# Are Physician Estimates of Asthma Severity Less Accurate in Black than in White Patients?

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***BACKGROUND:*** Racial differences in asthma care are not fully explained by socioeconomic status, care access, and insurance status. Appropriate care requires accurate physician estimates of severity. It is unknown if accuracy of physician estimates differs between black and white patients, and how this relates to asthma care disparities.

***OBJECTIVE:*** We hypothesized that: 1) physician underestimation of asthma severity is more frequent among black patients; 2) among black patients, physician underestimation of severity is associated with poorer quality asthma care.

***DESIGN, SETTING AND PATIENTS:*** We conducted a cross-sectional survey among adult patients with asthma cared for in 15 managed care organizations in the United States. We collected physicians' estimates of their patients' asthma severity. Physicians' estimates of patients' asthma as being less severe than patient-reported symptoms were classified as underestimates of severity.

***MEASUREMENTS:*** Frequency of underestimation, asthma care, and communication.

***RESULTS:*** Three thousand four hundred and ninety-four patients participated (13% were black). Blacks were significantly more likely than white patients to have their asthma severity underestimated (OR=1.39, 95% CI 1.08–1.79). Among black patients, underestimation was associated with less use of daily inhaled corticosteroids (13% vs 20%, $p<.05$), less physician instruction on management of asthma flare-ups (33% vs 41%, $p<.0001$), and lower ratings of asthma care ($p=.01$) and physician communication ($p=.04$).

***CONCLUSIONS:*** Biased estimates of asthma severity may contribute to racially disparate asthma care. Interventions to improve physicians' assessments of asthma severity and patient–physician communication may minimize racial disparities in asthma care.

*KEY WORDS:* asthma; racial disparities; patient–physician communication.
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## INTRODUCTION

Although the prevalence of asthma appears slightly greater among blacks than whites in the United States, morbidity and mortality from asthma are substantially higher among blacks.[1] Reasons for these disparities are numerous and include potential differences in asthma care, genetic susceptibility, and environmental exposure.[2] In addition, asthma care for blacks is worse compared to whites, although the reasons are unknown.[3]

According to national asthma guidelines, care should be based on asthma severity assessment. When this assessment is inaccurate, asthma care is suboptimal.[4] Asthma severity assessment depends on patient-reported symptoms and requires good physician–patient communication. Because minority patients are more likely than whites to report communication difficulties,[5] it is important to learn if minority patients experience inaccurate severity assignment and how that relates to disparate asthma care. We therefore tested 2 hypotheses: 1) underestimation of asthma severity by physicians is more frequent among blacks than whites, and 2) among black patients, underestimation of asthma severity is associated with poorer care and communication ratings.

## METHODS

### Study Design

This study used patient-reported and physician-reported cross-sectional data from surveys in a cohort study of adults with asthma enrolled in managed care. The Managed Health Care Association Outcomes Management System Consortium Asthma Study was undertaken to test the feasibility and usefulness of patient-reported information to improve the quality of patient care.[6] Fifteen managed care organizations (MCOs) participated in a prospective longitudinal study, which has been previously described in detail.[7] The study was approved by the Committee on Human Research at The Johns Hopkins School of Hygiene and Public Health.

### Study Population

Participants were selected from the pool of enrollees in each MCO from claims data or other central information sources. Three inclusion criteria were applied: 1) age 18 years or older on September 1, 1993; 2) enrollment in the MCO at the time of sampling; 3) 2 or more medical care encounters (outpatient visits, emergency department visits, or hospitalizations) with a

diagnosis of asthma (ICD-9-CM code 493.*xx*) from September 1991 to August 1993. Individuals were excluded if they stated that they did not have asthma, disenrolled or were expected to disenroll before January 1, 1994. Only patients who identified themselves as black or white were included in the present analysis because there were too few Hispanic, Asian, and American Indian individuals for meaningful analyses.

