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An analysis of insurance and other factors associated with asthma-related emergency department visits, 2009–2014



Asthma is a common chronic airway disorder characterized by periods of reversible airflow obstruction known as asthma attacks. Although no cure for asthma is known, control of the frequency and intensity of exacerbations and associated functional limitations is desirable. Uncontrolled asthma has a significant cost to families and society, including costs associated with work and school absenteeism, emergency department (ED) visits, and hospitalizations. Costs associated with asthma, including costs of children and adults missing school or work after an asthma attack, continue to increase.¹ Asthma prevalence is also increasing disproportionately across historically vulnerable populations that are likely to have barriers to routine asthma care.^{2,3}

Since the passing of the Patients Protection and Affordable Care Act (ACA) in 2010, insurance status has been at the forefront of the health care discussion along with ways to decrease costs. ED visits related to asthma are often characterized as unwarranted and even abusive in some cases.⁴ The goal of existing asthma guidelines is to prevent asthma attacks, reducing the need for ED visits and hospitalizations. However, in recent years, although health care visits for asthma have decreased in primary care settings, ED visits and hospitalization rates for asthma were stable.³ This study sought to examine whether asthma-related ED visits and insurance status are associated (while accounting for other sociodemographic variables of interest) by using the most recently available National Hospital Ambulatory Medical Care Survey–Emergency Department (NHAMCS-ED) data.

This study was a retrospective, cross-sectional, observational analysis of data collected by the Centers for Disease Control and Prevention (and available to the public) in the NHAMCS-ED during the years 2009 through 2014.⁵ Children younger than 2 years and patients with an obstructive lung disease (including all the following *International Classification of Diseases, Ninth Revision* [ICD-9] codes 490xx, 4901x, 4911x, 49120, 49121, 49122, 4918x, 4919x, 4920x, 4928x, 4940x, and 4941x) were excluded.

The survey data were analyzed using the sampled visit weight, which is the product of the corresponding sampling fractions at each stage in the sample design. The sampling weights have been adjusted by the National Center for Health Statistics for survey nonresponse as appropriate, yielding unbiased national estimates of visit occurrences, percentages, and characteristics.⁵ The sampling weights were divided by the number of survey years included

in this study (2009–2014) to arrive at mean annual estimates. The analysis of the survey, as designed, allows the generation of national mean annual ED visit totals by extrapolation of the survey sample ($n = 166,795$). Because of the complex sample design, the appropriate SAS (version 9.3, SAS Institute Inc, Cary, North Carolina) procedures/options to address missing data and utilize domains to determine accurate variance estimates were implemented in the analyses as recommended by the National Center for Health Statistics.⁶ The study was submitted to the Campbell University Institutional Review Board and received an exemption.

The outcome variable of interest was a diagnosis of asthma with an ICD-9 code of 493xx (yes vs no), where the denominator was the number of cases that met the inclusion and exclusion criteria. Although an asthma diagnosis at an ED visit included in this survey may be an initial diagnosis of the condition, it more likely is a recording of a known, preexisting condition. The choice of independent variables was made based on factors determined to be relevant to an asthma diagnosis recorded at the survey visit but was limited by the data available in the NHAMCS-ED surveys.

A multivariable logistic regression model was constructed for the diagnosis of asthma recorded at the time of ED visit to evaluate the predictive value of each independent variable, adjusting for covariates of interest. Weighted, adjusted odds ratios (ORs) with corresponding 95% confidence intervals (CIs) for each level of each variable included in the model (compared with each variable's reference group) were reported.

An unweighted total of 166,795 visits were identified for patients who met the study inclusion and exclusion criteria in the NHAMCS-ED between the years of 2009 and 2014. From this survey total, the national mean annual asthma-related ED visit totals were estimated (Table 1).

On the basis of the weighted multivariable logistic regression model, after adjusting for factors of interest, patients were significantly less likely to have an asthma diagnosis noted during an ED visit if they had workers' compensation or other insurance as compared with private insurance (OR, 0.57; 95% CI, 0.37–0.88). Work-related asthma is a common, yet underdiagnosed condition, with a median prevalence estimate of 18% among working adults; however, only a small percentage of workers' compensation claims are attributable to respiratory disorders, such as asthma.^{7–9} Therefore, although patients who qualify for workers' compensation could have presented to the ED with asthma, they likely used their private insurance because it was easier than filing a claim.

