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## Racial and Ethnic Disparities in Current Asthma and Emergency Department Visits: Findings from the National Health Interview Survey, 2001–2010

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### Abstract

**Objectives**—Racial/ethnic disparities in current asthma prevalence and medical care are a major public health concern. We examined the differences in asthma prevalence and morbidity among major racial/ethnic populations in the U.S.

**Methods**—We analyzed data from the 2001–2010 National Health Interview Survey for adults (≥ 18 years) and children and adolescents (<18 years). Outcome variables were current asthma prevalence, episodes and emergency department/urgent care center (ED/UCC) visits. We used multivariate logistic regression to calculate model-adjusted prevalence and risk ratios (ARR).

**Results**—In our study, 9.0% children and 7.2% adults had current asthma. Non-Hispanic black and Puerto Rican children were more likely to have current asthma (ARR 1.46, 1.66 respectively) and ED/UCC visits (ARR 1.61, 1.66, respectively) than non-Hispanic whites. Prevalence of asthma episodes did not differ significantly ( $P>0.05$ ) among different race/ethnicities after adjusting for covariates. Among adults, Puerto Ricans were more likely to have current asthma (ARR 1.60) than non-Hispanic whites, and Non-Hispanic blacks (ARR 1.78) and Puerto Rican adults (ARR 1.71) reported ED/UCC visits more frequently than non-Hispanic whites. Adults and children who received emergency care for asthma in the past 12 months more frequently received multiple components of asthma management and control (e.g., taking long-term medication, having an asthma management plan) compared to those without emergency care.

**Conclusions**—Racial/ethnic differences in current asthma prevalence persist among children and adults, but are most prominent among adults with asthma-related ED/UCC visits. Appropriate

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and effective asthma management and education may lead to better asthma control and reduce emergency care utilization.

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## INTRODUCTION

Asthma is a respiratory disease characterized by recurrent episodic symptoms which include wheezing, shortness of breath, ; and coughing, and is considered one of the most prevalent chronic disorders in the United States,<sup>1</sup> afflicting an estimated 25.7 million Americans.<sup>2</sup> In 2010, 18.7 million adults aged 18 or older and 7 million children aged 17 or below had asthma.<sup>2</sup> From 2000 to 2004, asthma accounted for an estimated annual 13.6 million physician office visits, 14 million work/school days lost, 1.8 million emergency department (ED) visits, and nearly 4,000 deaths annually.<sup>3</sup> However, the burden of asthma falls disproportionately on children, racial/ethnic minorities, and persons with lower socioeconomic status.<sup>3,4,5,6</sup>

Asthma-related health disparities among racial/ethnic groups are caused by multiple, complex health-related and sociodemographic risk factors. These risk factors include poverty, cigarette smoking, prematurity or low birth weight, indoor and outdoor air quality, obesity, allergen exposure, viral respiratory infections, psychological distress, and poor adherence.<sup>7</sup> Disparities in asthma prevalence persist despite numerous clinical and public health interventions and the implementation of national guidelines for asthma diagnosis, treatment, and education.<sup>8,9</sup> Non-Hispanic blacks have a higher rate of asthma-related emergency department visits, hospitalizations, and mortality than non-Hispanic whites.<sup>2</sup> Children, regardless of race/ethnicity, visit a healthcare provider for asthma-related problems more frequently than adults.<sup>2</sup> In general, low-income, uninsured, or minority persons living with asthma consistently experience poorer asthma outcomes when compared to persons living with asthma who have higher income, health insurance, and do not belong to a racial/ethnic minority.<sup>5</sup>

Previous studies have described the varying effect that socioeconomic and environmental factors have on explaining asthma disparities,<sup>10,11</sup> however, understanding of how these factors influence racial/ethnic differences in asthma prevalence, morbidity, and health care utilization is limited. We used 10 years of nationally representative data from the National Health Interview Survey (NHIS) to describe racial/ethnic disparities in asthma prevalence, morbidity, and asthma-related emergency room visits and to explore sociodemographic and healthcare-related factors associated with them.

## METHODS

### Data Source

NHIS is an in-person annual health survey of the civilian, non-institutionalized population of the United States.<sup>12</sup> A representative sample of households and non-institutional quarters were included using a multi-stage probability sampling process. Hispanic, Black, and Asian populations were oversampled to allow for more precise estimation of these minority groups. Data from the Sample Adult Core and Sample Child Core components of the 2001–2010 NHIS were included in the analysis. An adult family member was selected to act as a

proxy respondent for children aged 0–17 years. We restricted analyses to respondents who provided complete data on asthma status.