## Data Collection

In August 1993, 10,539 patients were sampled 8,640 of whom were eligible for study. From September 1 to December 31, 1993 data were collected from patients by mail survey with telephone follow-up of nonresponders.

Physicians were eligible if they were identified as being the main asthma provider by the patient. Physician estimates of underlying asthma severity for each patient were completed by mailed survey between 1 and 6 months after the baseline patient survey.

## Independent Variables

***Patient Demographics.*** Information was collected from patients regarding their age, race, gender, employment status and education.

***Patient Symptom Severity.*** Asthma questions were based on the symptom types and frequencies used by National Heart Lung and Blood Institute's (NHLBI) National Asthma Education and Prevention Program (NAEPP)[8] and international asthma guidelines[9] and included cough, sputum, chest tightness, wheezing, and shortness of breath. Patients reported the frequency of various asthma symptoms during the previous 4 weeks, including disruption of sleep, asthma attacks, breathing status between attacks, and interference with normal activities. Responses to asthma symptoms were then converted to mild, moderate, and severe categories, based on the NAEPP 1991 guidelines. The 1991 guideline classification scheme was used because the study was conducted and completed before the 2002 NAEPP update.

***Physician Estimate of Asthma Severity.*** Physicians were given a table (Appendix 1) derived from the 1991 NAEPP guidelines' characterization of each severity category with the following instructions: "Please evaluate the severity of this patient's asthma, considering the underlying disease, not the patient's current status. Using the descriptions of symptom frequency, nocturnal symptoms and symptom chronicity in the chart below, rate the severity of this patient's asthma as 'mild', 'moderate', or 'severe'. If a patient meets any of the criteria for a severity level (with regard to symptom frequency, nocturnal symptoms, or symptom chronicity), then the patient qualifies for that level." The 1997 version of the guidelines used approximately the same scheme for assessment of severity and assignment of treatment, although there were 4 rather than 3 severity grades. The update in 2002 did not modify the scheme any further.[10] Underestimation of asthma severity was defined as a physician estimate of underlying patient asthma severity that was lower than the classification of severity based on patient-reported symptoms (e.g., if the physician rated the patient's asthma as moderate, but the patient-reported symptoms were consistent with severe asthma by NAEPP criteria).

## Dependent Variables

***Quality of Asthma Care, Patient Satisfaction and Physician Communication.*** Patients were asked 12 questions regarding their asthma care based on the NAEPP guidelines (Appendix 2). Six of the 12 questions were selected as quality of care indicators because they are considered key recommendations in the National Heart, Lung and Blood Institute's NAEPP Asthma guidelines and reflect currently recommended asthma care. These 6 indicators represent 4 major domains of asthma care occurring in the primary care setting: medication, self-management education, control of factors related to asthma severity, and periodic assessment. Patients rated the quality of communication with the physician by responding to the request, "Please think about the care you have had for your asthma over the past 12 months and rate your satisfaction with the quality of communication with your doctors/nurses about your asthma." They also rated the overall quality of their asthma care. Response options for both questions were poor, fair, good, very good, and excellent.

## Statistical Analysis

Categorical variables were examined using frequencies and cross-tabulations. Bivariable comparisons were conducted, including patient characteristics of physician responders and nonresponders, black and white patients, black patients with and without physician underestimation of underlying asthma severity using the Chi-square statistic. Patient-reported quality of physician communication and care was examined using the chi-square test for trend to determine whether there was a significant difference in care received by blacks whose physician did or did not underestimate the patient's level of asthma severity. The multivariable logistic regression models were used to estimate the odds of underestimation and the odds of receipt of a given indicator of asthma care. In these models, we controlled for factors that may affect the propensity to receive asthma care, including age, gender, race, education, employment status, asthma severity, and comorbid illnesses (smoking history, sinusitis, heartburn, chronic bronchitis, emphysema, and congestive heart failure). We then constructed a model that included underestimation with the aforementioned potential confounders, to examine the change in odds ratios for receipt of care after underestimation was accounted for. Statistical significance was defined as a 2-tailed $p$ value $<.05$ for all analyses. Computations were performed with SAS software version 8.02 (SAS Institute, Cary, NC).

