

**The Role of Access: Acute Asthma Care Utilization in a
2008 Arizona Medicaid Population**

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Zachary Ortiz

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Mentor: Diana Petitti, MD, MPH

Dedication

To my mother and father; without you, nothing is possible.

To my wife, whose commitment is unwavering and love is enduring.

To Abby and Tucker, who teach me how to relax and enjoy.

Acknowledgements

I am greatly indebted to dedicated, intelligent and generous professionals at ASU's *Center for Health Information and Research (CHIR)*. In particular, to Dr. Bill Johnson for his approval of the project, to Gevork Harootunian for help with the technical aspects of data collection and especially to Dr. Diana Petitti, who imparted her expertise while having the stamina and patience to see the work through to its conclusion. Finally, Dr. Paul Hsu from the University of Arizona College of Public Health assisted in statistical analysis.

Abstract

Prior research shows racial disparities in patient (IP) and emergency department (ED) use for children with asthma. It has been difficult to disentangle the effects of race/ethnicity from the effect of socioeconomic status on IP and ED use. To better understand the relationship between race/ethnicity and care in these settings, data from a cohort of 3490 school-age children with asthma enrolled in the AHCCCS (Medicaid) program in Maricopa County, Arizona in 2008 were analyzed. For children with asthma, odds ratios were estimated by comparing 'any visit' (ED or IP) to 'no visits' according to race/ethnicity. Among children with asthma, junior high and high school individuals were more likely to experience a visit compared to elementary school age individuals. African-Americans were about twice as likely to have at least one ED or IP visit compared with White, non-Hispanics. Odds ratios for having any ED or IP visit were also increased in Hispanics and Native-Americans compared with White, non-Hispanics but the increases were not statistically significant. Although the generalizability of the study is limited, the data suggest that differences in socioeconomic status do not fully explain racial disparities in use of the ED and IP settings for asthma care. Attempts

to further understand any causal relationship between race/ethnicity and asthma should be coupled with targeted interventions to minimize known disparities.

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Introduction

The Epidemiology of Asthma: Lifetime prevalence:

20 million Americans suffer from asthma, more than any other chronic non-communicable disease (National Institute of Allergy and Infectious Disease, 2001). Unlike some communicable and sexually transmitted diseases, there is no mandatory state or federal reporting mechanism for asthma. The best estimator of prevalence is therefore the Center for Disease Control's (CDC's) Behavior Risk Factor Surveillance System (BRFSS). This is a state-based randomized telephone survey that assesses the civilian non-incarcerated population age 18 and older which assesses lifetime prevalence by asking parents if their children have ever been told they have asthma (Centers for Disease Control and Prevention, 2011). In Arizona in 2009, 13.5% of parents reported that their child (age 17 or younger) ever had asthma (Tormala, Shetty, Valenzuela, & Ortiz, 2010). The rates in 2009 closely matched the national lifetime prevalence of 14%, a trend also observed in the preceding four years (see figure 1).

Figure 1: Lifetime prevalence of children (≤ 17 yrs) in Arizona, United States, 2005—2009 (Tormala et al., 2010)

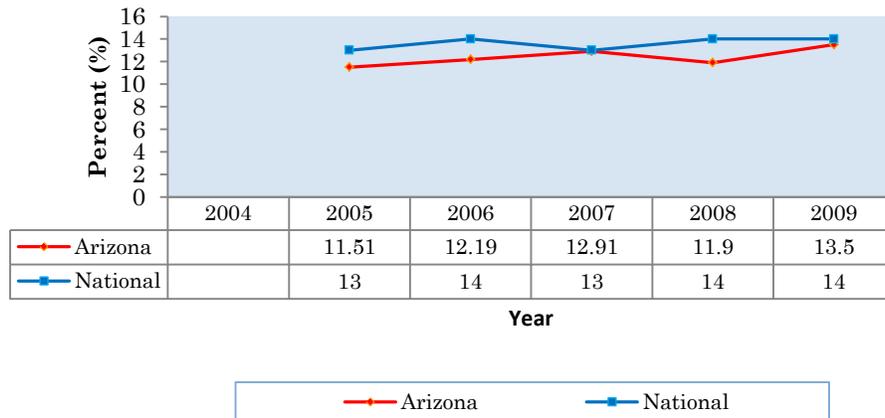


Figure 1: The question asked of the respondent was: “Has a doctor, nurse or other health professional ever said that the child has asthma?”

