Published in final edited form as:

J Allergy Clin Immunol. 2008 August ; 122(2): 313–318. doi:10.1016/j.jaci.2008.04.024.

Improved overall trends but persistent racial disparities in emergency department visits for acute asthma, 1993–2005

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Abstract

Background—Emergency department (ED) visits for acute asthma provide an important marker of morbidity.

Objective—To describe the epidemiology of ED visits for acute asthma.

Methods—We obtained data from the National Hospital Ambulatory Medical Care Survey, 1993 to 2005, and used the primary diagnosis code for asthma (493) to identify cases. We calculated national estimates by using assigned patient visit weights and national rates per 1000 US population with demographic-specific population data from the US Census Bureau.

Results—From 1993 to 2005, there were approximately 23,800,000 asthma visits, representing 1.8% of all ED visits, or an overall rate of 6.7 visits per 1000 US population. The national visit rate rose between 1993 and 1998 ($P_{\text{trend}} = .05$), but was stable (or possibly decreasing) from 1998 to 2005 ($P_{\text{trend}} = .07$). Although rates for white subjects decreased by 25% from 1998 to 2005 ($P_{\text{trend}} = .02$), the rates for black subjects remained constant ($P_{\text{trend}} = .80$). The overall asthma-related ED visit rate was highest among the following groups: age <10 years (13), women (7.2), black subjects (19), Hispanic subjects (7.1), and subjects in the Northeast (9.2). ED administration of inhaled anticholinergic agents increased 20-fold and systemic corticosteroids increased 2-fold from 1993 to 2005 ($P_{\text{trend}} = .02$ and $.03$, respectively), whereas inhaled β -agonist and inhaled corticosteroid administration was stable ($P_{\text{trend}} = .09$ and $.34$, respectively).

Conclusion—Although asthma-related ED visit rates showed a significant upward trend from 1993 to 1998, our results support the emerging view that the asthma epidemic may have reached a plateau. Nevertheless, the higher visit rates observed among specific demographic groups and widening disparities, particularly among black subjects, remain problematic and warrant further investigation.

Keywords

Asthma; disparities; emergency department; epidemiology; public health

Asthma is among the most common chronic diseases, affecting 22 million, or 7.2%, of Americans in 2005.¹ Acute asthma accounts for approximately 2 million emergency department (ED) visits and 500,000 hospitalizations annually, at a costs of at least \$18 billion per year.¹ Asthma prevalence has increased over the past 2 decades, rising more than

3-fold since 1980.² From 1980 to 1995, asthma deaths almost doubled (from 2891 to 5637); however, in recent years, vital statistics data suggest that asthma death rates have steadily decreased, down to 3816 in 2004.²⁻⁴ Although speculative, possible explanations for this trend include better management consistent with National Asthma Education and Prevention Program (NAEPP) guidelines and changes in factors that influence asthma prevalence.^{3,4} Although this improvement is encouraging, major differences in asthma mortality continue among various demographic groups—including higher rates among women (2.3 per 10,000 people with current asthma) and black subjects (3.4).²

Asthma-related ED visits offer a measure of the acute morbidity associated with an asthma exacerbation.⁵ Because most asthma-related ED visits can be prevented through guideline-concordant care,⁶ disparities and increases in ED visits for acute asthma are clinical red flags and warrant investigation. Because the vast majority of patients with asthma-related ED visits are discharged home (85% to 90%), ED patients provide a unique perspective of asthma morbidity, a perspective that complements hospitalization and mortality statistics.² Furthermore, ED visits add significantly to the financial burden of asthma, costing as much as 5 times more per visit than outpatient office visits for asthma.^{7,8}

Understanding and describing the trends in asthma-related ED visits may provide further insight into the recent trends in asthma mortality, morbidity, and management. Therefore, in this article, we describe national annual estimates and trends of asthma-related ED visits that occurred between 1993 and 2005.

METHODS

We combined data from the ED component of the 1993 to 2005 National Hospital and Ambulatory Medical Care Survey (NHAMCS) to generate national estimates of ED visits for acute asthma. Our institutional review boards waived review of this analysis.