# RESULTS

## Demographics

Six thousand two hundred thirty-six patients completed the baseline survey (76.9%), of whom approximately 14% were black. Three thousand four hundred ninety-four patients (54%) had physicians who participated in the survey and were included in this study. There were no data on the race or gender of the physicians. Slightly more physicians of white

patients participated than physicians of black patients (57% vs 50%, respectively; $p<.0001$). Patients' mean age was 44 (±14) years and 70% were women. Black patients reported slightly less severe symptoms than white patients (Table 1).

Underestimation of asthma severity was common for black and white patients (Table 1). After adjustment for patient symptom severity, age, gender, and education, black patients were more likely to have their asthma severity underestimated by physicians than were white patients (OR=1.39, 95% CI 1.08–1.79). Black patients also rated the quality of their asthma care and communication with their physician less favorably than whites (Table 1). These differences remained significant after adjusting for asthma severity, age, gender, and education for patient ratings of asthma care (OR=0.78, 95% CI 0.63–0.97) and communication (OR=0.78, 95% CI 0.63–0.97).

Among the 446 black patients, almost two thirds ($n$=277, 64%) had their asthma severity underestimated by their physician. In bivariate analyses, underestimation of asthma severity was related to worse asthma care (Table 2). Black patients with underestimated asthma severity were less likely to report daily use of inhaled corticosteroid (ICS), being told what to do for asthma flare-ups and how to prevent them. They were also less likely to rate their overall asthma care and communication with their physician as "very good" or "excellent".

Table 3 shows the relationship between race and quality of care indicators after adjusting for potential confounders (model 1): age, gender, education, medical comorbidities, and symptom severity. On all but 1 indicator, told what to do if peak flow is low, black patients were more likely to report poorer asthma care. After further adjusting for underestimation of asthma severity, there was a small but consistent trend toward a decrease in the odds of reporting poorer quality of asthma care for possession and daily use of inhaled corticosteroids.

**Table 1. Patient Characteristics, Asthma Severity, Underestimation and Ratings of Care by Patient Race ($N$=3,494)**

| Characteristic | Black patients 446 (13%) | White patients 3,048 (87%) | *P* value |
|---|---|---|---|
| Mean age, years (SD) | 44 (12.4) | 44 (14.1) | 0.7 |
| Female, *n* (%) | 356 (80) | 2,089 (69) | <.0001 |
| Education, *n* (%) | | | <.0001 |
| Less than high school | 54 (12) | 304 (10) | |
| High school graduate | 141 (32) | 769 (25) | |
| College or postcollege graduate | 249 (56) | 1,968 (65) | |
| Patient-reported asthma severity, *n* (%) | | | 0.04* |
| Severe | 177 (40) | 1,297 (43) | |
| Moderate | 223 (50) | 1,377 (45) | |
| Mild | 45 (10) | 372 (12) | |
| Physician underestimation of asthma severity, *n* (%)† | | | |
| Overall underestimation of severity | 277 (64) | 1,774 (59) | 0.05* |
| Underestimation of moderate asthma, *n* (% of patients with moderate asthma) | 130 (59) | 736 (54) | 0.07 |
| Underestimation of severe asthma, n (% of patients with severe asthma) | 147 (86) | 1,038 (81) | 0.09 |
| Excellent or very good ratings, n (%)‡ | | | |
| Overall asthma care | 265 (61) | 2,026 (69) | <.001 |
| Communication with doctor | 260 (60) | 1,999 (68) | <.001 |

**P value based on the chi-square statistic*
*†Underestimation of asthma severity was defined as a physician estimate of underlying patient asthma severity classification that was lower than the classification of severity based on patient-reported symptoms (N=3,430).*
*‡ Patients rated the overall quality of their asthma care and the quality of communication with their doctor about their asthma care over the past 12 months as poor, fair, good, very good, or excellent.*