### Description of Variables

Considering asthma prevalence and disease characteristics, separate analyses were carried out for the child (<18 years) and adult (≥ 18 years) sample population. An individual was considered to have current asthma if he/she responded 'yes' to both of the following questions: "Has a doctor or other health professional ever told you that you have asthma?" and "Do you still have asthma?"

Respondents were considered to have had an asthma episode in past 12 months if they had current asthma and responded 'yes' to the question "During the past 12 months, have you had an episode of asthma or an asthma attack?" An individual with current asthma was considered to have an asthma-related emergency department or urgent care center (ED/UCC) visit if they had answered "yes" to the two questions, "During the past 12 months, have you had an episode of asthma or an asthma attack?" and "During the past 12 months, have you had to visit an emergency room or urgent care center because of asthma?"

Respondents were classified as either 'USS-born' (born in the 50 U.S. states or Washington DC area) or 'non-USS-born' (born elsewhere) according to their reported place of birth. Although persons born in the U.S. territories (e.g., Puerto Rico and Guam,) are citizens of the U.S., place of birth was considered a proxy for migration to a different physical environment. Respondents of Hispanic origin were classified as either Puerto Rican or other Hispanic. Those who were not of Hispanic origin were categorized as non-Hispanic White, non-Hispanic Black, American Indian/Alaskan Native (AI/AN), and Asian. These two groups were combined to create the race/ethnicity variables.

Additional demographic and health-related covariates were selected for further consideration in our analyses if the literature suggested relevance or an important association with asthma or asthma disparities. Variables selected are: age (children: 5 years, 6–11 years, and 12–17 years; adults: 18–24 years, 25–44 years, 45–64 years, ≥ 65 years), health insurance coverage (private, public, not insured), homeownership status (own, rent, rental assistance), and region of residence (Northeast, Midwest, South, West). The family income to federal poverty level (FPL) ratio was calculated by dividing family income by the appropriate poverty threshold for each year, adjusting for family size.<sup>13</sup> For the 10-year study period, values for the family income to FPL ratio were not available for approximately 20% of the population surveyed; missing values were imputed based on procedures specified by NCHS.<sup>14</sup> Income to FPL ratio was categorized as poor (< 0.99), near poor (1.00–1.99), and not poor (≥ 2.00). Information on children's birth weight (low birth weight = < 2500 grams at birth) were included. Other variables included for analysis of adult sample were respondent's education level (less than a high school diploma/GED, high school graduate/GED or more), smoking status (current, former, never), body mass index (< 24.99 = normal or underweight, 25.00–29.99 = overweight, and ≥ 30.00 = obese), having a usual source of medical care, and having a co-morbid (e.g., coronary heart disease, emphysema, diabetes, chronic bronchitis) condition (none, 1–2, 3 or more).

Additional analyses were conducted separately for the 2003 and 2008 NHIS survey that included supplemental questions for asthma control and management. Adults and children were asked: “Have you ever taken the preventive kind of asthma medicine (including both oral medicine and inhalers) used every day to protect your lungs and keep you from having attacks?”; “Has a doctor or other health professional ever given you an asthma management plan?”; “Have you ever taken a course or class on how to manage asthma yourself?”; “Has a doctor or other health professional ever taught you how to recognize early signs or symptoms of an asthma episode?”; “Has a doctor or other health professional ever taught you how to respond to episodes of asthma?”; “Has a doctor or other health professional ever taught you how to monitor peak flow for daily therapy?”; and “Has a doctor or other health professional ever advised you to change things in your home, school, or work to improve your asthma?” Respondents were considered to have received that component of asthma control or management if they responded ‘yes’ to the corresponding question.

