

# Race/Ethnicity and Asthma Among Children Presenting to the Emergency Department: Differences in Disease Severity and Management

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**ABSTRACT.** *Objective.* To investigate racial/ethnic differences in acute asthma among children who present to the emergency department (ED).

*Method.* We analyzed data from 2 prospective cohort studies performed during 1997–1998 as part of the Multicenter Airway Research Collaboration. Using a standardized protocol, researchers at 40 EDs in 18 US states provided 24-hour-per-day coverage for a median of 2 weeks per year. Children with acute asthma were interviewed in the ED and by telephone 2 weeks after discharge.

*Results.* Among 1095 patients, 679 (62%) were black, 256 (23%) were Hispanic, and 160 (15%) were white. Black and Hispanic children had greater histories of lifetime (63%, 64%, 46%) and past-year (34%, 31%, 14%) hospitalization and more ED visits in the past year (medians: 2, 3, 1). Asthma severity at ED presentation, ED management and course, hospitalization during the index visit, discharge prescriptions, and postdischarge outcomes were equivalent among all race/ethnic groups.

*Conclusion.* Despite pronounced race/ethnicity-based differences in chronic asthma, all racial/ethnic groups exhibited similar acute asthma severity, ED management, and course. However, given that black and Hispanic children exhibited much higher admission histories and past ED use, the equivalence in inhaled corticosteroid prescriptions on discharge is a disconcerting pattern that mirrors previous literature on outpatient prescription practices. In addition to barriers attributable to socioeconomic factors, health care providers and policy makers should target equalizing deficiencies in preventive medication prescription practices. *Pediatrics* 2003;111:e615–e621. URL: <http://www.pediatrics.org/cgi/content/full/111/5/e615>; *asthma, children, socioeconomic status, race, ethnicity, quality of care.*

ABBREVIATIONS. ED, emergency department; MARC, Multicenter Airway Research Collaboration; PCP, primary care provider; SES, socioeconomic status.

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Despite effective therapies, asthma prevalence, morbidity, and mortality among children is increasing in the United States, and the burden is being borne disproportionately by blacks and Hispanics.<sup>1–28</sup> Previous studies have focused primarily on racial/ethnic disparities noted in chronic care and management and have relied heavily on archival or billing data. To examine further the role of race/ethnicity on asthma among children who present to the emergency department (ED), we examined prospective data from the Multicenter Airway Research Collaboration (MARC). On the basis of previous research, we hypothesized that black and Hispanic children with asthma would 1) exhibit more severe respiratory distress on arrival to the ED, 2) receive less adequate care while in the ED, 3) be admitted more often from the ED during their index visit, and 4) be more likely to relapse or have continued symptoms during the 2 weeks postdischarge. We further hypothesized that sociodemographic factors (including parental education, income, and insurance status) and access to a primary care provider (PCP) would play an important role in the racial/ethnic differences observed.

## METHODS

We analyzed data from 2 prospective cohort studies performed during 1997–1998 as part of the MARC ([health.care.partners.org/marc](http://health.care.partners.org/marc)). Using a standardized protocol, researchers at 40 EDs in 18 US states provided 24-hour-per-day coverage for a median of 2 weeks and consecutively enrolled children. Inclusion criteria were physician diagnosis of acute asthma, ages 2 to 17, and the ability to give informed consent. Repeat visits by individual patients were excluded. All patients were treated at the discretion of the treating physician. The institutional review board at each hospital approved the study.

## Data Collection

The ED interview was conducted with the legal guardian who attended the ED visit with the child. We assessed sociodemographic characteristics, asthma history, and details of the current asthma exacerbation. Data on ED management, disposition, and discharge medications were obtained by chart review. Follow-up data were collected by telephone interview 2 weeks later. All forms were reviewed by site investigators before submission to the MARC Coordinating Center in Boston, where they underwent additional review by trained personnel and then double data entry.