**Table 2. Quality of Asthma Care and Communication by Physicians' Estimation of Asthma Severity for Black Patients ($n$=446)**

| Quality of care indicators, *n* (%) | Severity underestimated* ($n$=277) | Severity not underestimated ($n$=169) | *p* value† |
|---|---|---|---|
| Has inhaled corticosteroid | 165 (63) | 100 (67) | 0.40 |
| Uses inhaled corticosteroid daily‡ | 57 (21) | 46 (29) | 0.04 |
| Told what to do if peak flow is low§ | 40 (82) | 39 (72) | 0.3 |
| Told what to do for severe asthma flare-up | 115 (42) | 85 (56) | 0.01 |
| Told how to adjust medicines when asthma gets worse | 102 (38) | 88 (57) | 0.0008 |
| Told how to avoid things that can worsen asthma | 103 (38%) | 78 (51%) | 0.007 |
| Excellent or very good ratings,// *n* (%) | | | |
| Overall asthma care | 151 (55) | 105 (69) | 0.006 |
| Communication with doctor | 149 (55) | 104 (68) | 0.008 |

**Physician estimates of asthma severity were lower than the classification of asthma severity based on patients' reported symptoms.*
*†P value is based on chi-square statistic.*
*‡Responses only among those patients who reported possession of an inhaled corticosteroid*
*§Responses only among those patients who reported possessing a peak flow meter*
*//Patients rated the overall quality of their asthma care and the quality of communication with their doctor about their asthma care over the past 12 months as poor, fair, good, very good, or excellent.*

## DISCUSSION

We observed a high prevalence of underestimation of asthma severity by physicians, regardless of patient race. Underestimation of asthma severity by physicians was observed more frequently among black than white patients in our study, suggesting that underestimation of asthma severity by physicians may be part of the explanation for lower quality asthma care among black patients. Our multivariable models showed a small but consistent trend toward reduced disparities in care when we adjusted for underestimation of asthma severity for possession and daily use of inhaled corticosteroids, the cornerstone of asthma treatment. Although racial differences in other aspects of asthma care persisted after adjusting for underestimation, there may be residual effects of unmeasured factors or other factors related to race that were adjusted for in the models. Underestimation of asthma severity by physicians may be 1 of a number of subtle influences that contribute to disparities in asthma care. It is difficult to say what effect size of

**Table 3. Unadjusted and Adjusted Odds Ratios for Predictors of Poor Quality of Asthma Care for Black Compared to White Patients**

| Quality of care indicator | Patients *n* (%) | Unadjusted OR (95% CI) | Model 1 Adjusted OR* (95% CI) | Model 2 Adjusted OR† (95% CI) |
|---|---|---|---|---|
| No inhaled corticosteroids (ICS) | – | – | – | – |
| White patients | 2,979 (87) | 1.00 | 1.00 | 1.00 |
| Black patients | 426 (13) | 1.47 (1.2–1.8) | 1.40 (1.1–1.8) | 1.36 (1.0–1.8) |
| C-statistic | | 0.52 | 0.60 | 0.66 |
| Does not use ICS daily | | | | |
| White patients | 3,073 (87) | 1.00 | 1.00 | 1.00 |
| Black patients | 448 (13) | 2.47 (1.9–3.2) | 2.31 (1.7–3.2) | 2.26 (1.6–3.1) |
| C-statistic | | 0.54 | 0.63 | 0.67 |
| Not told what to do if peak flow is low | | | | |
| White patients | 755 (89) | 1.00 | 1.00 | 1.00 |
| Black patients | 204 (11) | 1.14 (0.7–1.8) | 1.25 (0.7–2.2) | 1.23 (0.7–2.2) |
| C-statistic | | 0.51 | 0.61 | 0.63 |
| Not told what to do for a severe asthma flare-up | | | | |
| White patients | 2,998 (87) | 1.00 | 1.00 | 1.00 |
| Black patients | 434 (13) | 1.72 (1.4–2.1) | 1.70 (1.3–2.2) | 1.68 (1.3–2.2) |
| C-statistic | | 0.53 | 0.58 | 0.60 |
| Not told how to adjust meds when asthma gets worse | | | | |
| White patients | 3,073 (87) | 1.00 | 1.00 | 1.00 |
| Black patients | 448 (13) | 1.57 (1.3–1.9) | 1.50 (1.2–1.9) | 1.48 (1.5–1.9) |
| C-statistic | | 0.52 | 0.58 | 0.59 |
| Not told how to avoid things that can worsen asthma | | | | |
| White patients | 2,424 (88) | 1.00 | 1.00 | 1.00 |
| Black patients | 345 (12) | 1.56 (1.2–2.0) | 1.45 (1.03–2.0) | 1.43 (1.01–2.0) |
| C-statistic | | 0.53 | 0.61 | 0.63 |