Table 1Multivariable Logistic Regression Model of Asthma-Related ED Visits in the NHAMCS-ED, 2009–2014^a

Effect	Asthma-related visits, no. (%) ^b	Adjusted OR (95% CIs)
Insurance payment type		
Workers' compensation or other	53,194 (1.1)	0.57 (0.37–0.88)
Self-pay, no charge, charity	369,764 (1.9)	1.13 (0.88–1.45)
Medicaid or CHIP	1,031,664 (3.2)	1.17 (0.98–1.39)
Medicare	267,009 (1.1)	1.01 (0.78–1.31)
Private	716,176 (1.9)	[Reference]
Survey year		
2014	577,131 (2.6)	1.18 (0.90–1.55)
2013	433,231 (2.1)	1.26 (0.99–1.60)
2012 ^c	365,792 (1.8)	
2011	404,551 (1.9)	0.93 (0.76–1.15)
2010	406,805 (2.0)	1.05 (0.87–1.28)
2009	447,524 (2.1)	[Reference]
Age group, y		
≥65	145,886 (0.7)	0.50 (0.36–0.70)
2–18	1,040,455 (4.2)	2.12 (1.81–2.48)
19–64	1,448,693 (1.8)	[Reference]
Sex		
Female	1,457,330 (2.1)	0.99 (0.85–1.14)
Male	1,177,703 (2.1)	[Reference]
Ethnicity		
Hispanic or Latino	453,186 (3.1)	1.68 (1.36–2.07)
Not Hispanic or Latino	1,650,512 (2.0)	[Reference]
Race		
Other ^d	111,949 (3.0)	2.02 (1.45–2.81)
Black	860,855 (3.4)	2.45 (2.07–2.89)
White	1,185,391 (1.5)	[Reference]
MSA		
Non-MSA	286,867 (1.6)	0.86 (0.66–1.11)
MSA	1,982,374 (2.3)	[Reference]
Region		
Northeast	635,824 (2.8)	1.57 (1.23–2.00)
Midwest	606,216 (2.1)	0.96 (0.75–1.23)
West	477,750 (1.9)	1.03 (0.80–1.32)
South	915,243 (1.9)	[Reference]
Seen in last 72 hours		
Yes	97,709 (2.0)	1.18 (0.86–1.63)
No	2,143,156 (2.1)	[Reference]
Triage		
No triage	64,208 (1.9)	0.67 (0.49–0.93)
Nonurgent	102,134 (1.4)	0.33 (0.23–0.47)
Urgent or semiurgent	1,754,758 (2.1)	0.59 (0.48–0.73)
Immediate or emergency	327,944 (2.7)	[Reference]

Abbreviations: CI, confidence interval; ED, emergency department; CHIP, Children's Health Insurance Program; MSA, metropolitan statistical area; NHAMCS-ED, National Hospital Ambulatory Medical Care Survey—Emergency Department; OR, odds ratio.

^aSurvey weighting and clusters accounted for reflecting unbiased, national annual estimates of visit occurrences for the portion of the population that met the study inclusion and exclusion criteria.

^bPercentage in each stratum of variable.

^cThe MSA variable was not included in the 2012 survey, resulting in missing MSA data for 2012. As a result, the model was unable to estimate the 2012 vs 2009 comparison.

^dOther race includes Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaska Native, and more than one race reported.

No other statistically significant differences were found between the various insurance payment types and private insurance. However, clinically important differences remain evident. Per Table 1, those with Medicaid or Children's Health Insurance Program (CHIP) had a 67% relative increase in ED visits at which a diagnosis of asthma was made (3.2%) compared with those with private insurance (1.9%). Among those with Medicaid or CHIP

presenting to the ED, a mean of 1,031,664 receive an asthma diagnosis annually. Reducing the asthma diagnosis rate among those with Medicaid or CHIP from 3.2% to 1.9% (to match the rate of those presenting to the ED with private insurance) would result in 615,085 such visits, a mean reduction of 416,579 visits annually. Given a mean ED charge of \$1,233, this corresponds to an estimated annual reduction in ED costs of \$513,641,907.¹⁰

The overuse of ED systems is a topic that has been discussed for more than 4 decades but has recently received more attention.⁴ Given the numerous initiatives targeted at reducing crises and preventing acute care, we sought to update the literature with the most recent data available on insurance payment type and asthma exacerbations. Unfortunately, disparities appear to remain in the nation's ED facilities despite the recent push to ensure that all Americans have health care through the Affordable Care Act. Our findings substantiate those of previous trials and indicate that efforts to decrease barriers to care may be better targeted at certain subsets of the asthma population.

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