, including asthma. The data include sample weights to adjust for the unequal probability of selection, the disproportionate selection of population subgroups relative to the state's population distribution or any instance of nonresponse [10].

NHIS is a continuous, face-to-face household interview survey of a probability sample of the non-institutionalized US civilian population. This survey uses a multistage clustered sample design to collect data in all 50 states and the DC to produce national estimates for a variety of health indicators for all ages, including adults. The data include sample weights to adjust for the unequal probability of selection, the disproportionate selection of population subgroups relative to the US population distribution or any instance of nonresponse. The NHIS response rate for adults was 62.6% in 2008, 65.4% in 2009 and 60.8% in 2010 [11].

Both surveys include two questions as the basis for estimating current asthma prevalence. Respondents were classified as having current asthma if they answered "yes" to both questions: "Has a doctor or other health professional ever told you that you had asthma?" and "Do you still have asthma?" For the analyses, we selected variables that were pertinent to asthma and available in both surveys. Variables for demographic characteristics (sex, age and race/ethnicity), socioeconomic status (educational attainment and annual household income) and health risk behaviors (obesity status and cigarette smoking status) were included in the analyses. To define ethnicity, the BRFSS survey asked "Are you Hispanic or Latino?", whereas the NHIS survey asked "Does any of these groups (Puerto Rican, other

Caribbean, Chicano, Cuban, Mexican/Mexicano, Hispanic, Mexican American, Cuban American, other Latin American and other Spanish or Hispanic) represent {subject's name's} national origin or ancestry?". In addition, information on geographic place of birth was available only in NHIS data. Therefore, we included geographic place of birth in the analysis of NHIS data. Obesity status was assessed by body mass index (BMI). BMI (weight in kilograms divided by height in meters squared) was calculated from self-reported height and weight and was grouped into standard categories of non-obese (less than 30.0 kg/m²) and obese (30.0 kg/m² or higher).

We used a statistical package (SAS-callable SUDAAN, version 9.3 S, RTI International, Raleigh, NC) to account for the complex sampling design and to incorporate sampling weights for both data analyses. The Taylor series linearization method was used for variance estimation. We used a chisquared test and multivariate logistic regression analysis to assess the association between the outcome variable (having current asthma) and independent variables to identify predictors of asthma within each study population. We presented weighted unadjusted and adjusted prevalence estimates, adjusted prevalence ratios (aPR) and 95% confidence intervals (CIs). Prevalence ratios were adjusted for age, sex, education, income, obesity status and cigarette smoking status.

We assessed whether the differences between two prevalence estimates (e.g. difference in asthma prevalence for two Puerto Rican populations) was statistically significant by examining the overlap between CIs [12]. We did not use the standard method of testing significance for our study because prevalence estimates were obtained by analyzing two independent surveys separately.

Furthermore, the method of examining overlap between CIs is more conservative (i.e. rejects the null hypothesis less often) than the standard method when the null hypothesis is true. Given that we have large sample sizes, by not using standard method of testing significance, we may avoid reporting small but significant differences due to large sample size. All statistical tests were conducted at an $\alpha=0.05$ level (two-sided). Observed differences in asthma prevalence between populations were considered statistically significant if 95% CIs did not overlap or if p value for chisquare statistical testing was <0.05 to examine association between two categorical variables within each population.

Results

Hispanic adults living in Puerto Rico (Hispanics in Puerto Rico) versus Hispanic adults of Puerto Rican descent in the United States (PR Americans)

Demographic characteristics—About 53.0% of both Hispanic adults in Puerto Rico (Hispanics in PR) and Hispanic adults of Puerto Rican descent in the United States (PR Americans) were females, and about one-third of both populations were between the ages of 18 and 34 years; but more Hispanics in PR were aged 65 and older (16.8%) than were PR Americans (11.1%). Hispanic adults in PR had higher educational attainment (four-year or more college education) than did PR Americans (29.2% and 16.3%, respectively). However, a greater proportion of Hispanics in PR had lower annual household income than did PR Americans. About 70% of Hispanics in PR versus 34% of PR Americans had a household

income of less than \$25 000 and about 10% of Hispanics in PR versus 40% of PR Americans had an income of \$50 000 or more. Obesity (27.1%) and being a current smoker (11.4%) were less prevalent among Hispanic adults in PR than among PR Americans (37.0% and 18.2%, respectively; Table 1).