**Model 1 is adjusted for age, gender, education level (less than high school, high school graduate, college, or postcollege graduate), medical comorbidities (smoke, sinusitis, reflux, chronic bronchitis, emphysema, CHF), asthma severity.*

†*Model 2 is adjusted for the variables in Model 1 and physician underestimation of asthma severity.*

disparate care is meaningful. However, as underestimation of asthma severity occurs more often in black than white patients, it should be considered as a potential target to remedy racially disparate asthma care.

We want to emphasize that while underestimation of asthma severity occurs more often in black than white patients, it is still a large problem for whites as well. In other analyses restricted to white patients (data not shown), all studied asthma care was worse if underestimation was present. Thus, irrespective of patient race, it would be useful to develop strategies to improve doctor–patient communication and accuracy of asthma severity assessment, to improve the health of the U.S. asthma population.

This study is unique in identifying asthma severity assessment as a potential factor in racial disparities in asthma care. Our findings, based on data collected in the early 1990s, will serve as a baseline against which future studies will be able to judge whether physician assessment of asthma severity has improved for black patients. The 1991 NAEPP guidelines, which serve as the basis for our study, were updated in 1997 and 2002[10] resulting in 4 severity categories, rather than the 3 categories we used based on the 1991 guidelines (Appendix 1). However, because we were concerned about physician underestimates of asthma severity, having patients classified as mild intermittent or mild persistent, instead of mild, probably would not change our findings. In addition, current recommendations for how physicians assess severity still depend on patient-reported symptoms, making this study relevant to recent asthma guidelines.

We are not aware of any evidence for secular trends in reducing health care disparities, making the likelihood of their continued existence in the clinical setting quite high.[11–13] We do acknowledge, however, the need for studies that examine how physicians assign asthma severity and if that has changed since 1991 NAEPP guidelines.

Poor communication within the context of provider bias, stereotyping, and clinical uncertainty may contribute to racial disparities in asthma care, as suggested in the Institute of Medicine report on racial disparities.[14–17] The limited research available does not suggest that physician race significantly influences the quality of patient–physician communication[18,19] or quality of medical care,[20,21] suggesting that there may also be systemic problems with the care of minority patients. Improved physician communication skills can improve asthma care.[22] Clark et al.[22] examined the impact of a randomly assigned communication-based intervention. Pediatricians assigned to the communication intervention were significantly more likely than controls to provide asthma care consistent with national asthma guidelines. However, racial disparities in care were not addressed in the study. Additional studies exploring the roles of patient–physician communication, provider bias, stereotyping, and clinical uncertainty in racially disparate asthma care are needed.