## Sociodemographics and Race/Ethnicity

Age, gender, level of parental education, and insurance status were recorded. Consistent with other literature in this area,<sup>2,7,10,13,16,23</sup> median family income was estimated using patients' home zip codes.<sup>29</sup> Race/ethnicity was assigned by report of the

child's guardian to standard US Census categories. For the purpose of this analysis, mutually exclusive categories were determined: black (African-American, non-Hispanic), Hispanic, or white (non-Hispanic); patients designated as Asian or "other" ethnicity were excluded because of small numbers. Although limitations of self-report have been discussed in the literature,<sup>30–33</sup> it remains the most common and efficient manner by which to classify patients' race/ethnicity. Finally, patients' guardians were asked about whether the child had a PCP.

### *Chronic Asthma History*

We assessed patients' asthma medication use, including oral corticosteroids, rescue inhalers, and inhaled corticosteroids. We measured health care utilization via hospitalization history (ever and past year), number of ED visits in the past year, number of urgent clinic visits in the past year, and the source of their primary asthma care and prescriptions. Smoking status was recorded for patients 12 years and older. To examine further disease self-management, we assessed whether the patient owned a spacer device and peak-flow meter.

### *ED Course*

We collected both subjective and objective measures of acute asthma severity. "Severe symptoms" was assigned to patients who reported "severe symptoms" during the 24 hours preceding their ED presentation on at least 1 of 2 questions (asthma symptoms "most of the time" or "severe" discomfort and distress as a result of their asthma). Pulmonary index scores were calculated for patients ages 2 to 17 using respiratory rate, accessory muscle use, wheezing, and inspiration/expiration ratio.<sup>34</sup> On the basis of a scale of 0–3 for each item, a total was calculated with a maximum pulmonary index score of 12. A severity index was derived by dividing pulmonary index scores into quartiles using approximately the 25th, 50th, and 75th percentiles: 1, pulmonary index score <3; 2, pulmonary index score 3–4; 3, pulmonary index score 5–6; 4, pulmonary index score >6. We also recorded the number of inhaled  $\beta$ -agonist treatments given during the ED visit (within the first hour and total), whether the patient received oral corticosteroids, and treatment with other asthma-related medications. Finally, we recorded whether a comorbid medical condition was present (eg, pneumonia), calculated ED length of stay, and ED disposition and discharge medications.

### *Two-Week Follow-up*

All patients were called 2 weeks after their discharge from the ED. Relapse was defined as any urgent visit to an ED or clinic for worsening of asthma during the 2-week follow-up period. The number of days between discharge from the ED and the date of relapse was recorded. An "ongoing exacerbation" classification was assigned to patients who reported "severe symptoms" during the preceding 24 hours on any 1 of 2 questions (asthma symptoms "most of the time" or "severe" discomfort and distress as a result of their asthma) or who stated that their asthma was "about the same" or worse than at the time of their ED presentation.

### **Statistical Analysis**

All analyses were performed using STATA 7.0 (Stata Corp, College Station, TX). Data are presented as proportions, means (with standard deviation), or medians (with interquartile range). The association between race/ethnicity and other factors was examined using  $\chi^2$ , analysis of variance, and Kruskal-Wallis tests, as appropriate. Multivariate models were performed to examine the adjusted association between race/ethnicity and initial pulmonary index score, hospitalization during the index ED visit, and postdischarge outcome. The possibility of a period effect was examined by adjusting for period of enrollment, but this did not materially affect any of the results that follow (data not shown). All odds ratios are presented with 95% confidence intervals. All *P* values are 2-sided. Considering the large sample size and the risk of multiple testing error, *P* < .01 was considered statistically significant.

## **RESULTS**

A total of 1127 patients were enrolled. Seven patients were excluded because race/ethnicity data

were missing. Because of small numbers, 25 patients who were identified as Asian or "other" race/ethnicity also were excluded. Among the 1095 patients included in this analysis, 679 (62%) were black, 256 (23%) were Hispanic, and 160 (15%) were white.

