Disparities and Predictors of Emergency Department Use Among California's African American, Latino, and White Children, Aged 1–11 Years, with Asthma

Objectives: The purpose of this study was to determine factors associated with use of emergency departments by African American, Latino, and White children aged 1–11 years in California.

Methods: I conducted a secondary analysis of parental reports of emergency department use by children with asthma (defined as doctor's diagnosis of asthma). An overall sample of 1313 children with asthma was identified from the California Health Interview Survey, 2001.

Results: African American children were 1.82 times (95% CI 1.23–1.25) and Latino children were 1.23 times (95% CI 1.21–1.25) more likely than White children to visit the ED for asthma symptoms. Severity of symptoms, having private health insurance, being from a single-family home, and childhood disability factors were also associated with emergency department use.

Conclusions: Health insurance type, being from a single-parent home, and asthma severity and disability predict the use of emergency department use for African American, Latino, and White children with asthma in California. (*Ethn Dis*. 2009;19:71–77)

Key Words: African American, Latino, Asthma, Disparities, Emergency Department

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Introduction

Asthma is the most common chronic condition among US children.[1] Asthma-related morbidity and mortality among children are rising, particularly among African Americans, the poor, and those residing in urban environments.[2] Among children from lower socioeconomic status backgrounds, worsening outcomes relate to lack of access to appropriate outpatient care. Poor and minority children are more likely to use the emergency department (ED) for acute asthma care and are less likely to make preventive visits to office- or clinic-based practitioners.[3] Surveys of healthcare use in several major US cities indicate that children with asthma make frequent visits to pediatric EDs for asthma, and this finding is especially true for low-income families who rely on the ED as a primary source of care for this disease.[3] These visits represent considerable direct and indirect costs for families and the healthcare system.[4]

Adverse outcomes such as hospitalization and ED visits account for almost three-fourths of the direct costs of asthma.[2–3,5–9] For some children, lack of adequate health insurance precludes optimal care and contributes to adverse outcomes. Even among insured children, the rates of hospitalization and ED visits vary widely.[10,11]

In examining the racial/ethnic and socioeconomic disparities in asthma-related ED use, few studies have accounted for the many contributing factors. Moreover, few studies have looked at these issues as predictors of asthma-related ED use as it relates to children in California. The purpose of this study was to look at ED use and to identify predictors of use and any potential racial/ethnic or socioeconomic disparities in ED use among a population of African American, Latino, and White children aged 1–11 years, with asthma, in the state of California. I attempted to answer two research questions: 1) What are the predisposing, enabling, and need factors that predict the use of the ED by race and ethnicity among children aged 1–11 years? and 2) Does income serve as a main deterrent in the use of the ED by race and ethnicity in children aged 1–11 years?

Methods

Research Design

This was a secondary analysis of a larger primary data set to determine the prevalence of asthma and the use of medication to control asthma among African American, Latino, and White children with asthma, aged 1–11 years, living in California. The larger primary data set was from the California Health Interview Survey (CHIS), 2001.[12] The CHIS 2001 included 12,592 households from every geographically stratified county in California by a random-digit–dialed, cross-sectional, multistage telephone survey, conducted from November 2000 through September 2001. During the initial screening interview for the child questionnaire (59% response rate), the parent or adult guardian who knew the most about the health care of the sampled child was selected for an extended interview (87% response rate). The overall response rate was 33% (the product of the overall rate for the adult survey [38%] multiplied by the appropriate child response rate [87%]).[12–13] Benchmarking of the CHIS 2001 sample characteristics against other known reliable data sources (ie, Behavioral Risk Factor Surveil-

lance System and the US Census) demonstrated that the CHIS 2001 sample was representative of California's household population and that weighted data provided reliable estimates of adults and children statewide.[14] Because a number of African American and Latino children often use the ED as a source of primary care, the outcome variable, which was a dichotomous variable, sought to determine the ED use among this population of children within the past 12 months.

Participants

Of the 12,592 families with children under the age of 12 interviewed in the larger dataset of CHIS 2001, 1313 families of children with asthma who were aged 1–11 years were included in the final sample. This was a racially/ethnically diverse sample of African Americans, Latinos, and Whites. The present study included data from the subset of the adult proxy that answered questions regarding the child.[13–15] The larger dataset (primary) was conducted with children who lived in California.