There are several limitations to our study. First, we do not know how nonresponding physicians differed from responding physicians. We could have underestimated or overestimated the extent of doctor–patient disparity in asthma severity assessment. Also, our results may not apply to patients cared for in nonmanaged care settings, patients with milder asthma, other minority populations, patients with less insurance coverage, less education, or who are unemployed. However, our study population characteristics may be seen as a strength. We focused on a population without some of the traditional barriers to optimal care, such as low socioeconomic status, absence of insurance, and poor access to care. Thus, racial differences in this study are unlikely caused by these barriers. A third limitation of our study is that we relied on patient-reported data, so there is a risk of reporting bias. However, the results of this study would only be affected if patient reports systematically

differ by race, which has not been previously shown.[23–25] Fourth, we do not know the race of participating physicians, so we do not know how racial concordance or discordance may have contributed to physician estimates of underlying patient asthma severity or to patient ratings of quality of communication. Limited research has shown the effects of racial discordance to be small.[17] Thus, it is unlikely that physician race would explain our findings. Finally, we do not know the contribution of behaviors by physicians or patients that result in underestimation of asthma severity.

Developing tools to aid physicians in asthma severity assessment may serve to improve the quality of asthma care for all patients and reduce disparities in asthma care associated with underestimation of asthma severity. Seeking more complete explanations for racial disparities in asthma care and developing solutions to these disparities should be a priority, so that new training and practice guidelines can ensure the best quality of asthma care possible, regardless of patient race.

Clinicians caring for black patients with asthma may need to probe more carefully to elicit accurate information about asthma severity. Such careful probing might be based on the use of validated measures and/or physician communication skills training. Given that national asthma guidelines encourage the formation of a patient–physician partnership, it is important to examine the exchange of information between patient and physician and how it relates to racial disparities in asthma care.

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***Conflicts of Interest:*** *None disclosed.*

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## APPENDIX 1

**Table 4. National Asthma Education and Prevention Program (NAEPP) Guidelines for Asthma Severity Classifications***

| 1991 NAEPP (EPR-1) Guideline | | | |
|---|---|---|---|
| **Severity level** | **Symptom frequency** | **Nocturnal symptoms** | **Symptom chronicity** |
| Mild | ≤2 times per week | <2 times per month | No symptoms between exacerbations |
| Moderate | >2 times per week | 2–3 times per week | Symptoms occur often between exacerbations; severe but infrequent exacerbations |
| Severe | Continuous | Almost nightly | Symptoms most of the time; frequent and severe exacerbations |
| 1997 NAEPP (EPR-2) Guideline | | | |
| Severity level | Symptom frequency | Nocturnal symptoms | Symptom chronicity |
| Mild intermittent | ≤2 per week | ≤1 per month | Asymptomatic between exacerbations; exacerbations brief† |
| Mild persistent | Symptoms >2 times a week but <1 time a day | >2 times a month | Exacerbations may affect activity |
| Moderate | Daily | >1 time a week | Daily symptoms; daily use of inhaled short-acting $\beta_2$ agonist; exacerbations ≥2 times a week |
| Severe | Continual | Frequent | Symptoms most of the time; frequent exacerbations |

**Physicians are asked to use symptom frequency, nighttime awakening, and chronicity of symptoms to grade severity and assign treatment in both the 1991 and 1997 versions of the guidelines. The update in 2002 did not modify this scheme further.*
*†In the 2002 update, the description of symptom chronicity for mild intermittent asthma was changed to "severe exacerbations may occur, separated by long periods of normal lung function and no symptoms."*