With respect to race/ethnicity, lifetime asthma prevalence in Arizona high school students in 2009 was found to be 29.6% of African-American, Non-Hispanic individuals compared to 23.0% of White, Non-Hispanics, 17.2% of Hispanic/Latinos and 14.5% of Native Americans (Arizona Department of Education, 2009). These findings mirror those of a 2008 CDC study, which reported that 21% of Non-Hispanic Black children had a lifetime asthma prevalence compared to 16% of Hispanics and 13% of Non-Hispanic whites in 2008 (Bloom, Cohen, & Freeman, 2009). A BRFSS analysis of lifetime prevalence rates from 2005-2009 further showed that white, non-Hispanic children have the lowest while African-American children have the highest rates of lifetime and period prevalence (see figure 3). The trends from national and Arizona data therefore suggest that in general, multiracial, African-American, Hispanic and possibly Native-American/ Alaskan Native groups experience asthma at greater rates than white, non-Hispanics, Asians and Native Hawaiians/Pacific Islanders.

Period Prevalence:

In contrast with lifetime prevalence, which assesses whether an individual has *ever* been diagnosed with asthma, period or current prevalence assesses individuals who carry an active diagnosis of

asthma during a defined period of time. Period prevalence is always of equal or lesser magnitude than lifetime prevalence, given that individuals with asthma may experience disease resolution. For example, the 2009 National Health Interview Survey (NHIS) found that 7.0 million, or 9.4%, of children in the United States had asthma during this year compared to national lifetime prevalence of 14% in the same year shown in figure 1 (*FASTSTATS - asthma*). Figure 2 illustrates this difference in the Arizona and United States adult population given BRFFS survey responses. While child-specific data for Arizona period prevalence are unavailable from 2005-2009, the mean difference between lifetime and period prevalence in both child and adult groups from 2005-2009 in Arizona and US is 4.7%.

With respect to race/ethnicity, a 2002 Behavior Risk Factor Surveillance Survey found American Indians/Alaskan Natives to have the highest period prevalence of asthma at 11.6% followed by African-American at 9.3%, white, non-Hispanic at 7.6%, Asian at 2.9% and Native Hawaiian/Pacific Islander at 1.3%, with multiracial individuals experiencing the highest rates at 15.6% (Asthma and Allergy Foundation of America & National Pharmaceutical Council, 2005). While data American Indians/Alaskan Natives, Asian and Native

Hawaiian/Pacific Islander groups are not delineated in the data, African-American and Multiracial children have a greater period prevalence than White, non-Hispanics from 2005-2009 as demonstrated in figure 3.