### **Sociodemographics**

Sociodemographic characteristics by race/ethnicity are presented in Table 1. Trends show that black and Hispanic children tended to be from households with a lower socioeconomic status (SES) than did whites. Blacks had lower median incomes than whites but had similar rates of parents who graduated from high school. Insurance status differed significantly on the basis of race/ethnicity. All groups had equal likelihood of having a PCP.

### **Chronic Asthma History**

Chronic asthma history by race/ethnicity also is presented in Table 1. Black and Hispanic children had higher rates of hospitalization (lifetime and past year). They also had more ED visits in the past year and were far more likely to state that they used the ED as their primary source of asthma care and prescriptions. Hispanic children also had more urgent clinic visits in the past year. All subjects were equally likely to have recently used systemic corticosteroids and inhaled bronchodilators. Although minority patients were less likely to have used inhaled corticosteroids, this did not reach statistical significance. All racial/ethnic groups were equally likely to have had a history of intubation.

### **Acute Presentation and ED Course**

Data on acute asthma presentation and ED course are presented in Table 2. Race/ethnicity was not related to pulmonary index scores, medications received while in the ED, length of stay, or hospitalization. All racial/ethnic groups were equally likely to be discharged on systemic and inhaled corticosteroids.

### **Two-Week Follow-up**

Results are presented in Table 2. Approximately 18% of children experienced a relapse event or an ongoing exacerbation. Race/ethnicity was not related to likelihood of short-term relapse or ongoing exacerbation.

### **Multivariate Analyses**

Multivariate analyses revealed that, after adjusting for sociodemographic factors, race/ethnicity remained unrelated to initial severity, hospitalization during the index ED visit, and postdischarge outcome (data not shown). A multivariate analysis predicting discharge on a new inhaled corticosteroid prescription was conducted (Table 3). Subjective perception of attack severity was the strongest predictor of receiving a prescription.

## **DISCUSSION**

Our study focused on exploring the race/ethnicity differences in acute asthma among children being treated in 40 EDs across 18 US states. Our data indi-

**TABLE 1.** Demographic and Chronic Asthma Characteristics of US Children With Acute Asthma, According to Race/Ethnicity

	Black ( <i>n</i> = 679)	Hispanic ( <i>n</i> = 256)	White ( <i>n</i> = 160)	<i>P</i> Value
Demographic factors				
Age (y); mean ± SD	7.7 ± 4.0	7.9 ± 4.2	.28	
Female (%)	38	43	45	.15
High school graduate (%)*	76	51	78	<.001
Estimated household income (median [IQR])	27 527 (21 520–35 671)	24 661 (17 366–32 707)	38 286 (31 557–45 904)	<.001
Insurance status (%)				
Private	42	26	56	
Medicaid	36	32	17	
Other public	8	22	15	
None	13	21	12	
PCP status (%)	91	90	93	.51
Chronic asthma factors				
Ever taken steroid medicine for asthma (%)	73	73	74	.92
Ever hospitalized for asthma (%)	63	64	46	<.001
Ever intubated for asthma (%)	4	7	4	.26
Hay fever (%)	42	41	49	.21
Current smoker (%)†	7	11	14	.44
Inhaled β-agonist during past 4 weeks (%)	73	77	71	.30
Inhaled corticosteroids during past 4 weeks (%)	19	18	25	.16
Inhaled cromolyn during past 4 weeks (%)	28	33	26	.20
Other asthma medication during past 4 weeks (%)	18	16	17	.75
No. of ED visits in past year (median [IQR])	2 (1–4)	3 (1–5)	1 (0–2)	<.001
No. of urgent clinic visits in past year (median [IQR])	1 (0–3)	2 (0–5)	1 (0–3)	.03
Owns a spacer (%)	44	47	46	.66
Owns a peak flow meter (%)	31	22	33	.007
Has a written action plan (%)	36	33	33	.59
Admitted for asthma in past year (%)	34	31	14	<.001
ED usual site of care for asthma problems (%)	69	64	44	<.001
ED usual source of asthma prescriptions (%)	36	31	15	<.001

SD indicates standard deviation; IQR, interquartile range.