Methodological details are described elsewhere.^{9,10} Briefly, the NHAMCS is a 4-stage probability sample of visits to US noninstitutional general and short-stay hospitals. The NHAMCS is conducted annually by the National Center for Health Statistics and covers geographic primary sampling units, hospitals within primary sampling units, EDs within hospitals, and patients within EDs. Trained staff collected data during a randomly assigned 4-week data period for each of the sampled hospitals, approximately once every 15 months. When the data collection forms were completed, they were sent to the Constella Group (Durham, NC), where they were coded using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM).¹¹

For this study, we defined ED visit for acute asthma as any ED visit with an ICD-9-CM code for asthma (493) in the primary diagnosis field. We analyzed demographic data including age, sex, race (white, black, and other), Hispanic ethnicity, insurance, US region (Northeast, Midwest, South and West), and metropolitan statistical area status of the hospital (urban and nonurban). Region and metropolitan statistical area categories represent standardized geographical divisions defined by the US Bureau of the Census. In addition, we analyzed visit characteristics, which include season of visit, time of day, triage urgency at presentation, ED disposition (hospital or intensive care unit admission or discharge/referred), and asthma medications administered or prescribed. We identified asthma medications by using Ambulatory Care Drug Database System class code 1940 (antiasthmatics/bronchodilators) and classified individual medications into the following categories: inhaled β -agonists, inhaled anticholinergics, inhaled corticosteroids, systemic corticosteroids, leukotriene modifiers, mast cell stabilizers, methylxanthines, systemic epinephrine, inhaled epinephrine, magnesium, terbutaline, and other.¹²

We performed all analyses by using Stata 9.0 (StataCorp, College Station, Tex). Design variables, taking into account the complex 4-stage sampling frame, were used to estimate variance. All analyses used appropriate survey commands in Stata to account for the sampling frame. We presented number of observations and weighted population estimates to provide the actual sample size and estimated absolute number of asthma-related ED visits to provide unadjusted data for interpretation. We calculated rates per 1000 US population by using midyear age, sex, race, ethnicity, and region-specific population estimates for 1993 to 2005 from the US Census Bureau.¹³ We analyzed trends by using a nonparametric test for trends based on the Wilcoxon Mann-Whitney test, with 2-tailed $P < .05$ considered statistically significant.¹⁴

RESULTS

Between 1993 and 2005, there were an estimated 23.8 million asthma-related ED visits in the United States, or an average 1.8 million visits per year. These visits represent 1.8% of all ED visits over this period. The annual rates of asthma-related ED visits per 1000 US population show an upward trend from 6.6 (95% CI, 5.4-7.7) in 1993 to 7.4 (95% CI, 6.1-9.0) in 1998 ($P_{\text{trend}} = .05$). Rates have subsequently stabilized and may be declining, most recently to 6.0 (95% CI, 4.9-7.1) in 2005 (Fig 1).

The distribution and rates for asthma-related ED visits by demographic characteristics are shown in Table I and by visit characteristics in Table II. Overall, the asthma visit rates were highest among the following groups: age <10 years (13), women (7.2), black subjects (19), Hispanic subjects (7.1), and EDs in the Northeast (9.2).

Boys had higher visit rates than girls in the age group 0 to 9 years (16.4 vs 9.8 per 1000 US population), but female visit rates were higher in all other age groups (data not shown). Rates per US population for both male and female subjects increased from 1993 to 1998 by 13% and 17%, respectively, and appeared to decrease from 1998 to 2005 (22% and 19%, respectively).

When analyzed by race, rates for whites increased from 1993 to 1998 to 5.8 per 1000 US population (P for trend = .04) but decreased to 4.3 in 2005 ($P_{\text{trend}} = .02$; Fig 1). Rates for black subjects peaked in 1995 at 24 and appeared to decrease until 2000 to a rate of 14 ($P_{\text{trend}} = .04$). Since 2000, however, the rates for black subjects have demonstrated an upward, although not statistically significant, trend to 18 in 2005 ($P_{\text{trend}} = .19$).

Overall, black subjects had asthma-related ED visit rates almost 4 times higher than white subjects. The black/white ratio declined from 5.0 in 1995 to 2.5 in 2000, but recently has appeared to increase to 4.1 in 2002 to 2003 and 4.5 in 2004 to 2005. In addition, black visit rates remained higher than white rates across all age groups, with the most dramatic difference observed in the youngest age group (Fig 2).

As shown in Table I, the Northeast region had the highest overall visit rates in the US, more than double that of the West, which had the lowest overall visit rates. Visit rates in the Northeast appeared to peak in 1996 and then appeared to decline ($P_{\text{trend}} = .02$). By contrast, visit rates in the other regions have remained relatively stable (all $P_{\text{trend}} > .05$).