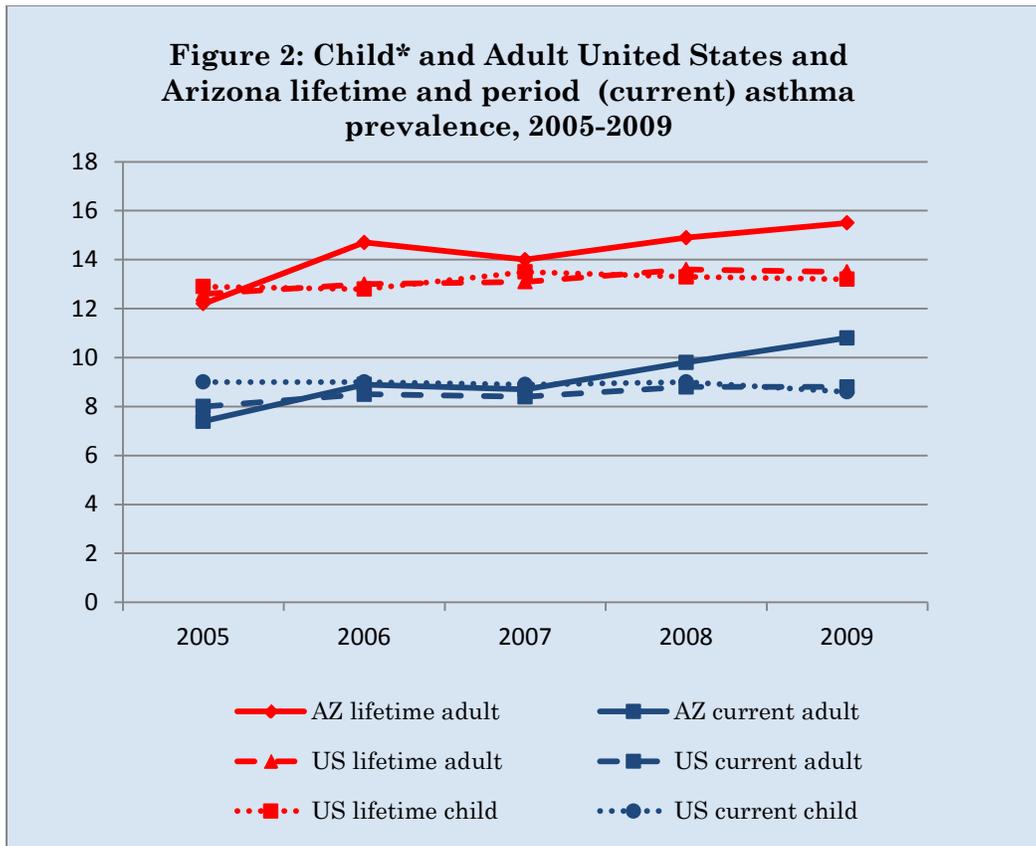


Figure 2: Lifetime and period (current) asthma prevalence in the United States and Arizona from 2005-2009(Centers for Disease Control and Prevention, 2011). *No child-specific prevalence data is available for Arizona.

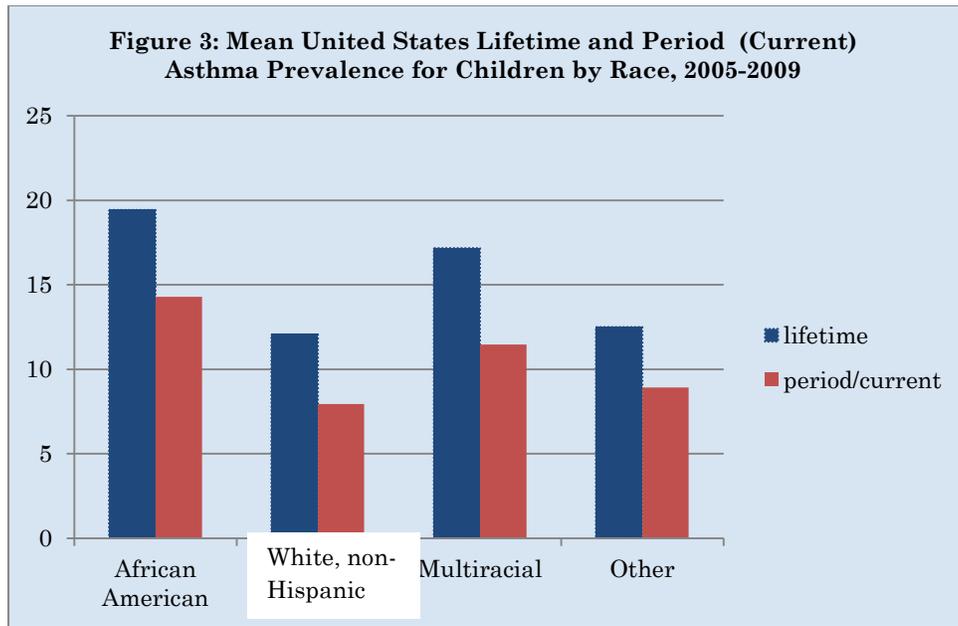


Figure 3: Mean Lifetime and Lifetime and Period (Current) Asthma Prevalence for Children by Race/Ethnicity, 2005-2009 (Centers for Disease Control and Prevention, 2011)

Acute Care Utilization for Asthma:

While there are no uniform national instruments like BRFSS or NHIS to measure acute care- seeking behavior for asthma, many studies describe these trends. Because there is no gold-standard test to diagnose or definitive way to define asthma based on utilization of services, a common instrument used is Healthcare Effectiveness Data and Information Set (HEDIS) asthma criteria. HEDIS defines persistent asthma as having one asthma inpatient admission or emergency department visit or four asthma medication dispensing events, or four outpatient asthma visits and at least two asthma medication dispensing events within a year period (National Committee for Quality Assurance (NCQA), 2011). The HEDIS definition was demonstrated to have an 89% sensitivity and 70% specificity for classifying persistent asthma when compared to the National Heart Lung and Blood Institute's (NHLBI's) criteria of patient reported symptoms of symptoms more than two nights a month or greater than two days a week in the previous 2 months (Cabana, Slish, Nan, & Clark, 2004). While imperfect, the HEDIS approach to defining asthma is frequently used as a surrogate to estimate

persistent asthma based on a combination of acute care seeking and medication dispensing events.