\* Parent/guardian's education level.

† Available for children ages 12–17.

**TABLE 2.** Acute Asthma Presentation, ED Course, and 2-Week Follow-up of US Children, According to Race/Ethnicity

	Black ( <i>n</i> = 679)	Hispanic ( <i>n</i> = 256)	White ( <i>n</i> = 160)	<i>P</i> Value
Presentation				
Duration of symptoms <24 h (%)	66	64	63	.79
Severe symptoms (%) *	63	67	68	.42
ED course				
Pulmonary index score (mean ± SD)*	4.4 ± 2.4	4.3 ± 2.3	4.1 ± 2.4	.42
Severity score (%) *				.59
1 (mild)	24	23	26	
2	27	29	24	
3	26	29	32	
4 (severe)	22	19	18	
No. of inhaled β-agonists in first hour (mean ± SD)	1.8 ± 1.2	1.6 ± 0.8	1.9 ± 1.1	.03
No. of inhaled β-agonists over ED stay (mean ± SD)	3.2 ± 2.6	2.8 ± 1.7	3.2 ± 2.6	.03
Given steroid treatment (%)	80	77	77	.50
ED length of stay (min; median [IQR])	150 (110–205)	140 (110–205)	150 (115–219)	.64
Sent home on systemic corticosteroids (%) †	78	78	78	.98
Sent home on inhaled corticosteroids (new; %) †	4	4	6	.84
Admitted (%)	24	21	26	.49
Comorbid medical condition	3	6	6	.06
2-wk follow-up‡				
Hospital length of stay (d; median [IQR])	2 (2–3)	2 (2–3)	2 (2–3)	.57
Relapse within 2 wk of ED visit (%) §	8	13	8	.11
Days to relapse event (median [IQR])	4 (1–8)	3 (1–6)	2 (1–7)	.58
Ongoing exacerbation (%)*	10	11	9	.72
Relapse event or ongoing exacerbation (%)	17	22	14	.10

\* See Methods for details.

† Restricted to patients sent home from ED (*n* = 851).

‡ Restricted to patients with 2-week follow-up (*n* = 966).

§ Relapse event based on patient reporting a "worsening of asthma symptoms" that led to an urgent care visit.

cated that, although black and Hispanic children clearly have more severe chronic asthma as evidenced by greater histories of past asthma-related hospitalizations and more frequent ED visits, all racial/ethnic groups presented to the ED with equally

severe respiratory distress. This trend held true for both objective and subjective measures of severity. Moreover, all children received comparable care while in the ED and were hospitalized during the index ED visit at the same rate. Black and Hispanic

**TABLE 3.** Predictors of New Discharge Prescription of Inhaled Corticosteroids Among Children Not Reporting Recent Use of Inhaled Steroids

	Odds Ratio	95% Confidence Interval	P Value
Age (per ↑ 5 y)	2.0	1.3–3.1	.003
Race			
White	1.0	Reference	Reference
Black	0.8	0.3–2.2	.65
Hispanic	0.8	0.2–2.6	.66
No. ED visits during past year (per ↑ 5 visits)	1.5	1.0–2.2	.04
No. urgent clinic visits during past year (per ↑ 5 visits)	0.7	0.3–1.4	.26
Severe symptoms *	0.4	0.2–0.9	.02

\* See Methods for details.

children demonstrated equivalent relapse and health outcomes 2 weeks postdischarge when compared with white children. However, 1 important race/ethnicity-based finding was observed. Blacks and Hispanics were discharged on inhaled corticosteroids at the same rate as whites despite the aforementioned racial/ethnic differences in chronic asthma. If hospitalizations and ED visits were considered evidence for the need for inhaled corticosteroids, then one would have expected to see much higher rates of inhaled corticosteroid prescriptions among blacks and Hispanics.