Asthma prevalence—Current asthma prevalence among Hispanics in PR (7.0% [6.4%–7.7%]) was significantly lower than the prevalence among PR Americans (15.6% [13.0%–18.1%]). Similarly, the prevalence among almost all socio-demographic and health risk subgroups of Hispanics in PR was significantly lower than the prevalence among the corresponding subgroups of PR Americans. Adjusting for potential confounders did not alter current asthma prevalence significantly (Table 2). For example, among Hispanics in PR, unadjusted asthma prevalence was 6.8% (6.2–7.4) and adjusted was 7.0% (6.4–7.7), which were about half of the prevalence estimates among PR Americans (15.7% [13.3–18.4] and 15.6% [13.0–18.1], respectively). We observed similar findings among almost all subgroups studied (Table 2). Among Hispanics in PR and PR Americans, using chi-square test, current asthma status was significantly associated with sex, household income and obesity. However, among Hispanics in PR, after adjusting for potential confounders, having asthma was significantly associated with being female (adjusted prevalence rate =9.1%; adjusted prevalence rate ratio (aPR) and 95% CI=1.9 (1.5–2.4), obese (9.3%; aPR=1.6 [1.3–1.9]) or a smoker (9.1%; aPR=1.4 [1.1–1.9]). Whereas, among PR Americans, it was associated with obesity only (19.8%; aPR=1.5 [1.1–2.0]).

In addition, more than half (52.9%) of PR Americans were born in one of the 50 United States or DC, 43.2% were born in a US territory and 3.9% were born in neither of those places. Current asthma prevalence did not differ significantly between PR Americans who were born in one of the 50 United States or DC (14.2% [95% CI: 11.0%–18.1%]) and those born in a US territory (18.5% [CI 14.4%–23.3%]); *p* value for *z*-statistics was greater than 0.05 (data are not shown). Therefore, we did not include variable “place of birth” in the regression analysis.

Hispanic adults in the United States: results from BRFSS and NHIS data

Asthma prevalence—Current asthma prevalence among Hispanic adults in the United States (Hispanic Americans) did not differ significantly by data source. Among all demographic, socioeconomic and health risk subgroups of Hispanic Americans studied, current asthma prevalence from BRFSS data were similar to that from NHIS data. Adjusting for potential confounders did not alter the results (Table 3). For example, unadjusted and adjusted current asthma prevalence among Hispanic Americans from BRFSS data was 6.6% (6.2–6.9) and 6.8% (6.5–7.2) and from NHIS data was 6.0% (5.5–6.5) and 6.0% (5.4–6.5), respectively (Table 3).

Non-Hispanic adults in the United States: results from BRFSS and NHIS data

Asthma prevalence—Current asthma prevalence among non-Hispanic adults in the United States (non-Hispanic Americans) differed significantly by data source. Overall, unadjusted (8.8% [8.7–8.9]) and adjusted (8.8% [8.7–8.9]) asthma prevalence among non-Hispanic adults from BRFSS data were higher than unadjusted and adjusted asthma

prevalence from NHIS data (8.0% [7.7–8.3] and 8.0% [7.7–8.3], respectively). Furthermore, the adjusted asthma prevalence from BRFSS data was significantly higher than the adjusted asthma prevalence from NHIS data in the following subgroups of non-Hispanic adults: females, males; aged 18–34, 45–54 and 55–64 years; those with HS or less and four-year or more college education; and household income of \$15 000 and \$15 000–\$24 000; Table 4).