Overall, asthma-related ED visits varied by season, with visit rates highest in spring (March-May) and fall (September-November) and lowest in summer (June-August; Table II). Although the Northeast and the South demonstrated this seasonal variation, there was little seasonal variation of asthma-related ED visits observed in the Midwest or West (data not shown). Asthma-related ED visits also varied by time of day, with the highest proportion of

visits coming between 6:00 PM and 11:59 PM, and the lowest proportion from midnight to 5:59 AM.

Table II also shows urgency of visit. Although 63% of asthma-related ED visits were triaged as urgent/emergent at presentation, only 12% resulted in hospital admission. The percentage of asthma-related ED visits classified as urgent/emergent peaked in 1997 at 87%, but this percentage may have been declining since 1997 ($P_{\text{trend}} = .05$). However, the percentage of asthma-related ED visits resulting in hospital admission has remained stable (10% to 16% during the study period).

Asthma medications administered or prescribed during the ED visit are described in Table II and displayed in Fig 3. Patients in 91% of asthma-related ED visits received at least 1 asthma medication, and 62% received 2 or more medications. β -Agonists and systemic corticosteroids were the most commonly administered medications. Although ED administration of inhaled β -agonists was unchanged ($P_{\text{trend}} = .09$) over the study period, inhaled anticholinergic agents increased 20-fold and systemic corticosteroids increased 2-fold ($P_{\text{trend}} = .02$ and $.03$, respectively). In addition, administration of methylxanthines (eg, theophylline) decreased from 20% of asthma-related ED visits in 1993 to <0.1% in 1995.

DISCUSSION

Most ED visits for acute asthma represent a treatment or maintenance failure^{8,15} and are believed to be preventable through longitudinal disease management undertaken by both medical providers and the patient.^{16,17} Rising trends in asthma morbidity in the 1980s and 1990s² led to publication and widespread distribution of NAEPP guidelines in 1991, 1997, 2002, and most recently in 2007.⁶ ED visits for acute asthma are particularly disturbing because effective therapy is available, and ED treatment for asthma tends to be more costly and inconsistent than treatment in the outpatient office setting.^{7,8} For these reasons, the Centers for Disease Control identified the reduction of hospital ED visits for asthma as a national objective in *Healthy People 2010*.¹⁸

The results of our study suggest that, after a peak in asthma-related ED visits at 7.6 per 1000 persons in 1998, the rate has subsequently stabilized (and possibly decreased) to 6.0. This mirrors trends reported by others for asthma mortality rates and supports an emerging view that the 20-year rise in asthma burden may be stabilizing.^{1,3} Although this is encouraging, recent rates still remain well above the target rates set by *Healthy People 2010* of <8.0 per 1000 persons for young children, and <5.0 per 1000 for older children and adults.¹⁸ In addition, disparities in visit rates by sex, race, and region have persisted and in some cases may be increasing.

General changes in ED use do not appear to explain an apparent stabilization in ED visit rates for acute asthma. For instance, analysis of ED visits for all causes indicated that overall ED use did not decrease between 1993 and 2005.⁹ In fact, while the rate remained stable, the volume of ED visits for all causes increased, with more than half of the increase occurring since 1997, when the Balanced Budget Act required public health insurance to cover ED visits that meet the “prudent layperson” standard.¹⁹

A more likely explanation for a stabilization of asthma-related ED visit rates is an improvement over time in the chronic management of asthma. Patients with better asthma management, including long-term control medications such as inhaled corticosteroids (ICSs), have been shown to have decreased risk of an ED visit.^{16,17} After the publication of the first NAEPP guidelines, 64% of physicians responding to the National Analysts survey stated that they would increase their use of ICS in the next year,²⁰ and subsequent studies reported much higher rates of anti-inflammatory prescription.²¹ Although rates of ICS

prescription are still lower than suggested,²² and other aspects of the NAEPP guidelines such as asthma education and action plans remain widely underused,²³ increased prescription of long-term anti-inflammatory medications may help explain the plateau in acute asthma morbidity that we have described in this study.

We found that women were more likely to visit the ED for asthma than men across all age groups except young children. Although analysis of patient asthma management characteristics was not possible using NHAMCS data, other studies have reported that whereas women who present with acute asthma are more likely to have ICSs, primary care, and health insurance than men, they are less likely than men to use their ICS daily if they have one, and stay longer when they are admitted to the hospital despite having less severe symptoms.²⁴⁻²⁶ Biological, social, and disease management factors may influence sex differences in asthma epidemiology, although consensus is lacking and further exploration is warranted.

