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Characteristics of Hospitalization for Asthma Among Persons Less than 35 Years of Age in Chicago

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ABSTRACT

Mortality from asthma in Chicago is among the highest in the nation for 5–34-year-olds. Data for all hospitalizations among Chicago residents less than 35 years of age were examined to define characteristics that may be contributing to morbidity and mortality from asthma. From 1987 through 1989, the average annual age-adjusted hospitalization rate among persons less than 35 years of age in Chicago was 3.57 per 1000 persons. There were significant associations of community hospitalization rate with median income ($r = -0.61$, $p < 0.001$) and with proportion of community asthma hospitalizations using Medicaid, Medicare, or self-payment ($r = 0.69$, $p < 0.001$). Among 18–34-year-old men, asthma hospitalization rates for Medicaid recipients were 17.4–34.1-fold higher than among men using other forms of insurance. Asthma admissions using Medicaid, Medicare, or self-payment were more likely than those using other forms of insurance to present through the emergency department (79.3% and 66.4%, respectively, $p < 0.001$) and be discharged against medical advice

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(1.8% vs. 0.7%, respectively, $p < 0.001$). These data suggest that differential access to or utilization of health care may be contributing to asthma morbidity in Chicago.

INTRODUCTION

Several authors have suggested that hospitalizations and deaths from asthma are, in most cases, avoidable health outcomes given the advances made in asthma treatment and control (1,2). However, among 5–34-year-olds nationally, both hospitalizations and deaths from asthma increased throughout the 1980s (3).

Variations in hospitalization rates for asthma have been documented among groups defined by race, socioeconomic class, and insurance status, with interaction existing among the effects of these variables (1,4–7). Many other factors have also been identified that may affect hospitalization from asthma, including receipt of episodic rather than continuous care and lack of access to appropriate treatment (8–10).

The identification of factors that affect hospitalization rates is particularly important in light of reports which suggest previous hospitalization from asthma is itself a strong risk factor for death from asthma (11,12). This study was conducted to describe characteristics of hospitalization for asthma in Chicago, a city for which asthma mortality is among the highest in the United States (13,14).

METHODOLOGY

Admission information for this study was abstracted from data collected by the Illinois Health Care Cost Containment Council (IHCCCC) containing all hospital discharges within the state of Illinois. All admissions with asthma as a principal diagnosis (International Classification of Diseases, 9th Revision codes 493.00–493.99) occurring in Chicago among persons less than 35 years of age from 1987 through 1989 were included in this report.

Information collected for each record included date of admission; patient age, sex, and zip code of residence; source of admission [doctor, clinic, HMO, transfer, emergency department (ED), other]; status at discharge [routine, transfer, left against medical advice (AMA), died]; principal and secondary diagnoses; and method of payment (Medicare, Medicaid, commercial, HMO, self-administered, self-pay, other). Data concerning patient race was not collected by the IHCCCC for reasons of privacy. The distribution of patient characteristics was examined by chi-square analysis for categorical variables and *t*-tests for the difference in mean age between select groups.

Yearly asthma admission rates for the city of Chicago, age- and sex-adjusted to the 1980 U.S. population, as well as age-specific and 1980 U.S. age-adjusted asthma admission rates by zip code within the city, were calculated using Chicago Department of Planning 1987–1989 and U.S. Bureau of the Census 1980 population data. Since rates are based on number of hospitalizations and not individual persons, they may include the same person more than once.

Medicaid population data for 1988 were obtained from the Illinois Department of Public Aid as a period midpoint denominator for the calculation of asthma admission rates among Medicaid recipients. Non-Medicaid population size was calculated by subtracting numbers in age/gender-specific groups receiving Medicaid from the total population in each corresponding age/gender group in Chicago for 1988. The population of uninsured Chicagoans could not be reliably estimated and the Medicare population of asthma admissions comprised only 0.5% of total admissions in the study population; therefore, asthma admission rate comparisons by insurance category were limited to comparisons between the Medicaid and all other ("non-

Medicaid") populations. Rate ratios and 95% confidence intervals were calculated by age and sex for this comparison.