Discussion

High asthma prevalence is a major concern for PR Americans [2,3,5,6]. As previously reported, current asthma prevalence was significantly higher among PR Americans than any other race and ethnic US populations [2,3,5,6]. Using data from two national surveys, we assessed the characteristics of Hispanic adults in PR and PR American adults and compared and contrasted differences in asthma prevalence to investigate if asthma were as prevalent among Hispanic adults in PR as among PR American adults. Our findings indicate that unadjusted current asthma prevalence among PR adult Americans (15.7%) was much higher than that among Hispanic adults in PR (6.8%). This was similar to the findings from other Centers for Disease Control and Prevention (CDC) reports. The current asthma prevalence was 18.1% among PR adult Americans [13] and 7.5% among Hispanic adults in Puerto Rico [14]. Based on the Puerto Rico Department of Health's 2010 Puerto Rico Asthma Prevalence & Mortality Fact Sheet, current asthma prevalence among adults in Puerto Rico was 6.1% [15]. As a result, we may infer that Puerto Rican ethnicity by itself could not explain high asthma prevalence among PR Americans. Furthermore, asthma rates for PR Americans did not differ by place of birth (mainland United States versus US territories).

Compared with PR Americans, Hispanics in PR had higher educational attainment but lower household income, smoking rate and obesity rate. Furthermore, more Hispanics in PR were aged 65 years and older. These characteristics are known predictors of asthma prevalence in most adult populations [4–6]. As shown in previous studies [4–6], this study shows that asthma prevalence was significantly associated with obesity among PR Americans and with obesity, smoking and being female among Hispanics in PR. Compared with PR Americans, higher education and lower smoking rate and obesity rate among Hispanics in PR could account for some but not all of the observed differences in asthma prevalence between these two Puerto Rican populations.

Examining the effect of data source on asthma prevalence estimates, our findings indicate that the observed variations in asthma prevalence among two Puerto Rican populations may not be explained by data source because asthma prevalence rates for Hispanic Americans did not differ by data source (2008–2010 BRFSS versus 2008–2010 NHIS data). Moreover, the prevalence rates for non-Hispanic Americans did differ by data source, but the rates from BRFSS data were higher than the rates from NHIS data, in contrast to the rate from BRFSS data for Hispanics in PR, which was lower than the rates from NHIS data for PR Americans.

In addition, similar to findings from previous reports, current asthma prevalence among Hispanics in PR (findings from BRFSS data) was similar to that of Hispanic Americans; however, it was lower than that of non-Hispanic Americans [9]. Asthma prevalence among

PR Americans (findings from NHIS data) was higher than that among both Hispanic Americans and non-Hispanic Americans [2,3,5].

The strength of this study is the large sample size, allowing the provision of stable estimates and its analysis of data from two national surveys provides evidence for internal consistency. Likewise, the study has a few limitations. First, this is a secondary data analysis. Although multiple environmental and genetic factors play an important role in the development of asthma and the worsening of asthma symptoms [16-18], potential risk factors for asthma that were available in the BRFSS data and NHIS data constrained our findings. Second, because of the cross-sectional nature of the survey data, we were generally not able to determine temporal sequence or causality. Finally, the findings are for adults only and cannot be generalized to the overall Puerto Rican population with current asthma.

Conclusion

During the period studied, asthma was more prevalent among PR Americans than among Hispanics in PR, even though both groups shared some similarities in demographic characteristics. The potential risk factors studied could not account for most of the observed differences in prevalence. The future research may provide additional information to explain the differences in asthma prevalence between these two Puerto Rican populations, Hispanics in PR and PR Americans.

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Table 1

Characteristics of Puerto Rican adult populations.