## APPENDIX 2

**Table 5. Patient-Reported Quality of Asthma Care: Domains, Indicators, and Patient Survey Questions***

| Domains | Indicators | Questions |
|---|---|---|
| Medications | Has inhaled corticosteroid | 1. Do you have a steroid inhaler for your asthma? Examples include Aerobid, Azmacort, Beclovent, Decadron, Respihaler, and Vanceril. (no, yes, don't know) |
| | Uses inhaled corticosteroid daily | 2. Patients answering "yes" were asked: In the past 4 weeks, how often have you used your steroid inhaler? (never, less than 1 day/week, 1–2 days/week, 3–4 days/week, 5–6 days/week, or 7 days/week)* |
| | | 3. Do you have any bronchodilator inhalers—such as Alupent, Asthmahaler, Brethair, Broniten, Bronkaid, Bronkometer, Maxair, Metaprel, Primatene, Primatene Mist, Proventil, Tornalate, or Ventlin—for your asthma? (no, yes, don't know) |
| | | 4. Do you use cromolyn inhalers, such as Intal? (no, yes, don't know)† |
| | | 5. Did you take theophylline—such as Aerolate, Bronkodyl, Constant-T, Elixophyllin, Quibron, Respid, Slo-bid, Slo-phyllin, T-Phyl, Theo-24, Theoclear, Theo-Dur, Theo-Sav, Unicontin, or Uniphyl—for asthma? (no, yes, don't know) |

(*continued on next page*)

Table 5. (continued)

| Domains | Indicators | Questions |
|---|---|---|
| Self-management education | | How much information have you been given by your doctor or nurse about the following: (nothing; some things, but you could use more information; everything you need to know) |
| | Told what do to for severe asthma flare-up | 6. What to do when you have a severe flare-up of your asthma? |
| | Told how to adjust medicines when asthma worsens | 7. How to adjust your medicines when your asthma gets worse? |
| Control of factors related to asthma severity | Told how to avoid things that can worsen asthma | How much information have you been given by your doctor or nurse about the following: (nothing; some things, but you could use more information; everything you need to know) |
| | | 8. What things can make your asthma worse and how to avoid them? |
| Periodic assessment | Told what to do if peak flow is low | 9. Do you have a peak flow meter at home? (no, yes) |
| | | Patients answering "yes" to question 9 were asked: |
| | | 10. How often do you use your peak flow meter? (every day, occasionally, rarely, or never) |
| | | 11. Did a doctor or nurse show you how to use your peak flow meter? (no, yes) |
| Asthma care specialist | | 12. Have you seen a physician who is an asthma specialist in the past 12 months? (no, didn't need to; now, would have liked to; yes) |

**Based on the 1991 National Asthma Education and Prevention Program (NAEPP)*
*†Black patients were significantly less likely to report positively to 11 of the 12 questions related to the quality of their asthma care compared to white patients. Black patient were less likely to report possession of Cromolyn than white patients, but this difference was not statistically significant. We selected 6 of the 12 questions as quality of care indicators because they are considered key recommendations in the National Heart, Lung, and Blood Institute's NAEPP Asthma guidelines and reflect currently recommended asthma care. These 6 indicators represent 4 major domains of asthma care occurring in the primary care setting: medication, self-management education, control of factors related to asthma severity, and periodic assessment.*