Age-specific rates and overall age-adjusted admission rates by zip code areas were related to median household income by zip code using regression analysis with weighting based on zip code–specific population size. Use of age-specific rates and an overall age-adjusted rate in this analysis was necessary because significant inverse correlations between median household income and population size for persons less than 18 years of age and for persons 18–24 years of age exist among Chicago's zip code districts ($r = -0.38$, $p < 0.01$ and $r = -0.39$, $p < 0.01$, respectively).

A regression analysis with weighting by zip code population was also performed to examine the association between percent of total area admissions using Medicare, Medicaid, or self-payment as the primary method of payment and age-adjusted admission rates with zip code as the unit of analysis.

RESULTS

A total of 19,176 admissions with asthma as a primary diagnosis were recorded in Chicago from 1987 through 1989, corresponding to an age/sex-adjusted admission rate of 3.57 per 1000 persons <35 years of age annually. The age/sex-adjusted rate for persons 5–34 years old, calculated for comparison with previously reported national estimates for that age group, was 2.92 admissions per 1000 persons annually.

The greatest number of total admissions (Table 1), and highest admission rates, occurred among children less than 5 years of age. Temporal trends in admission by age and sex are difficult to interpret since so few years were available for analysis, but from 1987 through 1989 admission rates for both sexes within 5-year age groups increased for 20–34-year-olds and either decreased or remained relatively stable for persons less than 20 years of age (Fig. 1).

Medicaid was the most common method of payment overall (45.9% of all admissions), accounting for the highest proportion of admissions among all age groups except 10–14-year-olds, for whom HMO coverage accounted for the highest proportion (41.7%) of total admissions by method of payment. There were no significant differences in method of payment by gender (chi square = 1.95, $p = 0.16$). The highest proportion of admissions with Medicaid use as a method of payment was found among 20–24- and 25–29-year-olds (49.7% and 51.5% of total asthma admissions using Medicaid, respectively). Self-payment of admission expenses was also highest among these age groups (13.5% and

Table 1. Distribution of Admission Characteristics, Chicago, 1987–1989

	NUMBER	PERCENT
Year of admission		
1987	6,248	32.6
1988	6,538	34.1
1989	6,390	33.3
Sex		
Male	10,071	52.5
Female	9,105	47.5
Age group		
00–04	6,438	33.6
05–09	3,536	18.4
10–14	2,585	13.5
15–19	1,581	8.2
20–24	1,606	8.4
25–29	1,650	8.6
30–34	1,780	9.3
Admission sources		
Doctor's office	2,820	14.7
Clinic	402	2.1
HMO	390	2.0
Emergency department	14,197	74.0
Other	1,367	7.2
Payment type		
Medicare	95	0.5
Medicaid	8,807	45.9
Commercial	6,540	34.1
HMO	1,097	5.7
Self-administered	147	0.8
Self-pay	1,760	9.2
Other	730	3.8
Discharge status		
Routine	18,757	97.8
AMA	259	1.4
Dead	7	0.1
Other	153	0.7