Asthma morbidity is also often described in relation to the use of ED and / or inpatient services that are associated with an ICD-493.XX code for asthma. In Arizona in 2009, 25,893 emergency department (ED) and 8,287 inpatient (IP) events occurred based on this definition of asthma, with 11,711 (45%) and 2,998 (36%) of events occurring in children age fifteen and younger, respectively. (Tormala et al., 2010). Asthma morbidity, however, is not experienced equally amongst all comers in the pediatric population. With emergency department (ED) and inpatient (IP) events being two of the better known indicators of asthma morbidity, a comparison of racial demographics in high prevalence groups are warranted.

An AHRQ study in adult asthmatics found that Hispanic hospitalization/ inpatient (IP) events related to asthma were observed at a rate of 15.5 compared to 8.9 per 10,000 in non-Hispanic whites, nearly twice the rate (Stranges, Coffey, & Andrews, 2008). Another report found that African Americans are nearly three times as likely as non-Hispanic whites to be hospitalized for asthma and are also three times more likely to die from asthma (National Institute of Allergy and

Infectious Disease, 2001). Because of lower lifetime and period prevalence relative to other race/ethnic groups as described above, IP and ED rates for Asians and Native Hawaiians/Pacific Islanders uncommonly appear in the national literature. However, the data describing differences in acute care utilization between Hispanic and African-American cohorts compared to Caucasians seem to hold true in children.

In a nationwide study comparing demographics and chronic asthma factors amongst 1,095 children, statistically significant increases were observed in percentage ever hospitalized for asthma, median number of ED visits in the past year, percent admitted for asthma in the past year and percent using the ED for asthma prescriptions in African-American and Hispanic children compared to White, non-Hispanic children (Boudreaux, Emond, Clark, & Camargo, 2003). Other studies have demonstrated that African-American and Hispanic is positively correlated with ED and IP care seeking, and inversely correlated maintenance medication use and specialist utilization (Asthma and Allergy Foundation of America & National Pharmaceutical Council, 2005).

Factors Accounting for Observed Demographic Differences:

The factors contributing to disparities of acute care utilization are largely based on observational studies of exposure to known asthma triggers. For example, Hispanics are at higher risk for exposure to air pollution, with one study finding that nearly 80% of US Hispanic adults and children living in areas that did not meet at least one Environmental Protection Agency air standard (Metzger, Delgado, & Herrell, 1995). Other factors contributing to utilization of asthma services are exposure to indoor and outdoor allergens, allergic cockroaches and high risk occupational exposure including textile, construction and farming (National Institute of Allergy and Infectious Disease, 2001). African Americans also share higher rates of exposure to residential allergens, as well as shortages of primary care physicians and underuse of long-term control medications (Asthma and Allergy Foundation of America & National Pharmaceutical Council, 2005). One study in turn demonstrated that African-American children on Medicaid, who had greater odds ED utilization (1.7) and hospitalization (1.42), also had lesser odds of having an asthma-related office visit (0.48) compared to a White, non-Hispanic referent group, with no difference in odds of prescription dispensation or well child

visits (Asthma and Allergy Foundation of America & National Pharmaceutical Council, 2005). In contrast, the previously mentioned study which found greater asthma use indices in African-American and Hispanic groups compared to White, non-Hispanics found no between-group differences in primary care physician percentages or in inhaled B-agonist or inhaled corticosteroid usage in the previous 4 weeks (Boudreaux et al., 2003). While medication prescribing and usage differences don't appear to account for differences in service utilization, the relation to utilization and routine asthma primary care is less clear.

In addition to medication dispensation and routine primary care, several other variables could potentially explain the increased utilization of asthma services in certain racial/ethnic groups: not filling prescriptions, poor compliance with filled prescriptions, parental beliefs about role and utility of medications, poor literacy of parents, mistrust between parents/doctors and concerns from parents about adverse effects of long term medication use, especially with respect to steroids (Asthma and Allergy Foundation of America & National Pharmaceutical Council, 2005). Multifactorial non-socioeconomic

factors are therefore thought to contribute to differences in acute asthma utilization.