## REFERENCES


1. CDC Report: asthma—United States, 1982–1992. Morb Mort Wkly Rep 1995;43:952–5.
2. **Strunk RC, Ford JG, Taggart V.** Reducing disparities in asthma care: priorities for research—National Heart, Lung, and Blood Institute workshop report. J Allergy Clin Immunol. 2002;109(2):229–37.
3. **Krishnan JA, Diette GB, Skinner EA, Clark BD, Steinwachs D, Wu AW.** Race and sex differences in consistency of care with national asthma guidelines in managed care organizations. Arch Intern Med. 2001;161 (13):1660–8.
4. **Wolfenden LL, Diette GB, Krishnan JA, Skinner EA, Steinwachs DM, Wu AW**. Lower physician estimate of underlying asthma severity leads to undertreatment. Arch Intern Med. 2003;163(2):231–6.
5. **Collins KS, Tenney K, Hughes DL**. Quality of health care for African Americans: findings from the Commonwealth Fund 2001 health care quality survey. The Commonwealth Fund. 2002;524:1–2.
6. **Steinwachs DM, Wu AW, Skinner EA, et al.** Outcomes management system: asthma final report to managed health care association, outcomes management system project. Managed Health Care Association. Baltimore, Maryland, Johns Hopkins University, 1996
7. **Diette GB, Wu AW, Skinner EA, et al**. Treatment patterns among adult patients with asthma: factors associated with overuse of inhaled beta-agonists and underuse of inhaled corticosteroids. Arch Intern Med. 1999;159(22):2697–704.
8. Guidelines for the diagnosis and management of asthma— National Heart, Lung, and Blood Institute National Asthma Education, Program Expert Panel Report. J Allergy Clin Immunol. 1991;88(3 pt 2):425–534.
9. **US Department of Health and Human Services**. International Consensus Report on Diagnosis and Management of Asthma. PHS/NIH Publication No 91-3091, 1992.
10. National Asthma Education and Prevention Program Expert Panel Report: guidelines for the diagnosis and management of asthma—update on selected topics, 2002. J Allergy Clin Immunol 2002;110, Part 2(5):S142-S219.
11. **Trivedi AN, Zaslavsky AM, Schneider EC, Ayanian JZ.** Trends in the quality of care and racial disparities in Medicare managed care. N Engl J Med. 2005;353(7):692–700.
12. **Jha AK, Fisher ES, Li Z, Orav EJ, Epstein AM.** Racial trends in the use of major procedures among the elderly. N Engl J Med. 2005;353(7):683–91.
13. **Vaccarino V, Rathore SS, Wenger NK, et al.** Sex and racial differences in the management of acute myocardial infarction, 1994 through 2002. N Engl J Med. 2005;353(7):671–82.
14. **Institute of Medicine.** Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, D.C.: National Academies Press; 2002.
15. **Collins KS, Hughes DL, Doty MM, Ives BL, Edwards JN, Tenney K.** Diverse communities, common concerns: assessing health care quality for minority Americans: findings from the Commonwealth Fund 2001 health care quality survey. The Commonwealth Fund Publication 523 2 A.D.
16. **Roter DL, Stewart M, Putnam SM, Lipkin M, Stiles W, Inui TS.** Communication patterns of primary care physicians. JAMA. 1997;277 (4):350–6.
17. **Cooper-Patrick L, Gallo JJ, Gonzales JJ, et al.** Race, gender, and partnership in the patient–physician relationship. JAMA. 1999;282(6):583–9.
18. **Cooper LA, Roter DL, Johnson RL, Ford DE, Steinwachs DM, Powe NR.** Patient-centered communication, ratings of care, and concordance of patient and physician race. Ann Intern Med. 2003; 139(11):907–15.
19. **Johnson RL, Roter D, Powe NR, Cooper LA.** Patient race/ethnicity and quality of patient–physician communication during medical visits. Am J Public Health. 2004;94(12):2084–90.
20. **Thamer M, Hwang W, Fink NE, et al.** US nephrologists' attitudes towards renal transplantation: results from a national survey. Transplantation. 2001;71(2):281–8.
21. **van Ryn M, Burke J.** The effect of patient race and socio-economic status on physicians' perceptions of patients. Soc Sci Med. 2000;50(6):813–28.
22. **Clark NM, Gong M, Schork A, et al.** Impact of education for physicians on patient outcomes. Pediatrics. 1998;101(5):831–6.
23. **Bergmann MM, Byers T, Freedman DS, Mokdad A.** Validity of self-reported diagnoses leading to hospitalization: a comparison of self-reports with hospital records in a prospective study of American adults. Am J Epidemiol. 1998;147(10):969–77.
24. **Wagenknecht LE, Burke GL, Perkins LL, Haley NJ, Friedman GD.** Misclassification of smoking status in the cardia study—a comparison of self-report with serum cotinine levels. Am J Public Health. 1992;82 (1):33–6.
25. **Wills TA, Cleary SD.** The validity of self-reports of smoking: analyses by race/ethnicity in a school sample of urban adolescents. Am J Public Health. 1997;87(1):56–61.