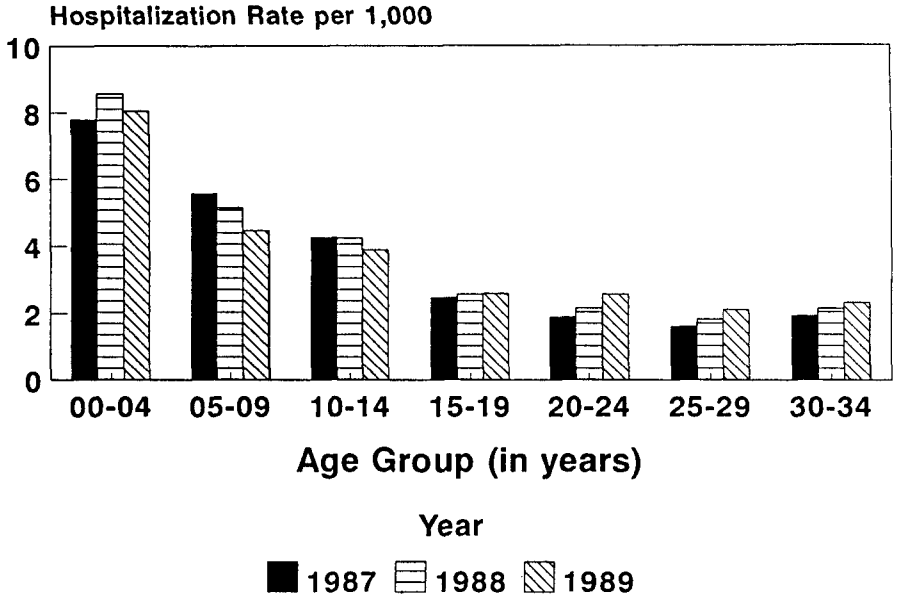

Figure 1. Chicago asthma hospitalizations by age group, 1987–1989. Sex-adjusted to 1980 U.S. population.

13.0% of 20–24- and 25–29-year-olds self-paying, respectively).

The ED was the most common source of admissions, accounting for 74.0% of all admissions in the period examined. There were no differences in admission source by gender (chi square = 7.91, $p > 0.05$). Children less than 5 years old were least likely and 20–29-year-olds were most likely to have the ED as an admission source (71% and 78%, respectively) among asthma hospitalizations.

A significantly greater proportion of admissions through the ED was made among persons using Medicare, Medicaid, self-payment, or other methods of payment when compared with persons admitted with commercial, self-administered, or HMO coverage (79.3% vs. 66.4%, respectively; chi square = 396.13, $p < 0.001$). Asthma admissions covered by Medicaid, Medicare, or self-payment were also more often discharged AMA when compared with those covered by other payment sources (1.8% vs. 0.7%, respectively; chi square = 41.61, $p < 0.001$).

Asthma admission rates for the Medicaid population were significantly higher than for the remainder of the Chicago population within any age group, with differences greater for males and among older age groups (Table 2). For persons less than 18 in Chicago, admission rates were 1.5–2.2-fold higher among Medicaid recipients than all other persons. Among persons 18–34 years of age, asthma admission rates among female Medicaid recipients were 3.9–5.1-fold higher than rates for other females, while rates for male Medicaid recipients were 17.4–34.1-fold higher than for males using other methods of payment. Asthma admission rates among male Medicaid recipients increased with age, rather than decreased, in sharp contrast to rates for the remainder of the Chicago male population.

Examination of age-specific and age-adjusted asthma admission rates by zip code area indicated a consistent inverse association with median household income (Table 3). Annual rates adjusted to the 1980 U.S. population for persons less than 35 years old were significantly and inversely correlated with income ($r = -0.61$, $p < 0.001$). Correlation coefficients ranged from –0.51 to –0.57 for age-specific analyses. Using percent of admissions with Medicare, Medicaid, or self-pay-

Table 2. Admission Rates by Payer Status and Medicaid/All Other Payment Rate Ratios All Rates Expressed as Admissions/1000 persons/year

	AGE GROUPS				
PAYER STATUS	<15	15–17	18–20	21–29	30–34
Male					
Medicaid	9.45	3.90	17.14	22.31	14.01
All other	6.21	2.01	0.77	0.65	0.80
Rate ratio	1.52	1.94	22.26	34.06	17.45
95% CI	(1.46, 1.59)	(1.62, 2.34)	(17.62, 28.11)	(29.96, 38.71)	(14.77, 20.60)
Female					
Medicaid	5.79	5.39	7.45	6.63	8.99
All other	3.77	2.39	1.78	1.70	1.75
Rate ratio	1.54	2.25	4.18	3.90	5.13
95% CI	(1.45, 1.63)	(1.92, 2.65)	(3.55, 4.93)	(3.58, 4.25)	(4.59, 5.73)
Overall					
Medicaid	7.66	4.67	9.03	8.31	10.00
All other	5.01	2.19	1.22	1.12	1.26
Rate ratio	1.53	2.13	7.40	7.41	7.95
95% CI	(1.48, 1.58)	(1.89, 2.41)	(6.47, 8.47)	(6.90, 7.96)	(7.25, 8.71)

ment as primary method of payment in the regression equation produced correlation coefficients similar in magnitude to the median income analysis but with a positive association, indicating higher asthma admission rates among zip code districts with greater utilization of these methods of payment (Table 3).