Variables	Hispanics living in Puerto Rico ^a – BRFSS (Hispanics in PR) <i>n</i> = 12067		Hispanics of Puerto Rican descent ^b – NHIS (PR Americans) <i>n</i> = 1463	
	Sample size ^c	Weighted % (95% CI)	Sample size ^c	Weighted % (95% CI)
Sex				
Male	4244	47.0 (45.8–48.2)	553	46.7 (42.7–50.7)
Female	7823	53.0 (51.8–54.2)	910	53.3 (49.3–57.3)
Age, year range				
18–34	1630	34.0 (32.7–35.3)	500	37.5 (33.7–41.4)
35–44	1487	18.4 (17.5–19.4)	303	21.2 (18.3–24.6)
45–54	1951	16.9 (16.1–17.7)	258	17.9 (15.5–20.5)
55–64	2538	13.9 (13.3–14.5)	184	12.3 (10.3–14.7)
65+	4403	16.8 (16.2–17.4)	218	11.1 (9.3–13.1)
Education level				
High School (HS) graduate or less	6503	43.3 (42.1–44.5)	845	54.7 (50.5–58.8)
Some college	2557	27.5 (26.3–28.6)	380	28.9 (25.3–32.9)
College four years or more	2985	29.2 (28.1–30.4)	216	16.3 (13.7–19.4)
Household income				
<\$15 000	4834	38.7 (37.4–39.9)	434	19.9 (17.3–22.7)
\$15 000–\$24 999	2683	31.6 (30.3–32.8)	231	14.3 (12.0–17.0)
\$25 000–\$49 999	1614	19.9 (18.8–20.9)	371	25.2 (22.2–28.4)
\$50 000–\$74 999	370	5.1 (4.5–5.8)	197	16.4 (14.1–18.9)
\$75 000	363	4.8 (4.3–5.4)	230	24.3 (20.8–28.2)
Body mass index (BMI)				
Obese	3093	27.1 (26.0–28.2)	486	37.0 (33.9–40.2)
Non-obese	8316	72.9 (71.8–74.0)	924	63.0 (59.8–66.1)
Cigarette smoking status				
Current smoker	1078	11.4 (10.6–12.2)	306	18.2 (15.7–21.1)
Former smoker	2578	17.9 (17.1–18.8)	260	20.3 (17.8–23.1)
Nonsmoker	8403	70.7 (69.6–71.8)	879	61.5 (57.9–64.9)

^a2008–2010 Behavioral Risk Factor Surveillance System data.^b2008–2010 National Health Interview Survey data.^cSample size (unweighted) for the corresponding subpopulations.

Table 2

Puerto Ricans unadjusted and adjusted^a current asthma prevalence^b and adjusted prevalence rate ratios among adults, by selected characteristics.