### Statistical Analysis

All analyses were performed using SUDAAN software (Release 10.0, Research Triangle Institute, Research Triangle Park, NC). Multivariate logistic regression was used to estimate the association between current asthma status, and occurrence of asthma episodes in past 12 months, or asthma-related ED/UCC visit in past 12 months among racial/ethnic groups for children and adults. A forward selection approach was used to determine whether a preliminarily selected variable based on the literature would be in the final model. The most significant variable (based on smallest p-value or lowest  $-2 \log$  likelihood estimate) in univariate logistic regressions included in the model first followed by the next significant variable until there was no significant change in the  $-2 \log$  likelihood estimate of the model for the addition of variables. Age, sex, race/ethnicity and country of birth were included in the base model. The respective year of the survey was included in the model in order to adjust for variability in asthma prevalence and morbidity within the specified time period. Chunk test was performed to include significant two-way interactions in the final model. Model-adjusted risk ratios and prevalence estimates (i.e., predicted marginals) were reported with 95% confidence intervals (CI). Ten years of data were aggregated to increase statistical power and reliability of estimates. All analyses accounted for the complex survey NHIS survey design and data weights.<sup>14</sup> Weights were divided by ten to adjust for multiple years of data.

## RESULTS

A total of 113,464 children and 281,665 adults were included in this analysis. From 2001–2010, 9.0% children and 7.2% adults had current asthma. Tables 1 and 2 describe the characteristics of children and adults with current asthma by race/ethnicity. In general, demographic and health-related risk factors for asthma varied significantly by race/ethnicity for children and adults. Among children, a higher proportion of Non-Hispanic blacks, AI/ANs, Puerto Ricans, and other Hispanics were poorer when compared to Non-Hispanic whites and Asians. Among adults with current asthma, a higher proportions of Non-Hispanic blacks, AI/ANs, Puerto Ricans, and other Hispanic adults reported being obese, having less

than a high school diploma/GED, being poor, and being uninsured when compared to Non-Hispanic whites and Asians.

Crude and adjusted prevalence estimates and adjusted risk ratios (ARR) for current asthma, asthma episode in past 12 months, and asthma-related ED/UCC visit in past 12 months among children and adults are shown in Table 3. The adjusted average annual estimated prevalence for current asthma among children ranged from 6.7% for Asians, followed by other Hispanics (7%), Non-Hispanic whites (8.6%), Non-Hispanic blacks (12.5%), Puerto Ricans (14.3%), and for AI/ANs (15.1%). Non-Hispanic blacks (ARR: 1.46; CI: 1.06 – 2.02) and Puerto Ricans (ARR: 1.66; CI: 1.08 – 2.58), and AI/ANs (ARR: 1.76 CI: 1.01 – 3.08) were significantly more likely to report current asthma than Non-Hispanic whites. Non-Hispanic blacks (ARR: 1.61; CI: 1.10 – 2.35) and Puerto Ricans (ARR: 1.66; CI: 1.05 – 2.62) were significantly more likely to report an asthma-related ED/UCC visit in the past 12 months compared to non-Hispanic whites.

The adjusted average annual estimated prevalence for current asthma among adults ranged from 6.2% for other Hispanics, to for Puerto Ricans (11.6 %). Puerto Ricans were significantly more likely to have current asthma than non-Hispanic whites (ARR: 1.60; CI: 1.04 – 2.45). The adjusted prevalence of adults with asthma reporting an asthma episode in the past 12 months ranged from 46.2% for Non-Hispanic blacks to 60.3% for AI/AN. Adjusted prevalence of reporting an asthma-related ED/UCC visit in the past 12 months was ranged from 20.8% for Non-Hispanic whites to 37.1% Non-Hispanic blacks; in addition, Non-Hispanic blacks (ARR: 1.78; CI: 1.25 – 2.54) and Puerto Ricans (ARR: 1.71; CI: 1.05 – 2.81) were significantly more likely to report an asthma-related ED/UCC visit in the past 12 months.

## DISCUSSION

Our study demonstrates that although racial/ethnic disparities in current asthma prevalence exist among children and adults, the most prominent differences occur among adults with asthma-related ED/UCC visits. Overall, differences in current asthma prevalence remained among children and after adjusting for sociodemographic and healthcare-related factors. Prevalence of asthma episodes did not vary among racial/ethnic groups; however, Non-Hispanic black and Puerto Rican adults and children were more likely to have an asthma-related ED/UCC visit than Non-Hispanic whites. The findings of this study make an important contribution by using over a decade of nationally representative data to produce comprehensive and generalizable estimates of racial/ethnic differences in asthma prevalence, morbidity, and health care utilization.