#### Race/Ethnicity, Chronic Asthma, and Acute Asthma

Previous community and cohort research has convincingly shown that black and Hispanic children, when compared with white children, exhibit more poorly controlled chronic asthma and more frequent ED use and hospitalizations and receive suboptimal pharmacotherapy and preventive care.<sup>2,4,5,7,9–13,15–19,22–24,26,28,35,36</sup> Our data confirmed these unfortunate differences in chronic management and course. Black and Hispanic children among our sample reported histories of markedly greater hospitalization rates, both lifetime and within the past year, and they visited the ED much more frequently than whites. Although ~91% of each racial/ethnic group reported having a PCP, black and Hispanic patients more often reported receiving their routine asthma care and prescriptions from the ED.

Considering the strong link between race/ethnicity and poor chronic asthma management, we hypothesized that black and Hispanic children would present to the ED in more severe respiratory distress than white children. However, our data discontinued our hypothesis. Children from different racial/ethnic groups presented with equally severe exacerbations as represented by the pulmonary index score. This score is a well-validated indicator of respiratory distress among children and incorporates several objective measures, such as respiratory rate, severity of wheeze, and accessory muscle use. Moreover, even the patients' subjective assessments of symptom severity were equivalent. Approximately 65% of each group reported "severe" symptoms, and as many reported a duration of symptoms lasting for <24 hours. It is interesting that these trends argue against the contention that black and Hispanic patients "abuse" the ED by presenting with trivial

symptoms. When black and Hispanic children present to the ED, they have symptoms that are equally severe, both objectively and subjectively, as white children.

We found similar uniformity among racial/ethnic groups in ED management, hospitalization during the index ED visit, and short-term outcomes. All groups received roughly the same number of inhaled  $\beta$ -agonists and were equally likely to have received systemic steroid treatment while in the ED. The total median length of stay in the ED was ~145 to 150 minutes, and ~23% were admitted to the hospital, regardless of race/ethnicity. These findings support the idea that the ED provides a "safety net" for all children with asthma regardless of race/ethnicity.

Our finding of equivalent hospitalization rates contrast with previous research. No other identified studies have actually investigated racial/ethnic differences in admission rates during an index ED visit. Rather, other studies have relied on archived or billing data and have investigated ED use and hospitalization over a given period of time. We can integrate our findings within this larger body of research by appealing to a base-rates explanation. Minority patients may be hospitalized equally during an index ED visit and, at the same time, be more likely to be hospitalized over a given period of time, because they have more frequent emergency exacerbations. This can be conceptualized in probabilistic terms. The chance of rolling a 6 on any roll of a die is identical. Nevertheless, one has a better chance of rolling at least one 6 during a given period of time if allowed to roll the die 2 times instead of only once. That is, although a black child has the same probability as a white child of being admitted at a given visit, if the black child presents twice over a year and the white child presents only once, then the black patient will be more likely to be hospitalized over that year.

#### Role of SES

Many researchers have hypothesized that SES is indirectly responsible for the often-found racial/ethnic discrepancies in chronic asthma severity, management, and health care utilization. The SES hypothesis asserts that race-based asthma discrepancies are not attributable to race/ethnicity, per se, but to SES, which is simply a trenchant confounder of race/ethnicity. The evidence for this hypothesis is mixed.



Although low SES independently and powerfully predicts poor asthma management and outcome,<sup>4,5,7,13,16,23,24,28,36,37</sup> only a few studies have shown that SES differences account for most or all of the race/ethnicity-based differences in asthma.<sup>1,8,14,27,28</sup> Many others have demonstrated that, even after controlling for factors such as income and insurance status, black and Hispanic children still have higher prevalence,<sup>3,6,18,25</sup> have more severe asthma symptoms,<sup>12,19,22</sup> visit the ED more often,<sup>12,15,18</sup> are hospitalized more frequently,<sup>5,15,23</sup> receive suboptimal preventive therapy,<sup>4,11,15</sup> and have greater mortality rates.<sup>37</sup> On the basis of these studies, the SES hypothesis seems inadequate to explain fully the racial/ethnic difference in asthma among children. In our study, even after adjusting for sociodemographic factors using multivariate analyses, race/ethnicity remained unrelated to acute care, hospitalization at the index visit, and short-term outcome. Race/ethnicity and SES may affect chronic asthma in a much more profound way than acute asthma. Because EDs are federally prohibited from denying treatment for financial or insurance reasons, SES may not play as large of a role in access to and the quality of care received in this setting.