	Hispanics living in Puerto Rico- BRFSS ^c (Hispanics in PR)			Hispanics of Puerto Rican descent in United States- NHIS ^d (PR Americans)		
	Unadjusted current asthma prevalence % (95% CI) ^e	Adjusted current asthma prevalence % (95% CI) ^e	Prevalence rate ratio (aPR) aPR (95% CI) ^f	Unadjusted current asthma prevalence % (95% CI) ^e	Adjusted current asthma prevalence % (95% CI) ^e	Prevalence rate ratio (aPR) aPR (95% CI) ^f
Total	6.8 (6.2–7.4)	7.0 (6.4–7.7)		15.7 (13.3–18.4)	15.6 (13.0–18.1)	
Sex	<i>p</i> = 0.0001 ^g			<i>p</i> = 0.0156 ^g		
Male	4.7 (4.0–5.6)	4.7 (3.9–5.7)	1.0 (reference)	12.2 (8.7–16.9)	12.7 (8.9–17.7)	1.0 (reference)
Female	8.6 (7.8–9.5)	9.1 (8.1–10.1)	1.9 (1.5–2.4)	18.7 (15.6–22.2)	18.1 (15.0–21.7)	1.4 (1.0–2.1)
Age, year range	<i>p</i> = 0.3478 ^g			<i>p</i> = 0.6722 ^g		
18–34	7.2 (5.9–8.7)	7.9 (6.4–9.7)	1.3 (1.0–1.7)	15.8 (12.3–20.2)	17.3 (13.0–22.6)	1.6 (1.0–2.7)
35–44	6.0 (4.8–7.5)	5.7 (4.4–7.3)	0.9 (0.7–1.3)	14.1 (9.6–20.4)	13.0 (8.6–19.0)	1.2 (0.7–2.3)
45–54	7.5 (6.3–9.0)	7.4 (6.1–8.9)	1.2 (0.9–1.5)	18.6 (13.4–25.4)	18.3 (13.5–24.3)	1.7 (0.9–3.1)
55–64	6.6 (5.6–7.7)	7.0 (5.9–8.2)	1.1 (0.9–1.4)	16.3 (10.9–23.6)	16.0 (10.7–23.3)	1.5 (0.8–2.7)
65+	6.2 (5.5–7.1)	6.2 (5.2–7.3)	1.0 (reference)	12.6 (7.9–19.5)	10.7 (6.5–17.3)	1.0 (reference)
Education level	<i>p</i> = 0.5066 ^g			<i>p</i> = 0.7993 ^g		
High school (HS) graduate or less	6.7 (5.9–7.6)	6.3 (5.3–7.5)	0.9 (0.7–1.2)	16.4 (12.8–20.6)	16.5 (12.8–21.0)	1.1 (0.6–1.9)
Some college	7.4 (6.2–8.8)	7.8 (6.5–9.4)	1.1 (0.9–1.5)	14.5 (10.7–19.2)	13.9 (10.4–18.5)	0.9 (0.5–1.6)
College four years or more	6.3 (5.3–7.5)	7.0 (5.7–8.6)	1.0 (reference)	16.1 (10.1–24.6)	15.6 (9.3–24.9)	1.0 (reference)
Household income	<i>p</i> = 0.0150 ^g			<i>p</i> = 0.0121 ^g		
<\$15 000	8.1 (7.1–9.3)	8.2 (7.0–9.6)	1.7 (1.0–3.2)	24.1 (18.2–31.2)	24.0 (17.8–31.5)	1.3 (0.8–2.3)
\$15 000–\$24 999	6.6 (5.5–8.0)	6.5 (5.3–7.8)	1.4 (0.7–2.5)	12.0 (7.2–19.3)	11.2 (6.7–17.9)	0.6 (0.3–1.2)
\$25 000–\$49 999	5.9 (4.7–7.4)	5.9 (4.6–7.6)	1.3 (0.7–2.3)	10.5 (7.4–14.8)	10.1 (7.2–14.0)	0.6 (0.3–1.0)
\$50 000–\$74 999	6.3 (4.0–9.8)	6.4 (4.0–10.3)	1.4 (0.7–2.8)	14.2 (8.5–22.8)	14.1 (8.4–22.7)	0.8 (0.4–1.5)
\$75 000	4.2 (2.3–7.3)	4.7 (2.6–8.3)	1.0 (reference)	17.2 (11.5–24.9)	17.9 (11.5–26.9)	1.0 (reference)
Body Mass Index (BMI)	<i>p</i> = 0.0001 ^g			<i>p</i> = 0.0184 ^g		
Obese	9.3 (8.0–10.8)	9.3 (7.9–10.9)	1.6 (1.3–1.9)	19.4 (15.4–24.3)	19.8 (15.5–24.8)	1.5 (1.1–2.0)
Non-obese	5.9 (5.3–6.6)	6.0 (5.3–6.8)	1.0 (reference)	13.4 (10.8–16.6)	13.2 (10.6–16.4)	1.0 (reference)
Cigarette smoking status	<i>p</i> = 0.7516 ^g			<i>p</i> = 0.9152 ^g		