Our findings were consistent with previous studies in that we did not identify any significant differences among racial/ethnic groups in the risk of reporting an asthma episode, yet we identified the most apparent differences among use of the ED for asthma treatment.<sup>10</sup> Even after adjusting for health-related and socioeconomic factors, the prevalence of asthma-related ED/UCC visits among Non-Hispanic black and Puerto Rican adults and children was nearly double that of Non-Hispanic whites. There has been consistent evidence for the relative overuse of emergency care for asthma treatment among minorities. It is important to

note that minorities are more likely to have uncontrolled or severe asthma which may result in their overuse of the emergency department.<sup>15</sup> Factors associated with uncontrolled or severe asthma among minorities include: genetic and environmental risk factors, poor access to health care, socioeconomic status, and cultural beliefs.<sup>6</sup> Previous studies have reported that blacks and Hispanics rely less on routine care and more on emergency care for asthma.<sup>16,17</sup> Use of emergency services for asthma care among minorities often occurs with several other factors which include but are not limited to: underuse of long-term control medications; asthma management and treatment inconsistent with national guidelines; difficulties in access to primary care in urban environments; shortages in primary care physicians; cultural differences in attitudes and beliefs regarding adherence to asthma medication.<sup>6</sup> The emergency department represents an alternative health care setting that is devoid of the barriers to primary care, that include difficulties in making appointments and inconvenient office hours, which have been shown to hinder minorities from using primary care.<sup>18</sup> However, it is important to note that studies have found that severity of asthma attacks seen in the ED are similar for black and white patients, and that ED visits among minority patients may not represent more mild attacks or inappropriate ED use.<sup>19-21</sup>

In a sub-analysis to examine the level of asthma management and control among different racial subgroups, we found that children and adults, regardless of race, who have received emergency care for asthma, had higher prevalence of receiving multiple components of asthma management and control (i.e. taken a long-term controller medicine for asthma; have an asthma management plan; taken a class to learn how to manage asthma; have been taught to recognize signs of an asthma attack; have been taught how to use a peak flow meter; and given advice on environmental remediation [Table 4]) than those with current asthma without an asthma-related ER visit in the past 12 months. Individuals with asthma that receive and adhere to these components should have well controlled asthma and be less likely to end up in the emergency department due to an asthma attack. This alludes to the possibility that some of these components were administered after their ED visits for asthma. For example, some of them might have received long-term controller medication at the ED visit. However, limitations in the data available restrict further research on this issue. This also highlights the need to increase the administration of components of asthma management and control in a primary care setting in order to reduce emergency health care utilization.

Patient education concerning self-management is one of the four key components of effective asthma management listed in the National Institute of Health guidelines developed by the National Asthma Education and Prevention Program (NAEPP).<sup>22</sup> An expanding body of research indicates that people with asthma who possess a better understanding of their diagnosis, treatment, and care are able to effectively self-manage their disease, thereby experiencing less asthma morbidity, reducing emergency health care utilization and lost days of work.<sup>23-32</sup> Research has shown that asthma self-management and patient education has been effective in improving outcomes in high-risk populations.<sup>21</sup> Clinical and community interventions have demonstrated that the burden of asthma among minorities can be reduced through environmental remediation, asthma education and management programs designed for minority groups, increasing the use of long-term controller medication, and culturally competent care consistent with the NAEPP guidelines.<sup>27</sup> These



approaches have reported short-term improvements in outcome measures including lung function, self-efficacy, absenteeism from school, number of days of restricted activity, and number of visits to an emergency department.<sup>33–37</sup>

Several reports indicate that the emergency department can be used as a setting for asthma education<sup>38</sup> with the implementation of a standard curriculum<sup>39</sup> and the use of written care plans.<sup>40</sup> However, resources in the emergency department, including time and staff, are not always ideal for providing long-term care and education for asthmatics.<sup>41</sup> Depending on the illness severity of patients seen, resources may shift to those most in need of immediate care. Overall effectiveness of asthma education and interventions for control delivered through an emergency department setting should be evaluated for asthma patients who continue to use the emergency department as a primary source of care. However, from a public health perspective, provision of comprehensive asthma control measures should be implemented at time of diagnosis and in non-emergency settings as a mean to decrease emergency department use and to reduce asthma-related healthcare burden both in terms of cost and utilization.