The ratio of high to low admission rates among communities was over 25-fold, with the highest rate of 12.7 admissions per 1000 persons annually in a neighborhood with a median income of $7098 and 78.6% of all admissions using Medicaid, Medicare, or self-payment as the method of payment, and with the lowest rate of 0.51 admissions per 1000 persons annually in a neighborhood with a median income of $14,723 and 87% of admissions paid for by commercial or self-administered insurance or by an HMO.

DISCUSSION

The overall age- and sex-adjusted asthma admission rate of 2.92 per 1000 persons aged 5–34 per year in Chicago from 1987 through

Table 3. Weighted Regression Analysis: Association of Zip Code Area Socioeconomic Variables and Asthma Admission Rates, Chicago, 1987–1989

	MEDIAN INCOME			% PUBLIC OR SELF-PAY[a]		
AGE GROUP	r	r^2	p	r	r^2	p
<18	–0.57	0.32	<0.001	0.57	0.32	<0.001
18–24	–0.55	0.30	<0.001	0.60	0.36	<0.001
25–34	–0.51	0.26	<0.001	0.64	0.40	<0.001
<35	–0.61	0.37	<0.001	0.69	0.48	<0.001

[a]Indicates use of Medicaid, Medicare, or self-payment as primary method of payment.

1989 is more than twofold higher than the 1.22 admissions per 1000 5–34-year-olds reported nationally from 1982 through 1986 (3). Much of this difference could be due to a disproportionate representation in Chicago of low-income persons or racial groups with higher asthma prevalence rates relative to the nation. Adjustment for race and ethnic status in this study, however, was not feasible since race and ethnic status were not collected by the IHCCCC.

Unfortunately, asthma has been reported among the most commonly misused diagnoses for fraudulent Medicaid office visit reimbursements, and beta-agonists may be inappropriately dispensed to nonasthmatics who use the drug to potentiate the effects of cocaine. As such, estimates of prevalence and severity using Medicaid or prescription data may falsely overestimate true measures of illness. This effect would be less substantial for hospitalizations due to the more stringent criteria that must be met for admission, particularly with reference to primary diagnoses as used in this report. The long-term role of drug abuse in asthma is an important one and certainly requires further examination.

While the few years of data collection limit extensive analysis, our study suggests that admission rates may be stable or decreasing among children and increasing among young adults. If these trends persist, they may reflect true changes in prevalence of disease, which could not be measured in this study, or increasing awareness and prevention of severe outcomes among asthmatic children with less attention to the disease or less effective treatment for asthma among adults.

The significant inverse association between asthma admission rates and neighborhood median income as well as the positive association with proportion of total neighborhood admissions using Medicaid, Medicare, or self-payment as the method of payment are consistent with a previous study which found that 57% of the variation in New York City neighborhood hospitalization rates could be explained by median income (4).

Wissow et al. found a two- to threefold increase in hospitalization rates for asthma among Maryland Medicaid recipients less than 20 years of age when compared with the remainder of the population from 1979 to 1981 (6). Weissman et al. examined persons less than 65 years of age and found 1.7–4.9-fold higher asthma admission rates among Medicaid and uninsured populations relative to privately insured in Maryland and Massachusetts (1), an increase that remained significantly higher even after adjustment for differences in overall admission rates. While the rate ratios of Medicaid:non-Medicaid admission rates among persons less than 18 and females 18–34 in Chicago are within the ranges previously noted, the rate ratios for males 18–34 years of age are considerably higher and indicate excess hospitalization among male Medicaid recipients relative to females.