In this study, we report an average 4-fold greater risk of an asthma-related ED visit by black subjects compared with white subjects between 1993 and 2005, with the greatest disparity in younger children. During this period, the ED visit rate for all causes was less than 2 times higher for black subjects compared with white subjects, which emphasizes the disproportionate racial disparity for asthma-related ED visits.^{9,19} In addition, although the black/white ratio of asthma-related ED visit rates decreased from 1995 to 2000, it has begun to rise again over the past 5 years. Although the visit rates for white subjects have decreased, the recent widening racial disparity merits close surveillance.

These results support the cross-sectional findings of other investigators who also report higher rates of ED visits for asthma among black subjects in the United States, despite similar rates of physician office use among black and white subjects.²⁷⁻³⁰ These studies have demonstrated lower ICS use and more limited access to preventive and specialist care, which may lead to heavier reliance on episodic symptom treatment and emergency care for asthma among black subjects than among white subjects.²⁷⁻³⁰ Although lower income levels and health insurance coverage among black subjects have been implicated in these findings, they do not fully explain these observed differences. A recent meta-analysis suggests that early, intensive patient education may be the key to reduce racial disparities in asthma morbidity and healthcare use.³¹

We also found pronounced variation in asthma-related ED visit rates by region in this study. Despite asthma prevalence being similar among the regions,² we found that the Northeast had the highest overall visit rates and odds of hospitalization. Outpatient office visit rates for asthma were more than 2 times higher per person with diagnosed asthma in the Northeast compared with the West, which implies that overall health care use for asthma may be higher in the Northeast.²

One proposed explanation for geographic variation is that lower temperatures and extreme changes in weather and allergen levels may account for higher incidence of acute asthma.³² Although we found that overall seasonal patterns of asthma-related ED visits mirrored those observed by others in asthma hospitalization rate,³³ the intensity and timing of the ED visit rate peaks varied between regions, suggesting a role for seasonal factors in regional asthma-related ED visit rates. More specific studies exploring how regional differences in seasonal conditions and weather relate to asthma morbidity patterns may help clarify these observations.

Recent evidence has confirmed that ED treatment using inhaled anticholinergic agents for acute asthma improves recovery and spirometric parameters.³⁴ In addition, a meta-analysis shows that oral corticosteroids reduce β -agonist use, relapse, and subsequent ED visits and

hospitalizations.³⁵ On the basis of these data, ED treatment with inhaled anticholinergic agents and prescription of short courses of oral corticosteroids have become standard of care in NAEPP guidelines for ED treatment of acute asthma.⁶ Indeed, we found that ED use of both inhaled anticholinergic agents and systemic corticosteroids increased significantly during the study period.

Conversely, prescription of ICS remained less than 5% and did not change during the study period. These results demonstrate the continued reluctance of most emergency physicians to prescribe ICS, despite evidence that their addition to oral corticosteroids improves symptoms, reduces relapse, and enhances continuation of ICS as long-term maintenance therapy.³⁶⁻³⁸ To promote increased prescription of ICS by emergency physicians, the 2007 NAEPP guidelines added recommendations to consider ICS initiation in the ED.⁶ Such efforts are not necessary for discouraged medications, such as methylxanthines. Although this medication class was used in 20% of asthma-related ED visits in 1993, methylxanthines have been essentially phased out from current management of acute asthma, likely because of their limited role in the era of inhaled short-acting β -agonists.

Potential limitations

Several limitations should be noted in our study. Given the manner in which the data are collected, the NHAMCS is subject to the limitations of general survey research, with possible errors in data collection and coding. In particular, lack of information about the source of the race/ethnicity classification (ie, observation vs self-report) may limit the precision of these estimates. However, data collection errors of the NHAMCS should not vary significantly between years, and therefore these errors likely would have limited impact on trend analysis. ED visits could not be linked to detect multiple visits in the same patient. Therefore, rates and trends reflect overall ED use in a population rather than individuals' use, and inferences regarding individual use cannot be made. Finally, the NHAMCS data contain information only about actions during the ED visit, exclusive of previous and subsequent events. Nevertheless, NHAMCS data have been used widely by others to report clinical epidemiology of a variety of conditions, using rigorous methodology and data known to be collected with a high level of accuracy.¹⁰

Conclusion

High national ED visit rates for acute asthma represent an opportunity for continued improvement in asthma management. Although asthma-related ED visit rates in the United States remain well above the target goals of *Healthy People 2010*,¹⁸ our study supports the emerging view that the epidemic of asthma morbidity may have reached a plateau, because rates appear to have stabilized (and possibly declined) since 1998. Nevertheless, the higher ED visit rates for acute asthma among female subjects and black subjects and in the Northeast remain problematic and warrant further investigation. National efforts to improve asthma management—with special emphasis on high-risk demographic groups—may help to minimize these disparities and further reduce ED visits among individuals with asthma.