Institutional review board approval was sought and obtained. Because this study was a secondary analysis of a larger dataset taken from the CHIS, the study was also reviewed and approved by the CHIS Data Disclosure Review Committee.

Predictor Variables

Three sets of predictor variables based on the theoretical behavioral model of access were used to analyze the data: 1) predisposing factors; 2) enabling factors; and 3) need factors.[16]

The predisposing factors were 1) demographic factors of race/ethnicity, which was defined as African American, Latino, or White; 2) age, dichotomized as from 1 to 5 years and from 6 to 11 years; 3) sex, dichotomized as male and female; 4) area of residence, dichotomized as small town/rural and urban/second city/suburban; 5) poverty level,

dichotomized as ≤199% of the federal poverty level or ≥200% of the federal poverty level. The parental factors that were used included family type and household size.

Enabling factors were defined as two dichotomous factors: 1) currently insured (yes or no) and 2) had a usual place to go when sick (yes or no). Another enabling factor was the type of health insurance defined as MediCal, Healthy Families, and employer-based (private) health insurance. Each factor was consistent with the literature on access to health care for children and was a good measure of factors that facilitate access to and use of healthcare services.[17]

Need factors included physician diagnosis of asthma, the severity of asthma, and the degree of childhood disability. CHIS 2001 provides substantial measures of severity and disability for children with asthma. The terms "limit," "limited," or "prevent," are words defining disability used by CHIS 2001. Disabling asthma is often associated with a substantial use of physicians and an increased number of hospitalizations.[18] Severity measures have been operationalized in the literature, based on a combination of physiologic measures, social role function, and healthcare utilization.[18]

Need factors were operationalized by several factors, including a physician's diagnosis of asthma and a measure of frequency and severity of asthma symptoms in the past 12 months. This was defined as no symptoms, symptoms less than one month (mild symptoms), symptoms one to two times a month (moderate symptoms), and symptoms every week but not every day and every day and almost every day (severe symptoms). I also looked at measures of child disability, which included 1) current condition limits/prevents activities as usual for age, 2) current condition limits/prevents the ability to attend school regularly, 3) current condition limits/prevents the ability to

do regular school work, and 4) physical activity was limited because of asthma defined as rarely/never, sometimes, and always/most of the time.

Statistical Analysis

Because CHIS 2001 was based on a complex sampling design, appropriate sample weights were used in the analysis. SUDAAN version 7.5 (RTI International, Research Triangle Park, North Carolina), with probability weighting using relevant strata and primary sampling unit (ie, household), was used for population analysis. SUDAAN was used to obtain weighted frequencies, odds ratios (ORs), and 95% confidence intervals (CIs). I used χ^2 tests to test differences in proportions and logistic regression for multivariate analysis.

Analyses included frequency distributions and univariate statistics for measures of demographic data (predisposing and enabling factors), asthma status, and severity and disability associated with asthma (need factors). Factors for severity and disability were evaluated by stratifying race and ethnicity. Regression analyses were conducted for outcome of medication use to control asthma and to evaluate the predictors of medication use. The format of this present study followed the theoretical model by including predisposing, enabling, and need factors in sequential multivariate models. Unadjusted ORs and 95% CIs were calculated from the estimated regression coefficients for the independent variables. A significance level of $P<.1$ was used for this step. To look at multiple effects of significant predisposing, enabling, and need variables (determined by the unadjusted odds calculations) and to identify which variables may be confounding variables, multiple logistic regression models were constructed for the outcome variable. To ensure that no variables were excluded from the final model helping to decrease type II errors, a significance level of $P<.05$ was set. To

Table 1. Demographic factors among California's African American, Latino, and White children with asthma, ages 1–11 years (N = 1,313)