### Role of Controller Medications

Minority children in our sample were somewhat less likely to have used inhaled corticosteroids in the 4 weeks before their ED visit, and they were equally likely to be discharged on inhaled corticosteroids. This is particularly noteworthy considering black and Hispanic children's histories of greater hospitalizations and ED visits, which logically suggests that they are most in need of inhaled corticosteroids.<sup>38</sup> Our multivariate analyses indicated that being discharged on inhaled corticosteroids was most strongly influenced by the patient's description of the current attack rather than health care utilization. If the emergency physicians who treated the patients in our study had prescribed inhaled corticosteroids on the basis of emergent or urgent health care utilization, then most of the black and Hispanic children in our sample would have been discharged on an inhaled corticosteroid. Others have repeatedly found similar trends highlighting the relative deficits in preventive and state-of-the-art medication use among minority asthma patients.<sup>4,11,15,21</sup> Because previous studies relied on retrospective reviews of archived data, it has been difficult to determine whether the deficit is attributable to a lack of prescriptions being written by the physician or to a lack of filling prescriptions by the patient—or both.<sup>36</sup> Our results suggest that the deficit in inhaled corticosteroid use is, at least in part, because of a prescription discrepancy. Similarly, in the outpatient setting, Bosco et al<sup>4</sup> found that black children were filling prescriptions for medications that were outdated or found to be inefficacious long after national guidelines recommended against their use. Because black children had to receive a prescription for this outdated medication to fill it, we can assume that they were disproportionately prescribed these medications. This does not rule out the possibility that black

and Hispanic patients may be less compliant with filling the prescriptions once they received them (those data were not assessed in this study). Considering the gross SES inequities and the expense associated with inhaled corticosteroids, it seems likely that this is true. However, such trends would only act additively to create an even greater discrepancy in actual use of inhaled corticosteroids.

We have no direct evidence to help us explain why ED physicians prescribed inhaled corticosteroids equally to blacks and Hispanics despite evidence of more severe chronic asthma. We speculate that multiple factors may be responsible. Overall, the rate of inhaled corticosteroid prescriptions was low for all races/ethnicities, indicating that ED physicians may be hesitant to prescribe such medications in general. They may be unfamiliar with these medications and their indications, contraindications, and side effects, making them reluctant to prescribe them. Controller medication prescription and monitoring may be viewed as solely the domain of the child's PCP or pediatrician. Ironically, the lack of prescriptions for such medications also may be an indirect effect of an ED physician's knowledge that patients who present to the ED for treatment often have lower SES and more deficient outpatient care. Emergency physicians may perceive their patients as being unable to afford such expensive medications and less likely to follow up with a regular outpatient physician. Therefore, they may decide that prescribing a medication these patients cannot afford and that cannot be properly monitored is useless and perhaps even dangerous. There is little hard evidence with which to judge the merits of these hypotheses, however, and they await future research.

Finally, a discussion of racial differences would not be complete without mention of the qualitative differences in the experiences of disenfranchised peoples in America. Statistical models and quantitative data are not likely to describe adequately or capture this fully, even when attempting to account for SES differences. As scientists, we should remember that patients' practice of health behaviors, their utilization of health care resources, and the provider's practice of medicine all are set within a larger social and cultural framework. In the United States, this social framework is characterized by persistent race/ethnicity-based inequalities in income, education, and social standing and has a legacy of racial/ethnic discrimination. The manner in which these societal and historical factors influence the experience of the health care process are complex and not readily summarized numerically. Take, for example, the case of a black mother employed as a housekeeper because of inferior educational opportunities and racial discrimination that prevented her from taking another, better paying job. She decides to bring her child to the ED for his asthma care after hours, because she is discouraged from taking off work and every dollar that she makes is important for her family's survival. The clinics in the neighborhood in which she lives are overcrowded because there are not enough physicians practicing there,<sup>39</sup> so she brings him to the ED, where he receives the same

care that he would receive if he were white while he is in the ED, but the emergency physician knows that she is economically disadvantaged and unlikely to be able to afford inhaled corticosteroids, so he does not prescribe it. The cycle of suboptimal illness control is therefore continued. The causes and subjective experience of such a case cannot be summarized statistically.