What is less clear is the extent to which race/ethnicity itself drives the difference in utilization of asthma care versus a correlated lower socioeconomic status in minority groups that is prohibitive in care seeking. For instance, a cross-sectional study demonstrated that poor children were more likely to have spent ≥ 7 days in bed related to their asthma and had 40% fewer doctor visits with 40% more hospitalizations related to asthma (Halfon & Newacheck, 1993). As further evidence of a false correlation between race/ethnicity and socioeconomics, Hispanics in the lowest quartile of earnings experience 21.7 admissions compared to 12.3 per 10,000 patients in Non-Hispanic White adults, but in the highest income quartiles the gap between the group narrows to 11.0 compared to 7.3 per 10,000 patient (Stranges et al., 2008). Studies of asthma service utilization amongst Medicaid and other safety net programs thus offer a unique opportunity to study the true influence of race/ethnicity disentangled from confounding socioeconomic variables.

The Role of Safety Net Programs and Medicaid in Asthma:

School based health centers (SBHCs) represent one safety net program designed to help meet the health care needs of the vulnerable asthmatic populations, especially with respect to regular access to outpatient care. SBHCs have been well documented to reduce asthmatic emergencies and asthma-related absenteeism by providing a variety screening and treatment services. In a study of asthmatic outcomes in four schools with SBHCs two without in New York, hospitalizations were much more common at sites without SBHCs, while students with asthma who received routine care at SBHCs missed on average 3 days less of school due to acute complications (Webber et al., 2003). Another study done at two schools in Colorado and one in Texas yielded similar results; SBHC-mediated education and treatment of asthma to reduce the incidence of missed doctor's appointments and missed school days by two-third after just 6 months of interventions with care-giver perception of these students' overall health and activity improved by 11% (Tinkelman & Schwartz, 2005). SBHCs also hold the potential to reduce costs to state Medicaid programs. One cost-analysis study at an elementary school in Atlanta,

GA sought to determine whether a SBHC had any effects on lowering Medicaid expenditures for adolescent services. In two years, the study found Medicaid-related expenses in inpatient, prescription drugs, transportation, emergency and non-emergency setting were all reduced (Adams & Johnson, 2000). A study of Cincinnati-based SBHCs in both urban and rural settings had similar implications. A five year longitudinal study of 5,500 students found a 2.4 fold decrease in hospitalizations with an estimated “Net Social Benefit” calculated between 0.5 and 4.5 million dollars in cost reduction over three years (Guo, Pharm, & Jang, 2005).

While SBHCs appear to bolster access primary and preventive asthma care, Medicaid remains the most vital source of care for vulnerable populations including ethnic/racial minorities. A study of asthmatic children in urban California, Georgia and Michigan sought to elucidate the differences in outcomes between Medicaid and private insurance. It found that Medicaid patients were more likely to be intubated and/or admitted to the ICU related to their hospitalization and more likely to be hospitalized two or more times for asthma (Merrick, Houchens, Tillisch, Berlow, & Landon, 2001). Patients on Medicaid also had longer lengths of stay, got fewer bronchodilator

treatments and were more likely to be discharged on suboptimal medication regimens and were less likely to have regular access to regular outpatient care (200). Medicaid enrollment is associated with race/ethnicity, with one study finding a greater percent of African-American (36%) and Hispanic (32%) children to be on Medicaid compared to White, non-Hispanic (17%) children, although the authors did not analyze ED or hospitalization/inpatient (IP) usage patterns by Medicaid status (Boudreaux et al., 2003). A study of Medicaid discharge data for childhood asthma found a nearly two-fold greater rate of asthma in African-American compared to White, non-Hispanic children, but that rates were nearly equivalent once adjusted for poverty (Wissow, Gittelsohn, Szklo, Starfield, & Mussman, 1988). While Medicaid plays a vital role in providing asthma care to portions of minority population, it is also associated with worse treatment and medical outcomes, with African-American and Hispanic disproportionately experiencing these outcomes based on greater reliance on these services.