Factor	Latino (*n* = 384)	African-American (*n* = 137)	White (*n* = 792)	Total Sample
Child age in years*				
1–5 years	38.8% (*n*=149)	33.6% (*n*=46)	27.5% (*n*=413)	*n*=413
6–11 years	61.2% (*n*=235)	66.4% (*n*=91)	72.5% (*n*=574)	*n*=900
				N=1,313
Child sex*				
Male	60.4.% (*n*=232)	67.9% (*n*=93)	61.7% (*n*=489)	*n*=814
Female	39.6% (*n*=152)	30.3% (*n*=44)	38.3% (*n*=303)	*n*=499
				N=1,313
Child poverty*				
<200% of federal poverty level	63.0% (*n*=242)	54.0% (*n*=74)	61.7% (*n*=489)	*n*=814
≥200% of federal poverty level	37.0% (*n*=142)	46.0% (*n*=63)	38.3% (*n*=303)	*n*=499
				N=1,313
Child area of residence*				
Urban/second city/ suburban	79.4% (*n*=304)	91.2% (*n*=125)	71.8% (*n*=567)	*n*=996
Small town/rural	20.6% (*n*=79)	8.8% (*n*=12)	28.2% (*n*=223)	*n*=314
				N=1,310†
Currently insured* (Yes)	90.1% (*n*=346)	96.4% (*n*=232)	96.2% (*n*=762)	N=1,240‡
Have usual place to go when sick*	97.1% (*n*=375)	99.3% (*n*=136)	98.9% (*n*=783)	N=1,294‡
Type of health insurance‡				
Medi-Cal (Yes)	30.2% (*n*=116)	38.0% (*n*=52)	15.3% (*n*=121)	*n*=289
Healthy Families (Yes)	9.1% (*n*=35)	5.1% (*n*=7)	3.8% (*n*=30)	*n*=72
Employer-based (Yes)	50.0% (*n*=192)	48.2% (*n*=66)	72.7% (*n*=576)	*n*=834
				N=1,195‡

* Differences are significant; Pearson χ^2 $P < .05$

† Data totals for type of insurances do not equal total due to missing data.

‡ Table shows only "yes" responses. When "no" responses are included the total N=1,313.

construct efficient final multiple regression models, a user-determined stepwise regression analysis procedure was conducted. In accordance to the theoretical model, each of the variable categories was put into the models in a separate step.

RESULTS

Of the 10% of African American, Latino, and White children in California aged 1–11 years who had asthma in the 2001 CHIS dataset, 12% were African American, 36% were Latino, and 52% were White. Children in the sample were predominantly older, male, lived at ≥200% the federal poverty level, and lived in urban/ second city or suburban areas (Table 1). Most were insured and had employer-based health insurance or Medi-Cal health insurance; very few had Healthy Families insurance. Most

children with asthma also had a usual place to go when sick.

While most parents reported that their children had mild symptoms of asthma in the past 12 months, more African American and Latino children had moderate asthma symptoms than did White children (Table 2). More White and Latino children had severe asthma symptoms than did African American children. African American children had higher rates of childhood disability from asthma. More African American parents reported that their children had a condition that limited activities than did parents of White and Latino children. More African American children had a condition that limited their ability to attend school than did Latino and White children, and more African American children had a condition that limited their ability to do regular schoolwork than did Latino and White children. Finally, more African American chil-

dren had their physical activity limited than did Latino and White children.

Not controlling for other factors, analysis of data indicated significant associations by race and ethnicity in ED visits in the past 12 months. African American children with asthma were 1.24 times as likely (95% CI 1.23–1.25) as Whites to visit the ED in the past 12 months, and Latino children were 1.23 times as likely (95% CI 1.21–1.25) as Whites. There was little difference between African American and Latino children's use of the ED.

The univariate models looked at each of the predisposing, enabling, and need variables and at outcome variables, regarding visits to the ED in the past 12 months. Univariate predictors of ED use at the P<.05 significance level included (1) predisposing factors of *age* (1–5 years), and *single with kids*; (2) the enabling factor *employer-based health insurance*; and (3) the need

Table 2. Asthma severity and disability related to asthma among California's African American, Latino, and White children aged 1–11 years with asthma (N = 1,313)