It is notable that, in addition to the greatest differential in hospitalization rates between Medicaid and non-Medicaid populations, young adult males in this study had the highest proportion of payment by Medicaid as well as without insurance, the highest proportion of admissions made through the ED, and the highest rate of discharge AMA. Among persons aged 5–34 in Chicago, the highest asthma mortality rate occurs among young adult males, as well (14).

The fact that differences in asthma admission rates between Medicaid recipients and other persons in this study were greater for men than women may reflect gender differences in criteria for Medicaid eligibility. Men may receive Medicaid for reasons related to medical need, such as chronic conditions including asthma, while women may, in addition, receive Medicaid for reasons unrelated to asthma, such as being the head of a household with dependent children.

The higher admission rates seen among Medicaid recipients and low-socioeconomic-status (SES) communities may reflect a variety of factors. Higher prevalence of disease among persons of lower SES has been noted for both children (15,16) and adults (17). Control for various social and environmental factors in the 1981 National Health Interview Survey Child Health Supplement data reduced the risk for increased prevalence of asthma among African-American and poor children to statistical insignificance (16). Ad-

justments for SES differences in other studies have similarly reduced the race-associated risks for asthma prevalence (17,18) and hospitalization (6).

Greater severity of asthma among low-SES groups and Medicaid recipients may also be a factor in why a larger percentage of individuals from this group seek medical care for asthma. In a study of Michigan Medicaid recipients less than 45 years of age, Gerstman et al. noted a 6.6% annual increase in the average number of antiasthma medications per Medicaid recipient and a sixfold increase in the use of metered dose inhalers from 1980 through 1986 (19). Both increases were greater in Medicaid recipients than in the remainder of the population and may suggest increasing severity of disease with appropriate access to care.

Alternately, if the Medicaid population has worse access to care or less continuous care, controllable asthma may worsen in severity or patients may receive greater amounts of medication in substitution for more regular care. Failure to receive preventive care—particularly among young adult males, for whom it is generally difficult to obtain public medical assistance—has been linked to increasing rates of hospitalization for asthma (10). The disproportionately increased rates of asthma hospitalization seen among male Medicaid recipients in Chicago are consistent with this hypothesis. Low-SES groups may be more likely to have episodic care (20) and experience less consistent management or delays in care (21). Several studies have found that economically disadvantaged inner-city children are more likely to receive episodic care and use emergency departments as the primary source of medical care (8–10). This may lead to greater likelihood of physicians admitting an asthmatic to the hospital for fear of inadequate follow-up (1). The fact that differences between Medicaid and non-Medicaid admission rates were smaller among children may suggest similarity in access to care among younger asthmatics, a possibility supported by lower ED utilization for admission and greater commercial or private insurance support among children than young adults in Chicago. Greater differences in access to care among young adults relative to children may also be a factor in what appear to be stable or decreasing rates of asthma admissions among younger persons and increasing rates among adults in Chicago during the period of study.

SUMMARY AND CONCLUSIONS

A significant inverse correlation was noted between neighborhood median income and asthma hospitalization rates among persons less than 35 years of age in Chicago. Persons using Medicaid or Medicare as the primary source of payment had higher asthma hospitalization rates than the remainder of the population for every age- and sex-specific group examined, particularly among young adult males for whom asthma mortality is relatively highest among persons 5–34 years of age in Chicago (14). Further, persons admitted for asthma and using Medicaid or without insurance in this study were significantly more likely to have been admitted through the ED and were significantly more likely to leave the hospital AMA than were admissions using private or commercial health insurance payment, which may suggest inadequate access to or utilization of health services and incomplete or episodic care.

Increasing prevalence or severity of asthma, as well as differential access and utilization of health services, all of which are amenable to intervention, may be contributing to socioeconomic differences in asthma hospitalization noted in this report. These issues are particularly important since asthma is considered, in general to be a preventable illness (1,2) and hospitalization for asthma is a risk factor for subsequent death from the disease (12,13). Delineating factors that contribute to these patterns will require further studies.

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