This study was subject to the following limitations. Responses to the NHIS are not confirmed by medical records or follow-up with health-care providers, so inaccurate reporting of asthma might result in misclassification during analysis. Also, the NHIS does not provide data on specific details of asthma management which should be taken into account. Another notable limitation was that the NHIS does not provide data on precise measures for indoor/outdoor air pollution. Indoor allergens from dust mites, cockroaches, pets, environmental tobacco smoke, mold, and outdoor pollutants (such as ozone, nitrogen oxides, and airborne particulate matter) have been linked to adult and childhood asthma.<sup>42</sup> However, as much as 40% of asthma in minority children has been attributed to exposure to residential allergens, and minority children have been found to live in homes that have high allergen levels, low indoor air quality, and live in environments with more air pollution.<sup>43</sup> Exposures to residential allergens also have been associated with living in urban environments of which the majority of this population is comprised of lower income minorities.<sup>44</sup> Our study found that the proportion of Non-Hispanic black and Puerto Rican children with asthma that reported receiving rental assistance was over seven times that of Non-Hispanic white children. The inclusion of direct environmental measures could have been used to better describe differences in prevalence and morbidity among racial/ethnic groups.

## Conclusion

Racial/ethnic disparities in asthma-related emergency treatment might represent larger disparities not included in this study such as asthma hospitalization. These disparities may stem from differences in socio-economic status (e.g., income), access to healthcare (e.g., health insurance, having a usual place of healthcare), or lack of appropriate and effective asthma education and management. Further research on emergency department visits and utilization might identify prevention opportunities and appropriate interventions.

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**Table 1**

Demographic and health-related characteristics of children with asthma, National Health Interview Survey 2001 – 2010

	Race/Ethnicity (%)						
	Total	Non-Hispanic White	Non-Hispanic Black	Puerto Rican	Other Hispanic	Asian	AI/AN
<b>Total, unweighted</b>	<b>10153</b>	<b>4636</b>	<b>2647</b>	<b>542</b>	<b>1964</b>	<b>276</b>	<b>88</b>
<b>Age *</b>							
0 – 5	25.0	21.0	30.0	32.6	29.5	29.6	22.1
6 – 11	36.1	35.5	36.2	35.3	37.5	39.2	39.8
12 – 17	39.0	43.6	33.8	32.1	33.0	31.2	38.1
<b>Gender *</b>							
Male	58.5	58.4	57.8	61.1	59.2	60.6	50.9
Female	41.5	41.6	42.2	38.9	40.8	39.4	49.1
<b>Country of Birth *</b>							
US-Born	97.5	98.9	98.8	90.3	94.7	82.4	99.0
Non-US-born	2.5	1.2	1.2	9.7	5.3	17.6	1.0
<b>Low Birth Weight *</b>							
Yes	12.8	10.2	19.2	15.4	12.0	13.0	9.9
No	87.2	89.8	80.8	84.6	88.0	87.1	90.2
<b>Federal Poverty Level Ratio *</b>							
Poor	24.5	14.2	41.0	46.5	32.8	10.1	32.3
Near Poor	23.0	20.2	25.2	24.7	30.8	14.1	33.6
Not Poor	52.6	65.6	33.8	28.8	36.5	75.8	34.0
<b>Housing Status *</b>							
Own Home	61.6	76.6	37.2	30.9	50.7	74.6	44.8
Rent	29.0	20.1	40.3	42.9	41.3	22.6	43.0
Rent Assistance	9.5	3.3	22.5	26.3	8.0	2.8	12.2
<b>Region of Residence *</b>							
Northeast	20.1	20.3	17.5	66.9	10.9	21.7	9.7
Midwest	25.0	31.0	23.3	7.1	10.7	20.2	18.6
South	36.6	32.2	51.7	21.8	36.2	13.4	41.7
West	18.3	16.6	7.6	4.1	42.2	44.7	30.1

Note: AI/AN= American Indian/Alaskan Natives;

\* *P* value < 0.05

**Table 2**

Demographic and health-related characteristics of adults with asthma, National Health Interview Survey 2001 – 2010