Factor	Latino (*n* = 384)	African-American (*n* = 137)	White (*n* = 792)	Total Sample
How often had asthma symptoms in the past 12 months*				
No symptoms in the past 12 months	23.1% (*n*=86)	12.7% (*n*=17)	22.1% (*n*=174)	*n*=277
Symptoms < once per month	58.6% (*n*=218)	69.4% (*n*=93)	60.9% (*n*=479)	*n*=790
Symptoms 1 or 2 times per month	8.1% (*n*=30)	14.2% (*n*=19)	6.6% (*n*=52)	*n*=101
Symptoms every week/not everyday and almost everyday	10.2% (*n*=38)	3.7% (*n*=5)	10.4% (*n*=82)	*n*=125
				N=1,293†
Current condition limits or prevents activities for age* (Yes)	16.7% (*n*=64)	19.7% (*n*=27)	20.7% (*n*=164)	*N*=255‡
Current condition limits or prevents attending school regularly* (Yes)	11.8% (*n*=33)	15.2% (*n*=15)	7.9% (*n*=50)	*N*=98
Current condition limits or prevents ability to do regular school work* **(Yes)**	9.7% (*n*=27)	9.1% (*n*=9)	10.2% (*n*=64)	*N*=100
How often physical activity limited due to asthma* (Yes)				
Always/most of the time	4.7% (*n*=18)	6.6% (*n*=9)	3.0% (*n*=24)	*n*=51
Sometimes	27.6% (*n*=106)	19.0% (*n*=26)	15.8% (*n*=125)	*n*=257
Rarely/never	67.7% (*n*=260)	74.4% (*n*=102)	81.2% (*n*=643)	*n*=1,005
				N=1,313

* Differences are significant; Pearson χ^2 *P*<.05.
† Data totals do not equal total due to missing data.
‡ Table shows only ''yes'' responses. When ''no'' responses are included totals are *N*=1,311 for ''Current condition limits/prevents activities for age;'' *N*=1,008 for ''Current condition limits/prevents attending school regularly;'' and *N*=1,005 for ''Current condition limits/prevents ability to do regular school work.''

factor measuring severity, *past 12 months with asthma symptoms*, including mild, moderate and severe symptoms (Table 3).

Significant variables in the univariate regression analysis were entered into multivariate analysis via stepwise progression. The final model indicated that

Table 3. Significant unadjusted odds ratios for predisposing, enabling and need factors and visiting the emergency room in the past 12 months for California's African American, Latino and White children with asthma (N = 1,313)

Variable Name	Unadjusted odds ratio (95% CI) for emergency room visit *		
	OR	CI lower	CI upper
Predisposing			
Age†			
1–5	1.91	1.32	2.77
6–11‡	1.00		
Family type†			
Married with kids‡	1.00		
Single with kids	2.03	1.44	2.87
Other	2.54	0.75	8.58
Enabling			
Type health insurance			
Employer-Based			
Yes‡	1.80	1.23	2.59
No	1.00		
Need			
Past 12 months with asthma symptoms*			
No Sympt. in past 12 months‡	1.00		
Sympt. < 1/mo	2.51	1.67	3.77
Sympt. 1–2/mo	4.87	2.54	9.32
Sympt. every week/not every day/almost every day	4.56	2.79	7.45

* $P \le 0.5$.
† Data totals do not equal final sample size due to missing data.
‡ Reference variable.

previous significant factors (ie, age, employer-based insurance, and being from a single-parent family) were no longer significant at *P*<.05. After controlling for predisposing, enabling, and need factors, the final regression model indicated that single parents (a predisposing variable),, those with employer-based health insurance; those with a current condition limiting activities (a need variable measuring childhood disability and asthma severity all were predictors of ED use in the past 12 months. Regarding severity of asthma (another need variable), a significant linear gradient was seen in visits to the ED on the basis of measures of additional symptom frequency. The more often symptoms were experienced, the greater the likelihood of visiting the ED (Table 4).

After adjusting for significant predisposing, enabling, and need predictor variables, race/ethnicity was not significant in predicting visits to the ED in the past 12 months. However, differences may be mediated by other predisposing and need factors. Bivariate analysis indicated significant differences among the races/ethnicities; African

Table 4. Final multiple logistic regression analysis of predisposing, enabling and need significant predictors of visiting the emergency room in the past 12 months, for African American, Latino and White children aged 1–11 years with asthma. (n=982)*

Variable Name	OR	CI lower	CI upper	P-Value
Predisposing				
Family type				
Married with kids†	1.89	1.24	2.89	**0.00**
Single with Kids				
Other				
Enabling				
Type health insurance				
Employer-based	0.53	0.33	0.85	**0.00**
Yes				
No†				
Need				
Current condition limit activities for age				
Yes	1.84	1.08	3.13	**0.03**
No†				
Past 12 months with asthma symptoms				
No sympt. in past 12 months†				
Sympt. < 1/mo	2.41	1.35	4.29	**0.00**
Sympt. 1–2/mo	2.84	1.14	7.05	**0.03**
Sympt. every week/not every day/almost every day	3.77	1.73	8.22	**0.00**

* Data totals do not equal final sample size due to missing data.
† Reference variable.