	Hispanics living in Puerto Rico- BRFSS ^c (Hispanics in PR)			Hispanics of Puerto Rican descent in United States- NHIS ^d (PR Americans)		
	Unadjusted current asthma prevalence % (95% CI) ^e	Adjusted current asthma prevalence % (95% CI) ^e	Prevalence rate ratio (aPR) aPR (95% CI) ^f	Unadjusted current asthma prevalence % (95% CI) ^e	Adjusted current asthma prevalence % (95% CI) ^e	Prevalence rate ratio (aPR) aPR (95% CI) ^f
Current smoker	7.4 (5.7–9.6)	9.1 (7.0–11.8)	1.4 (1.1–1.9)	16.9 (11.4–24.5)	15.5 (10.4–22.3)	1.0 (0.7–1.5)
Former smoker	6.6 (5.5–7.8)	7.7 (6.2–9.4)	1.2 (0.9–1.5)	15.9 (11.0–22.3)	15.8 (11.0–22.2)	1.0 (0.6–1.6)
Nonsmoker	6.7 (6.0–7.5)	6.4 (5.7–7.3)	1.0 (reference)	15.4 (12.4–18.8)	15.6 (12.5–19.3)	1.0 (reference)

^a Adjusted for age, sex, education, income, obesity and cigarette smoking status.

^b Includes persons who answered “yes” to the questions, “Have you ever been told by a doctor or other health professional that you had asthma?” and “Do you still have asthma?”

^c 2008–2010 Behavioral Risk Factor Surveillance System data for Hispanics in Puerto Rico.

^d 2008–2010 National Health Interview Survey data for Hispanics of Puerto Rican descent in 50 states and District of Columbia.

^e Using the method of examining overlap between 95% confidence intervals, unadjusted and adjusted current asthma prevalence among Hispanics living in PR were compared with the corresponding asthma prevalence among Hispanics of Puerto Rican descent in the United States. Non-overlapping confidence intervals indicate statistical significance.

^f Prevalence rate ratio (95% confidence interval) adjusted for age, sex, education, income, obesity and cigarette smoking status.

^g *p* Values for the chi-square test for independence to determine whether there is a significant relationship between two categorical variables.

Table 3

Hispanics unadjusted and adjusted^a current asthma prevalence^b and adjusted prevalence rate ratios among adults, by selected characteristics.

	Hispanics living in United States – BRFSS ^c		Hispanics living in United States – NHIS ^d	