Degree of asthma care usage has also been studied. A cohort study of Medicaid children with asthma analyzed low, high and extra high use categories of asthmatics. The study found that among

Medicaid enrollees, African-American children were at increased odds for being classified as high users based on ED or IP usage (OR 1.41; 95% CI 1.01-1.97) and that males and African-Americans (OR 1.78; 95% CI 1.10-2.87 *and* OR 1.88; 95% CI 1.14-3.09, respectively) were at greater odds of being in the extra high use group (Nash, Childs, & Kelleher, 1999). Similarly, a retrospective cohort study of asthmatics on Medicaid in Seattle, Washington found African-Americans on Medicaid had greater odds of having both IP and ED visits for asthma, were less likely to make outpatient visits for asthma and had 24% greater per-capita payments for Medicaid services compared to White, non-Hispanic children (Lozano, Connell, & Koepsell, 1995). These studies demonstrate that racial/ethnic groups seek acute asthma care differently despite access to care through Medicaid.

Significance of Pediatric Asthma in the Arizona

AHCCCS/Medicaid Population:

Asthma not only affects a considerable portion of the United States population, it is the most common chronic condition of childhood and accounts for 1% of all health expenditures (Krieger, Takaro, & Rabkin, 2011)(Nash et al., 1999). The Arizona Comprehensive Asthma Control Plan detailed the extent of the asthma burden in the state through 2004. The report found an overall increase in the prevalence of asthma from 11% to 12% between 2000 and 2003, a trend which continued through 2007 with lifetime prevalence rates exceeding 14% (Arizona Department of Health Services, 2004; *BRFSS prevalence and trends data - data display*). Further, Arizona lifetime and period asthma prevalence has exceeded the national averages between 2000 and 2010 in all but two years (Tormala et al., 2010).

Arizona's pediatric asthma population also uses considerable acute care services. Nearly 7,250 days of hospitalization of persons less than 21 years old resulted from asthma, with each event costing \$8,153, totaling 24 million dollars to the Arizona tax payers in 2004(Arizona Department of Health Services, 2004). Based on these figures, it is not surprising that a significant portion of the 1% of

national healthcare costs spent on asthma is attributable to emergency department visits and hospitalizations (Weiss, Gergen, & Hodgson, 1992). This represents a particularly significant economic problematic when utilization is superimposed on payer data for the state.

AHCCCS/Medicaid was the most common payer for both emergency department visits and hospitalizations in 2009, with over a third of both events being reimbursed by this entity (Tormala et al., 2010).

Furthermore, AHCCCS/Medicaid spending on Arizona children represents 42.3% of the total Medicaid expenditures for the state, as compared to a national average of just 18.6% (*Payments by enrollment group, FY2006 - kaiser state health facts.*)

AHCCCS/Medicaid therefore carries a disproportionately hefty financial burden in paying for the care of asthma morbidity in school-age asthmatics. Both school-age AHCCCS/Medicaid asthmatics and the tax payers who fund the program stand to benefit from how effectively the program prevents disease exacerbation.

Central Question, Hypothesis and Aims:

Central Question: Did school-age children in Maricopa County, AZ who were 1) continuously enrolled in AHCCCS/Medicaid in 2007-2008 and 2) defined as asthmatic by the HEDIS criteria in 2007 (“school-age asthmatic AHCCCS cohort”) have different rates of inpatient (IP) or emergency department (ED) service utilization in 2008 according to their gender, age or race/ethnicity?

Hypothesis: If socioeconomic barriers to preventive asthma care are reduced through continuous enrollment in AHCCCS/Medicaid in the “school-age asthmatic AHCCCS cohort” in 2007, then no significant between-group differences in inpatient (IP) or emergency department (ED) service utilization will occur with respect to age, gender and race/ethnicity in 2008.

Aims:

-To assess the acute asthma care (ED and IP) events of school-age children in Maricopa County, AZ in 2008 who were 1) continuously enrolled in AHCCCS/Medicaid and 2) defined as asthmatic by the HEDIS criteria in 2007 (“school-age asthmatic AHCCCS cohort”)

- To identify any differences in acute asthma care utilization in various age, race/ethnicity and gender groups that occurred in the “school-age asthmatic AHCCCS cohort”
- To consider explanations about the differences in acute asthma service utilization that occurred in the “school-age asthmatic AHCCCS cohort” in light of the national literature on pediatric asthma care in the Medicaid population
- To use “the school-age asthmatic AHCCCS cohort” to add to the empiric body of evidence attempting to answer the question, “To what extent does race/ethnicity contribute to asthma morbidity when disentangled from socioeconomic status”?
- To suggest improvements that can be made in AHCCCS services based on demographic trends of utilization amongst the “school-age asthmatic AHCCCS cohort”