Americans reported more frequent symptoms and use of the ED than did Whites or Latinos. Other variables, such as coming from a single-parent home, having a disability related to asthma, and having more severe asthma, were stronger predictors for visits to the ED for this sample and mediated the effects of race/ethnicity that were shown in the bivariate analysis.

DISCUSSION

Most children with asthma were White and Latino.[19] These data have implications for asthma research regarding geographic surroundings on asthma. Residents of poor areas are less likely to comply with their asthma medication regimens, leaving them at higher risk for exacerbated asthma attacks and poor health outcomes.[20]

Although children from each ethnic group had high rates of health insurance, Latino children were less likely to be insured than were African American and White children. Lack of insurance

may lead to increased use of other medical facilities, including the ED, for asthma care.[21]

African Americans and Latinos are more likely to have Medicaid insurance.[15,19] However, even when managed Medicaid equalizes financial access to health, variations in health care quality persist.[22]

The findings from this study support the results of other studies that have found that African Americans with asthma use the ED more often.[23] One national study found that from 1988 through 1991, African American children with asthma had a 5% greater rate of ED use for asthma than did non-African American children with asthma.[24] According to this and other studies, more African American children use the ED for care related to their asthma.[25]

Previous research found that children of single mothers had more disabling asthma, which restricted their activity.[18] Research also indicates that single mothers tend to be poor, live in under-served neighborhoods, and have

decreased access to quality health care.[26] Families from impoverished backgrounds may be less likely to have family or community support for the asthma management of their children. This may lead to increased use of the ED. Research studies also noted that frequent use of the ED as a source of primary care for asthma indicates a failure of available primary care and that these visits can be prevented with proper education and prevented treatment for asthma.[3]

While neither Medi-Cal nor Healthy Families insurance was a significant predictor of ED use, having employer-based health insurance was. This result was expected because other studies showed that those with private insurance use the ED less often than those without private insurance.[27] For example, in a study of children with asthma from Connecticut and Massachusetts, children with Medicaid used the ED more frequently for asthma services than did privately insured children.[28]

Limitations

The findings of this study are subject to several limitations. First, because the study sample was identified based on asthma diagnosis and asthma healthcare use during the past 12 months, children who did not have a physician's diagnosis of asthma or had asthma without any clinical care may have been excluded from this study. Many racial/ethnic minority children have undiagnosed asthma, and African American ethnicity is more strongly associated with a mother's report of asthma than with a doctor's diagnosis. These results may underrepresent the true extent of disparities in asthma severity, disability, and healthcare use among children in California.

Second, conceptualization errors and construct validity are two such measurement errors that potentially could be found in this data set. One concept that could have been measured

differently was the utilization of health-care services. Much of the research on childhood asthma and access to services closely follows the National Heart, Lung and Blood Institute's guidelines and uses other measures of access, including hospitalizations, type of place to receive care, type of medical provider, and type of medications used. These variables were not used in this study because the sample size for a particular variable was either too small and statistical analysis could not be done, or the variable was not found in the data set. Third, because this was an anonymous survey (to ensure high completion rates), the information reported by parents was not verified. Parents' reports of asthma severity might underestimate the symptom frequency and might be less sensitive to changes in quality of life,[29] and ED use could have been over-reported; however, because it was anonymous, underreporting was unlikely.

Conclusions

More African American and Latino children with asthma use the ED for care related to their asthma, adding to the increasing cost of health care to both the hospital and the patient. Intervention needs to be done at the level of the healthcare provider for African American and Latino children as well as for single-parent families to teach them how to prevent asthma flare-ups and when it is appropriate for them to use the ED. Healthcare facilities need to address the geographic needs of African American, Latino, and poor families. Healthcare systems need to ensure that African American and Latino children have access to primary care.

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AUTHOR CONTRIBUTIONS

Design concept of study: Wright
Acquisition of data: Wright
Data analysis and interpretation: Wright
Manuscript draft: Wright
Statistical expertise: Wright
Acquisition of funding: Wright
Administrative, technical, or material assistance: Wright
Supervision: Wright