### Potential Limitations

In evaluating our results, several potential limitations should be considered. First, we recognize that race/ethnicity designation, although ubiquitous in epidemiologic research, may be misleading and that standard census classification is simplistic. Nevertheless, our designations are consistent with those used in previous studies cited throughout our article. Recently, some have speculated that racial/ethnic discrimination among health care providers is a possible cause for inequities observed in health care,<sup>30,40</sup> although it is probably not conscious or deliberate.<sup>41</sup> Research such as ours is important in bringing these issues to the public awareness and may help providers to counteract any subconscious or unintentional racism that may be present.

Second, our sample size was large, which enabled us to detect small differences that were not necessarily clinically meaningful. We were sensitive to this fact, however, and emphasized only those trends that seemed clinically significant and noted in the text when such a problem might exist.

Third, the EDs that compose our sample are predominantly urban, academically affiliated hospitals. This may make our results less generalizable to community hospitals without academic affiliation. Future studies will need to address this issue.

Finally, care must be applied to any research that investigates the influence of SES on health disparities. Simply because the SES measures used in a study do not account for all of the race/ethnicity-related differences observed does not mean that SES is not a significant contributing factor. No study has concluded that SES is unrelated or unimportant to understanding race/ethnicity-based disparities in asthma, just that SES is not the sole mediator. Likely, SES is an important but not all-encompassing confounder of race/ethnicity-based asthma disparities. Furthermore, some authors note that by focusing on unidimensional indicators such as insurance status or income, many studies simply do not sufficiently account for SES. SES should be conceptualized as a chronic, multidimensional condition rather than an acute, unidimensional state.<sup>18</sup> It is widely known that residual confounding can be a significant problem when studying the health correlates of SES.<sup>32,42</sup> For example, using Medicaid status as a method of controlling for SES inadequately accounts for race/ethnicity-based income differences that may still characterize the Medicaid population. Consequently, some of the research conducted on SES and asthma may not have adequately controlled for SES. This has the potential for leading to a conclusion that race/ethnicity is linked to asthma outcomes independent of SES when, in fact, this may not be true. These

limitations are less important when interpreting our findings regarding acute asthma, because no racial/ethnic differences were observed. However, future research investigating SES and asthma should do a more thorough job at accounting for SES. Although an exhaustive review of how to do this is beyond the scope of this article, 1 guideline is to use multiple indicators, such as education level, income, and insurance status.

### CONCLUSIONS

Consistent with previous research, we found numerous race/ethnicity differences in chronic asthma management. Minority patients were more likely to have a history of hospitalization and had more frequent ED visits. Despite this inadequate chronic care, racial/ethnic groups looked remarkably similar in acute severity, ED management, hospitalization during the index ED visit, and short-term outcomes. Our results confirm that EDs serve as a "safety net" for children with asthma during exacerbations, particularly disadvantaged minorities. Nevertheless, ED physicians seem to perpetuate the prescription trends against inhaled corticosteroids that may result in continued exacerbations.

The elimination of health disparities by race/ethnicity is an overreaching goal of Healthy People 2010 ([www.health.gov/healthypeople/](http://www.health.gov/healthypeople/)). Recent evidence suggests that deficient asthma care often found among economically disadvantaged health care facilities can be rectified with education and supportive programs.<sup>35</sup> Such changes are unlikely to occur on a broad scale, however, without massive and sustained effort. Such reform must be championed not only by the federal government but also by health care providers and organizations, the pharmaceutical industry, community and civic associations, patient advocacy groups, and the patients themselves.

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