	Race/Ethnicity %						
	Total	Non-Hispanic White	Non-Hispanic Black	Puerto Rican	Other Hispanic	Asian	AI/AN
<b>Total, unweighted</b>	<b>20472</b>	<b>13368</b>	<b>3552</b>	<b>785</b>	<b>2055</b>	<b>509</b>	<b>203</b>
<b>Age *</b>							
18 – 24	15.0	13.8	19.5	17.8	18.5	15.2	11.3
25 – 44	34.9	33.2	37.8	41.1	43.7	38.6	36.0
45 – 64	34.2	35.4	31.3	30.3	27.3	30.4	47.1
65	16.0	17.6	11.4	10.8	10.5	15.8	5.6
<b>Gender *</b>							
Male	35.3	35.9	31.4	32.2	36.5	42.8	26.9
Female	64.7	64.1	68.6	67.8	63.5	57.2	73.2
<b>Country of Birth *</b>							
US-Born	91.9	97.2	95.6	51.6	61.9	33.9	95.2
Non-US-born	8.1	2.8	4.4	48.4	38.1	66.2	4.8
<b>Body Mass Index *</b>							
Normal or Underweight	33.0	34.9	24.6	24.4	26.3	50.9	26.9
Overweight	30.7	31.5	26.1	29.4	32.2	30.3	24.0
Obese	36.4	33.6	49.3	46.2	41.5	18.8	49.1
<b>Comorbid Condition *</b>							
None	34.8	33.3	35.3	34.5	45.1	48.9	30.2
1 – 2	41.5	42.0	41.2	42.9	38.3	37.6	40.0
3	23.7	24.7	23.6	22.7	16.6	13.5	29.8
<b>Smoking Status *</b>							
Current	23.9	24.9	23.6	22.3	16.6	12.4	36.7
Former	24.2	26.6	16.3	18.2	18.6	16.9	23.2
Never	51.9	48.5	60.1	59.5	64.8	70.7	40.1
<b>Education *</b>							
Some High School	17.6	14.5	25.2	36.9	32.1	11.4	21.1
High School Diploma or More	82.4	85.5	74.8	63.1	67.9	88.6	78.9
<b>Federal Poverty Level Ratio *</b>							
Poor	17.0	13.6	30.4	33.5	23.4	11.1	25.3
Near Poor	19.9	18.6	24.3	21.3	25.6	15.3	29.6
Not Poor	63.1	67.9	45.3	45.2	51.0	73.7	45.1
<b>Home Ownership *</b>							
Own Home	66.1	72.0	45.5	36.2	54.2	63.8	58.3
Rent	28.1	24.4	39.6	41.5	39.3	31.8	34.8

	Race/Ethnicity %						
	Total	Non-Hispanic White	Non-Hispanic Black	Puerto Rican	Other Hispanic	Asian	AI/AN
Rent Assistance	5.8	3.6	14.9	22.3	6.5	4.5	6.9
<b>Insurance Coverage *</b>							
Yes	14.0	12.1	18.7	14.3	23.5	13.0	29.9
No	86.0	87.9	81.3	85.7	76.5	87.0	70.1
<b>Usual Place of Care</b>							
Yes	90.5	91.8	88.5	90.6	82.0	87.0	86.0
No	9.5	8.2	11.5	9.4	18.0	13.0	14.0
<b>Region of Residence *</b>							
Northeast	19.8	20.1	16.3	61.9	10.6	15.2	10.3
Midwest	25.4	28.3	23.8	10.6	8.4	11.5	23.2
South	33.1	31.2	50.7	18.7	30.1	18.4	31.8
West	21.7	20.4	9.3	8.9	50.9	54.9	34.7

Note: AI/AN= American Indian/Alaskan Natives;

\*  $P$  value < 0.05

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**Table 3**

Crude and adjusted prevalence and adjusted risk ratios for asthma, asthma episode in past 12 months, and asthma-related emergency room or urgent care center visit in past 12 months among children and adults by race/ethnicity, National Health Interview Survey 2001 – 2010