	Unadjusted current asthma prevalence % (95% CI) ^f	Adjusted current asthma prevalence ^e % (95% CI) ^f	Unadjusted current asthma prevalence % (95% CI) ^f	Adjusted current asthma prevalence ^e % (95% CI) ^f
Total	6.6 (6.2–6.9)	6.8 (6.5–7.2)	6.0 (5.5–6.5)	6.0 (5.4–6.5)
Sex	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
Male	5.1 (4.6–5.6)	4.9 (4.4–5.5)	4.4 (3.8–5.2)	4.4 (3.7–5.2)
Female	8.1 (7.7–8.5)	8.8 (8.3–9.3)	7.6 (6.8–8.4)	7.6 (6.8–8.5)
Age, year range	<i>p</i> <0.0001 ^g		<i>p</i> =0.0103 ^g	
18–34	6.4 (5.8–7.0)	6.9 (6.2–7.6)	5.8 (5.1–6.6)	6.4 (5.5–7.4)
35–44	5.7 (5.1–6.3)	5.8 (5.1–6.5)	4.7 (3.9–5.8)	4.7 (3.9–5.7)
45–54	6.9 (6.2–7.5)	6.6 (6.0–7.4)	6.4 (5.3–7.7)	6.0 (5.0–7.3)
55–64	7.9 (7.1–8.8)	7.2 (6.4–8.2)	7.4 (5.9–9.1)	6.1 (4.8–7.8)
65+	8.1 (7.3–9.0)	8.0 (7.0–9.0)	7.3 (5.8–9.3)	6.5 (5.0–8.4)
Education level	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
High school (HS) graduate or less	6.0 (5.6–6.4)	6.1 (5.6–6.6)	4.9 (4.3–5.6)	5.0 (4.3–5.8)
Some college	8.3 (7.5–9.1)	8.0 (7.2–8.9)	8.2 (7.2–9.5)	8.0 (7.0–9.1)
College four years or more	6.6 (6.0–7.4)	7.2 (6.3–8.1)	6.7 (5.3–8.4)	6.7 (5.3–8.5)
Household income	<i>p</i> =0.0002 ^g		<i>p</i> <0.0001 ^g	
<\$15 000	7.6 (6.9–8.5)	8.1 (7.2–9.1)	8.3 (7.1–9.7)	8.5 (7.3–10.0)
\$15 000–\$24 999	5.9 (5.2–6.6)	6.3 (5.6–7.1)	4.6 (3.6–5.9)	4.9 (3.9–6.1)
\$25 000–\$49 999	5.7 (5.1–6.3)	5.7 (5.1–6.4)	4.5 (3.8–5.2)	4.5 (3.9–5.3)
\$50 000–\$74 999	7.7 (6.7–8.9)	7.4 (6.3–8.6)	6.5 (5.3–8.1)	6.3 (5.0–7.9)
\$75 000	6.6 (5.8–7.5)	6.6 (5.7–7.7)	7.0 (5.6–8.7)	6.4 (5.0–8.2)
Body mass index (BMI)	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
Obese	8.9 (8.2–9.6)	8.8 (8.1–9.6)	8.5 (7.5–9.5)	8.4 (7.4–9.5)
Non-obese	5.8 (5.4–6.2)	5.7 (5.3–6.2)	4.8 (4.3–5.4)	4.8 (4.3–5.4)
Cigarette smoking status	<i>p</i> <0.0001 ^g		<i>p</i> =0.0005 ^g	
Current smoker	8.2 (7.3–9.1)	8.9 (7.9–10.1)	7.2 (5.8–8.8)	7.6 (6.2–9.1)
Former smoker	7.7 (7.0–8.5)	8.3 (7.4–9.2)	8.1 (6.8–9.6)	8.0 (6.6–9.7)
Nonsmoker	6.0 (5.6–6.4)	5.8 (5.4–6.3)	5.3 (4.7–5.9)	5.2 (4.6–5.9)