Acknowledgments

We thank Andrea Pelletier for her assistance with the preliminary statistical analyses.

C.A.C. is supported, in part, by grant HL-84401 (Bethesda, Md).

A. A. Ginde receives grant support from the Emergency Medicine Foundation, Novo-Nordisk, and Bayer. C. A. Camargo Jr has consultant arrangements with AstraZeneca and Critical Therapeutics; is on the advisory boards for Dey, Genentech, GlaxoSmithKline, and Merck; is on the speakers' bureau for AstraZeneca, GlaxoSmithKline, and Merck; and receives grant support from AstraZeneca, GlaxoSmithKline, Merck, Novartis, and Respiroics.

Abbreviations used

ED	Emergency department
ICS	Inhaled corticosteroid
ICD-9-CM	International Classification of Diseases, Ninth Revision, Clinical Modification
NAEPP	National Asthma Education and Prevention Program
NHAMCS	National Hospital Ambulatory Medical Care Survey

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Clinical implications

Stabilization of overall trends in asthma-related ED visits suggests improvement in chronic and acute asthma care. Nevertheless, race-related disparities persist and may be widening, and they warrant further intervention.

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FIG 1.

Trends in ED visits for acute asthma per 1000 US population by year, race, and ethnicity, 1993 to 2005. Overall (*square*): 1993 to 1998, slope = 0.23, $P = .05$; 1998 to 2005, slope = -0.20 , $P = .07$. White (*circle*): 1993 to 1998, slope = 0.30, $P = .04$; 1998 to 2005, slope = -0.25 , $P = .02$. Black (*diamond*): 1993 to 1998, slope = -0.16 , $P = .95$; 1998 to 2005, slope = 0.10, $P = .80$. Hispanic (*triangle*): 1993 to 1998, slope = -0.32 , $P = .07$; 1998 to 2005, slope = -0.14 , $P = .41$.

FIG 2. ED visits for acute asthma per 1000 US population by age and race/ethnicity, 1993 to 2005. White (*circle*); black (*diamond*); Hispanic (*triangle*).

FIG 3.

Trends in medication administration for acute asthma ED visits from 1993 to 2005. Inhaled short-acting β -agonist (*diamond*): slope = 0.01; $P = .09$. Inhaled anticholinergics (*circle*): slope = 0.02; $P = .03$. Systemic corticosteroids (*triangle*): slope = 0.02; $P = .04$. Inhaled corticosteroids (*square*): slope = 0.001; $P = .34$.