Race/Ethnicity	Crude Prevalence	Adjusted Prevalence	Adjusted RR (95% CI)
<b>Current Asthma<sup>A</sup> (Child)</b>			
Non-Hispanic White	8.2	8.4	1.00
Non-Hispanic Black	13.8	12.6	<b>1.49 (1.09 – 2.04)</b>
Puerto Rican	18.2	13.6	<b>1.62 (1.04 – 2.52)</b>
Other Hispanic	6.6	7.4	0.87 (0.56 – 1.37)
Asian	5.9	5.7	0.67 (0.32 – 1.40)
AI/AN	12.2	14.9	<b>1.77 (1.01 – 3.12)</b>
<b>Asthma Episode in Past 12 Months<sup>B</sup> (Child)</b>			
Non-Hispanic White	59.9	60.4	1.00
Non-Hispanic Black	56.5	56.0	0.93 (0.66 – 1.30)
Puerto Rican	60.3	59.4	0.98 (0.64 – 1.51)
Other Hispanic	55.7	54.9	0.91 (0.62 – 1.34)
Asian	59.8	58.9	0.98 (0.59 – 1.62)
AI/AN	64.0	64.1	1.06 (0.57 – 1.98)
<b>Asthma-Related ED/UCC Visit in Past 12 Months<sup>C</sup> (Child)</b>			
Non-Hispanic White	25.1	27.5	1.00
Non-Hispanic Black	51.3	46.1	<b>1.68 (1.14 – 2.46)</b>
Puerto Rican	55.4	47.1	<b>1.71 (1.09 – 2.68)</b>
Other Hispanic	38.1	36.3	1.32 (0.81 – 2.14)
Asian	28.0	33.2	1.21 (0.59 – 2.46)
AI/AN	36.9	36.3	1.32 (0.60 – 2.89)
<b>Current Asthma<sup>D</sup> (Adult)</b>			
Non-Hispanic White	7.4	7.2	1.00
Non-Hispanic Black	7.9	6.9	0.96 (0.67 – 1.38)
Puerto Rican	13.4	10.8	1.51 (0.96 – 2.38)
Other Hispanic	4.1	6.1	0.84 (0.50 – 1.42)
Asian	4.0	6.3	0.88 (0.45 – 1.72)
AI/AN	11.3	10.4	1.46 (0.74 – 2.86)
<b>Asthma Episode in Past 12 Months<sup>E</sup> (Adult)</b>			
Non-Hispanic White	50.6	51.2	1.00
Non-Hispanic Black	49.4	47.0	0.92 (0.65 – 1.30)
Puerto Rican	59.8	55.4	1.08 (0.68 – 1.72)
Other Hispanic	52.2	49.5	0.97 (0.65 – 1.45)
Asian	47.7	46.5	0.91 (0.52 – 1.60)
AI/AN	68.3	63.6	1.24 (0.76 – 2.03)



Race/Ethnicity	Crude Prevalence	Adjusted Prevalence	Adjusted RR (95% CI)
<b>Asthma-Related ED/UCC Visit in Past 12 Months<sup>F</sup> (Adult)</b>			
Non-Hispanic White	20.0	21.3	1.00
Non-Hispanic Black	41.4	38.5	<b>1.80 (1.26 – 2.58)</b>
Puerto Rican	42.2	36.1	<b>1.70 (1.01 – 2.84)</b>
Other Hispanic	33.6	31.3	1.47 (0.87 – 2.48)
Asian	26.4	17.9	0.84 (0.29 – 2.47)
AI/AN	34.9	26.3	1.23 (0.58 – 2.62)

Note: AI/AN= American Indian/Alaskan Natives; RR = Risk Ratio; CI = Confidence Interval

<sup>A</sup> Adjusted for gender, age, country of birth, federal poverty level, region, home ownership, low birth weight, survey year, including significant interactions with age, sex, race/ethnicity, and country of birth.

<sup>B</sup> Adjusted for gender, age, country of birth, low birth weight, survey year.

<sup>C</sup> Adjusted for gender, age, country of birth, federal poverty level, region, home ownership, low birth weight, survey year.

<sup>D</sup> Adjusted for gender, age, country of birth, federal poverty level, education, region, smoking status, home ownership, body mass index, co-morbid conditions, usual place of care, insurance coverage, survey year, including significant interactions with age, sex, race/ethnicity, and country of birth.

<sup>E</sup> Adjusted for gender, age, country of birth, federal poverty level, region, smoking status, home ownership, body mass index, co-morbid conditions, usual place of care, insurance coverage, survey year, including significant interactions with age, sex, race/ethnicity, and country of birth.

<sup>F</sup> Adjusted for gender, age, country of birth, federal poverty level, education, region, smoking status, home ownership, body mass index, co-morbid conditions, usual place of care, insurance coverage, survey year, including significant interactions with age, sex, race/ethnicity, and country of birth.