Research Materials and Methods

Approval for the study was obtained from Arizona State University's (ASU's) Institutional Review board and administratively by the Arizona Health Care Cost Containment System (AHCCCS). The study data were then accessed through the Arizona Health Query (AZHQ) which is stored and managed through ASU's *Center for Health Information and Research (CHIR)*. All data in the study originated from patients enrolled in the Arizona Health Care Cost Containment System (AHCCCS), Arizona's Medicaid program. De-identified data for inpatient (IP) and emergency department (ED) events, as well as demographic information including patient age, gender and race/ethnicity were obtained from January 1st-December 31st 2008 for individuals meeting entry criteria in the study:

- 1) Enrolled in AHCCCS/Medicaid from January 1st 2007-December 31st 2008 with no gap in enrollment during each of these two years of more than 45 days (90 days total, not to exceed 45 days in each calendar year)
- 2) Resident of Maricopa County, AZ from January 1st-December 31st 2007
- 3) Age 5-17 from January 1st-December 31st 2007

4) Meets the HEDIS definition for asthma from January 1st-

December 31st 2007, defined as:

- a. 1 asthma related inpatient (IP) admission *or* 4 asthma medication dispensing events *or* 4 outpatient (OP) visits + 2 asthma medication dispensing events
 - i. IP and OP events will be identified by asthma being the primary ICD and/or CPT codes, which are used for service reimbursement:
 1. International Classification of Disease (ICD) coding—ICD-9-CM-493.XX (asthma) or ICD-10 J45-46 (asthma as the underlying cause of death) or
 2. Current Procedural Terminology (CPT) coding—1005F (asthma symptoms, 1038F (persistent asthma), 4015F (persistent asthma with preferred long term control medicine prescribed) and 1039F (intermittent asthma).

All IP and ED events were obtained separately, not in aggregate. Gender included male or female. School age was

categorized by age in 2008 as follows: Elementary school-age (6-12), junior high school age (13-14) and high school-age (15-18). Finally, race/ethnicity as categorized as: Asian/Pacific Islander, African-American, Hispanic, White, non-Hispanic and Native-American. Individuals identified with Hispanic ethnicity were considered in aggregate and not in their respective racial group. For example, a Hispanic Native-American was included in the analysis as Hispanic and *not* as Native-American, making all race/ethnicity categories mutually exclusive.

Characteristics of all children continuously enrolled in AHCCCS/Medicaid in Maricopa County 2007-2008 and the number and percent with asthma were first analyzed to determine a period prevalence of the population. The remainder of the analysis focused exclusively on utilization amongst asthmatics, as defined by the HEDIS definition. Total (ED and IP combined) and mean numbers of visits were determined for individuals by gender, school age according to age and race/ethnicity. Total and mean visits were then analyzed amongst individuals with at least one visit (ED or IP) for asthma, considering gender, school age and race/ethnicity. In order to determine any statistically significant between-group differences with

respect to gender, school age and race/ethnicity, a chi-squared test for association was utilized for individuals with at least one ED or IP visit for asthma. This analysis was designed to detect whole group differences, but did not reveal what entities were contributing to that difference. For example, the test could reveal a statistically significant differences in utilization by race/ethnicity, but not detect which specific race(s)/ethnicity(ies) was responsible for this difference. Because a large number of individuals had no ED or IP visits during 2008, individuals were dichotomized into “any visits” (at least one visit (ED or IP) related to asthma) and “no visits”. All subsequent calculations were subsequently undertaken in asthmatic children with “any visits” (ED or IP) compared to “no visits”.

A row x column ($r \times c$) contingency table was generated to compare the columns (any visits, no visits) to rows with respect to gender (male, female), school age (elementary, junior high, high school) and race/ethnicity (Asian American/Pacific Islander, African American, Hispanic, Native American and White, non-Hispanic). Individual identified as having a Hispanic ethnicity were grouped together irrespective of race/ethnicity. Thus a Native American identifying as Hispanic was considered Hispanic for the purposes of data analysis. A

χ^2 test statistic was generated by comparing observed to expected outcomes and a probability (p) value determined given the degrees of freedom in the test. As p value less than or equal to 0.05 (two-tails) was used to define statistical significance.