TABLE I

Patient and hospital characteristics of ED visits for acute asthma, 1993 to 2005

Variable	No. of cases	Estimated total no. of cases [*] in millions (95% CI)	Rate per 1000 US population (95% CI)	Rate per 1000 ED visits (95% CI)
Overall	6850	24 (22-26)	6.7 (6.2-7.1)	18 (17-19)
Age (y)				
<10	1872	6.7 (6.0-7.5)	13 (12-15)	29 (26-32)
10-19	1018	3.6 (3.3-4.0)	7.1 (6.4-7.8)	22 (20-25)
20-29	1090	3.9 (3.5-4.3)	8.0 (7.2-8.9)	18 (16-19)
30-39	1004	3.4 (3.1-3.8)	6.2 (5.5-6.8)	17 (15-18)
40-49	848	2.8 (2.5-3.1)	5.2 (4.6-5.8)	17 (15-18)
50-59	477	1.6 (1.4-1.8)	4.1 (3.5-4.6)	14 (12-16)
60-69	284	1.0 (0.8-1.1)	3.6 (3.0-4.1)	12 (10-14)
70-79	167	0.5 (0.4-0.6)	2.4 (1.8-2.9)	5.9 (4.6-7.2)
80+	90	0.3 (0.2-0.4)	2.8 (2.1-3.5)	4.5 (3.3-5.6)
Sex				
Female	3745	13 (12-14)	7.2 (6.6-7.7)	19 (17-20)
Male	3105	11 (10-12)	6.1 (5.6-6.6)	17 (16-19)
Race				
White	3887	15 (13-16)	5.0 (4.5-5.4)	14 (13-16)
Black	2698	8.6 (7.8-9.4)	19 (17-21)	30 (27-33)
Other	265	0.7 (0.5-0.9)	3.5 (2.6-4.3)	19 (14-23)
Ethnicity				
Hispanic	1015	3.1 (2.6-3.5)	7.1 (6.0-8.2)	23 (20-27)
Non-Hispanic	4716	17 (15-18)	5.3 (4.8-5.6)	17 (16-19)
Missing	1119	4.3 (3.6-4.9)	NA	17 (14-19)
Insurance				
Private	2107	7.8 (7.1-8.6)	NA	18 (16-20)
Public	2431	8.0 (7.3-8.8)	NA	19 (17-21)
Self-pay	925	3.4 (3.0-3.8)	NA	18 (16-20)
Other	868	2.8 (2.4-3.1)	NA	16 (14-18)
US Region				
Northeast	2287	6.3 (5.5-7.1)	9.2 (8.1-10)	24 (21-27)
Midwest	1495	6.1 (5.1-7.1)	7.4 (6.2-8.5)	18 (15-21)
South	1956	7.8 (6.8-8.8)	6.1 (5.3-6.9)	16 (14-18)
West	1112	3.6 (2.9-4.3)	4.5 (3.6-5.3)	15 (12-18)
Urban status				
Urban	6152	20 (18-22)	NA	19 (17-21)
Nonurban	698	3.6 (2.6-4.7)	NA	13 (9-17)

NA, Not available.

* Based on weighted estimates.

TABLE II

Visit characteristics and medication administration during ED visits for acute asthma, 1993 to 2005

Variable	No. of cases	Estimated total no. of cases [*] in millions (95% CI)	Percentage of acute asthma visits (95% CI)
Month of presentation [†]			
December to February	1604	5.6 (5.0-6.2)	23% (21-25)
March to May	1701	6.0 (5.3-6.7)	25% (23-27)
June to August	1252	4.5 (3.9-5.0)	19% (17-21)
September to November	1774	6.0 (5.4-6.7)	25% (23-27)
Time of day [†]			
12 AM to 5:59 AM	876	3.3 (3.0-3.7)	16% (15-17)
6 AM to 11:59 AM	1380	4.9 (4.4-5.4)	24% (23-25)
12 PM to 5:59 PM	1565	5.5 (4.9-6.0)	27% (25-28)
6 PM to 11:59 PM	1879	6.7 (6.1-7.3)	33% (31-34)
Urgency			
Urgent/emergent	4365	15 (14-16)	63% (60-65)
Nonurgent	1341	4.7 (4.2-5.3)	20% (18-22)
Missing/imputed	1144	4.2 (3.5-4.8)	18% (15-20)
Disposition			
Admitted	821	2.9 (2.6-3.2)	12% (11-13)
Intensive care unit	50	0.2 (0.1-0.2)	0.8% (0.5-1.1)
Discharged/referred	5946	21 (19-22)	87% (85-88)
Medications administered			
Inhaled β -agonists	5269	18 (17-20)	76% (74-78)
Inhaled anticholinergics	1137	3.9 (3.4-4.4)	16% (15-18)
ICSs	302	1.0 (0.8-1.1)	4.1% (3.5-4.7)
Systemic steroids	3463	12 (11-13)	51% (49-53)
Leukotriene modifier	115	0.3 (0.3-0.4)	1.5% (1.1-1.8)
Mast cell stabilizer	43	0.2 (0.1-0.2)	0.6% (0.4-0.9)
Theophylline	319	1.0 (0.8-1.2)	4.1% (3.5-4.8)
Antibiotics	1436	5.4 (4.9-5.9)	23% (21-24)
Systemic epinephrine	99	0.3 (0.2-0.4)	1.4% (1.0-1.7)
Inhaled epinephrine	13	0.05 (NC)	0.2% (NC)
Magnesium	10	0.03 (NC)	0.1% (NC)
Terbutaline	82	0.3 (0.2-0.4)	1.3% (0.9-1.7)
Other	330	1.2 (1.0-1.5)	5.2% (4.4-6.0)
Any antiasthma medications	6219	22 (20-23)	91% (90-92)
2 Antiasthma medications	4220	15 (14-16)	62% (60-64)

NC, Not calculable.

^{*}Based on weighted estimates.[†]Five hundred nineteen cases missing/imputed.

[‡]Available 1995 to 2005.

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