**Table 4**

Prevalence of asthma self-management components among children and adults who reported asthma, asthma episode in past 12 months, and asthma-related emergency room or urgent care center visit in past 12 months by race/ethnicity, National Health Interview Survey 2003 & 2008

Race/Ethnicity	Taken Long-Term Control Medicine	Have an Asthma Management Plan	Taken Class to Learn to Manage Asthma	Taught to Recognize Signs of Asthma Attack	Taught to Respond to Asthma Attack	Taught to Use a Peak Flow Meter	Given Advice on Environmental Remediation
<b>Current Asthma (Child)</b>							
Non-Hispanic White	55.5	41.5	8.6	73.1	78.6	52.5	52.7
Non-Hispanic Black	48.3*	45.7	19.7*	74.6	79.1	59.0	56.1
Puerto Rican	48.0	41.0	17.4*	78.8	81.7	56.7	56.7
Other Hispanic	44.6*	39.2	11.5	62.1	66.3*	45.1	39.3*
Asian	54.6	43.9	5.7	66.4	96.6*	52.2	52.4
AI/AN	33.5	22.6	3.0	56.8	75.7	42.3	45.6
<b>Asthma Episode in Past 12 Months (Child)</b>							
Non-Hispanic White	60.6	46.7	11.1	77.1	84.6	54.8	56.5
Non-Hispanic Black	54.7	52.6	23.0*	76.9	81.3	63.8	61.1
Puerto Rican	56.5	47.1	20.2	78.5	78.3	51.7	50.2
Other Hispanic	55.7	44.3	14.3	64.9*	68.6*	45.4	45.2
Asian	58.9	44.8	4.1	61.0	97.2	51.7	58.1
AI/AN	32.0*	26.2	4.6	55.1	84.2	43.9	39.6
<b>Asthma-Related ED/UCC Visit in Past 12 Months (Child)</b>							
Non-Hispanic White	73.9	50.1	15.8	80.4	87.8	66.7	62.0
Non-Hispanic Black	60.7	52.5	22.3	80.3	84.4	68.5	63.0
Puerto Rican	53.7	48.0	15.4	85.4	85.1	45.9	43.6
Other Hispanic	64.0	43.1	13.7	67.6	68.7*	49.2	42.6
<b>Current Asthma (Adult)</b>							
Non-Hispanic White	56.6	31.4	11.3	53.2	64.2	40.5	48.7
Non-Hispanic Black	45.8*	35.1	15.6*	61.9*	67.3	48.6*	47.4
Puerto Rican	55.6	41.0	16.8	68.8*	67.8	52.4*	48.5
Other Hispanic	43.0*	22.9*	10.9	52.0	56.7*	38.8	38.9
Asian	40.6*	34.2	14.0	65.9	73.3	45.7	50.4
AI/AN	43.1	34.1	29.8	69.8	71.6	48.1	67.3*
<b>Asthma Episode in Past 12 Months (Adult)</b>							
Non-Hispanic White	65.2	36.7	14.2	57.1	70.8	47.2	55.7
Non-Hispanic Black	53.2*	41.9	20.3*	67.3*	73.3	57.3*	59.8
Puerto Rican	61.9	38.7	22.7	81.4*	79.3	59.8	49.6
Other Hispanic	52.9*	27.0*	15.3	54.9	60.7*	41.4	43.4*
Asian	65.9	52.0	19.2	74.5	79.3	61.4	65.7
AI/AN	50.6	38.2	32.8*	75.2	74.3	49.8	73.9
<b>Asthma-Related ED/UCC Visit in Past 12 Months (Adult)</b>							
Non-Hispanic White	73.5	44.4	17.6	58.1	73.0	57.4	57.5

<b>Race/Ethnicity</b>	<b>Taken Long-Term Control Medicine</b>	<b>Have an Asthma Management Plan</b>	<b>Taken Class to Learn to Manage Asthma</b>	<b>Taught to Recognize Signs of Asthma Attack</b>	<b>Taught to Respond to Asthma Attack</b>	<b>Taught to Use a Peak Flow Meter</b>	<b>Given Advice on Environmental Remediation</b>
Non-Hispanic Black	68.2	51.2	28.8*	72.7	79.6	68.0	74.5*
Puerto Rican	86.7	54.9	27.8	83.5*	78.6	63.3	58.6
Other Hispanic	65.7	20.8*	23.9	53.7	56.6	49.0	51.1

Note: AI/AN= American Indian/Alaskan Natives

<sup>A</sup> Excludes Non-Hispanic Asians and AI/AN due to small sample size.

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