^a Adjusted for age, sex, education, income, obesity and cigarette smoking status.

^b Includes persons who answered “yes” to the questions, “Have you ever been told by a doctor or other health professional that you had asthma?” and “Do you still have asthma?”

^c 2008–2010 Behavioral Risk Factor Surveillance System data for Hispanics in 50 states and District of Columbia.

^d 2008–2010 National Health Interview Survey data for Hispanics in 50 states and District of Columbia.

^e Adjusted for age, sex, education, income, obesity and cigarette smoking status.

^f Using the method of examining overlap between 95% confidence intervals, unadjusted and adjusted current asthma prevalence from BRFSS were compared with the corresponding prevalence from NHIS. Non-overlapping confidence intervals indicate statistical significance.

^g p Values for the chi-square test for independence to determine whether there is a significant relationship between two categorical variables.

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Table 4

Non-Hispanics unadjusted and adjusted^a current asthma prevalence^b and adjusted prevalence rate ratios among adults, by selected characteristics.

	Non-Hispanics living in United States – BRFSS ^c		Non-Hispanics living in United States – NHIS ^d	
	Unadjusted current asthma prevalence ^e % (95% CI) ^f	Adjusted current asthma prevalence ^e % (95% CI) ^f	Unadjusted current asthma prevalence ^e % (95% CI) ^f	Adjusted current asthma prevalence ^e % (95% CI) ^f
Total	8.8 (8.7–8.9)	8.8 (8.7–8.9)	8.0 (7.7–8.3)	8.0 (7.7–8.3)
Sex	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
Male	6.7 (6.5–6.9)	6.7 (6.5–6.9)	5.9 (5.5–6.2)	5.9 (5.5–6.3)
Female	10.9 (10.7–11.0)	10.8 (10.7–11.0)	10.0 (9.5–10.4)	9.9 (9.5–10.3)
Age, year range	<i>p</i> <0.0001 ^g		<i>p</i> =0.5115 ^g	
18–34	10.0 (9.7–10.2)	9.9 (9.6–10.3)	8.3 (7.7–8.8)	8.5 (8.0–9.1)
35–44	8.3 (8.1–8.5)	8.6 (8.4–8.9)	7.9 (7.3–8.5)	8.1 (7.5–8.8)
45–54	8.7 (8.5–8.9)	8.7 (8.5–8.9)	7.8 (7.2–8.4)	7.8 (7.2–8.4)
55–64	9.1 (8.9–9.3)	8.8 (8.7–9.1)	8.3 (7.7–8.9)	8.0 (7.4–8.6)
65+	7.8 (7.7–8.0)	7.3 (7.1–7.4)	7.7 (7.1–8.3)	7.1 (6.5–7.8)
Education level	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
High School (HS) graduate or less	9.9 (9.7–10.1)	8.6 (8.4–8.8)	8.4 (7.9–8.8)	7.7 (7.2–8.1)
Some college	9.4 (9.2–9.7)	9.0 (8.8–9.3)	8.8 (8.3–9.3)	8.5 (8.0–9.0)
College four years or more	7.4 (7.3–7.6)	8.7 (8.5–8.9)	6.7 (6.3–7.2)	7.7 (7.2–8.3)
Household Income	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
<\$15 000	15.5 (15.1–16.0)	14.3 (13.8–14.8)	11.7 (10.9–12.5)	11.2 (10.4–12.0)
\$15 000–\$24 999	11.6 (11.3–11.9)	11.0 (10.7–11.4)	9.1 (8.3–10.0)	8.8 (8.0–9.8)
\$25 000–\$49 999	8.6 (8.3–8.8)	8.3 (8.1–8.5)	8.6 (8.0–9.2)	8.3 (7.8–8.9)
\$50 000–\$74 999	7.7 (7.4–7.9)	7.6 (7.3–7.8)	7.1 (6.5–7.8)	7.0 (6.4–7.6)
\$75 000	7.0 (6.8–7.1)	7.3 (7.1–7.5)	6.6 (6.1–7.1)	6.8 (6.4–7.4)
Body mass index (BMI)	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
Obese	12.2 (12.0–12.4)	11.8 (11.5–12.0)	11.0 (10.4–11.6)	10.9 (10.3–11.5)
Non-obese	7.5 (7.4–7.7)	7.6 (7.5–7.7)	6.8 (6.5–7.1)	6.8 (6.5–7.2)
Cigarette smoking status	<i>p</i> <0.0001 ^g		<i>p</i> <0.0001 ^g	
Current smoker	10.7 (10.4–10.9)	9.6 (9.3–9.9)	9.0 (8.4–9.6)	8.8 (8.1–9.4)

	Non-Hispanics living in United States – BRFSS ^c		Non-Hispanics living in United States – NHIS ^d	
	Unadjusted current asthma prevalence % (95% CI) ^f	Adjusted current asthma prevalence ^e % (95% CI) ^f	Unadjusted current asthma prevalence % (95% CI) ^f	Adjusted current asthma prevalence ^e % (95% CI) ^f
Former smoker	9.0 (8.8–9.2)	9.4 (9.2–9.7)	8.7 (8.2–9.3)	9.1 (8.5–9.8)
Nonsmoker	8.2 (8.0–8.3)	8.1 (8.0–8.3)	7.3 (7.0–7.7)	7.2 (6.9–7.5)

^a Adjusted for age, sex, education, income, obesity and cigarette smoking status.

^b Includes persons who answered “yes” to the questions, “Have you ever been told by a doctor or other health professional that you had asthma?” and “Do you still have asthma?”

^c 2008–2010 Behavioral Risk Factor Surveillance System data for Non-Hispanics in 50 states and District of Columbia.

^d 2008–2010 National Health Interview Survey data for Non-Hispanics in 50 states and District of Columbia.

^e Adjusted for age, sex, education, income, obesity and cigarette smoking status.

^f Using the method of examining overlap between 95% confidence intervals, unadjusted and adjusted current asthma prevalence from BRFSS were compared with the corresponding prevalence from NHIS. Non-overlapping confidence intervals indicate statistical significance.

^g _p Values for the chi-square test for independence to determine whether there is a significant relationship between two categorical variables.