“Any visit” (that is any ED or IP visit) probabilities were then compared to various exposures of gender, school age and race/ethnicity to assess the odds that these variables were associated with seeking acute asthma care. Being male, elementary school-age and Caucasian were considered as the referent group for categories of gender, school-age and race/ethnicity, respectively. To generate an odds ratio and 95% confidence interval for demographic factors associated with “any visit” utilization, a numerator/denominator calculation was determined as follows: the numerator group was considered the probability of having any event divided by the probability of having no event in the non referent groups (female; junior and high school-age; Asian-American/Pacific Islander, African-American, Hispanic and Native American) and the denominator group was calculated as the probability of having any ED or IP event divided by the probability of having no event in the appropriate referent group.

A subcategory of this analysis was then undertaken comparing odds of having “any visit” (ED or IP) by race/ethnicity, stratified by school age. Children with asthma were sorted by school-age and odds ratios for “any visit” (ED or IP) were obtained for race/ethnicity in each school age group (elementary, junior high, high school) using White, non-Hispanic as a referent group as described above. Finally, a logistic regression model was used to determine the predictors of the outcome.

Results

Period Prevalence:

A total of 84,383 residents of Maricopa County, AZ age 5-17 in 2007 met the continuous enrollment criteria for AHCCCS/Medicaid in 2007-08. Of these, 3,490 individuals also met the HEDIS criteria for asthma in addition to the above criteria. The overall percent of patients with asthma by the HEDIS definition among total patients in the school-age AHCCCS cohort in 2008 was 4.1% (table 1). This can be considered the period prevalence for the study cohort, but stands in contrast to BRFSS lifetime and period prevalence. As shown in table 1, males (4.9%) experienced a higher asthma period prevalence than females (3.3%). Junior high school-age individuals had a modestly greater asthma period prevalence (4.7%) compared with elementary (4.0%) and high school-age individuals (4.1%). African-American (6.2%) and White, non-Hispanic (5.4%) children had the highest asthma period prevalence compared to other race/ethnicities, with Asian-American/Pacific Islanders (3.0%), Hispanics (3.4%) and Native Americans (2.4%) experiencing the lowest period prevalence. Seven (0.2%) individuals had race/ethnicity labeled as missing and six (0.1%) were labeled as other in the data. These individuals were included in

analysis of gender and school age, but were not considered in subsequent analysis of race/ethnicity given the small sample size.

Table 1: Characteristics of All Children Continuously Enrolled in AHCCCS/Arizona Medicaid in Maricopa County 2007-2008 and Number and Percent With Asthma

		All Children	Children with Asthma	
		Number	Number	Percent
Gender				
	Male	42,289	2,083	4.9
	Female	42,094	1,407	3.3
School Age				
	Elementary (6 to 11)	46,370	1,848	4.0
	Junior High School (12 to 13)	13,199	617	4.7
	High School (14 to 18)	24,814	1,025	4.1
Race/Ethnicity				
	Asian/Pacific Islander	1,176	35	3.0
	African-American	8,792	546	6.2
	Hispanic	51,629	1,772	3.4
	Native-American	3,098	73	2.4
	White, non-Hispanic	19,330	1,051	5.4
	Missing	181	7	3.9
	Other	177	6	3.4

Acute Asthma Care Utilization:

Figure 4 is a histogram that shows the distribution of the data for both total visits (ED and IP) and for total visits (ED and IP) with any visits ≥ 1 . For total visits, the data have significant zero inflation and are skewed to the right. For total visits with any visits ≥ 1 , the data are also skewed to the right. In both cases, the data are not normally distributed. Therefore, in assessing between group differences in asthma care utilization, tests assuming normality such as ANOVA cannot be employed.

Total and mean aggregate ED and IP visits in children with asthma were then calculated by gender, school age and age (table 2). Overall, males experienced a greater total but not mean number of visits. Elementary school age patients had both a greater total and mean number of visits. Individuals of African-American, Hispanic and White, non-Hispanic race/ethnicity had the greatest total and mean number of visits. However, the magnitude of the standard deviation exceeded that of the mean in all cases. Given that mean number of aggregate ED and IP visits were less than 1 in all groups, a sub-analysis of the above demographics was also undertaken for

individuals who had one or more ED or IP visits during the 2008 calendar year (table 3).

In individuals with one or more total visits (ED and IP) in 2008, males experience a greater number of total visits but fewer mean visits (table 3). Elementary school age children still experience the majority of total visits, but mean visits are surpassed by the junior high cohort with the high school group experiencing the fewest number of mean visits. In this ≥ 1 visit category, African-Americans, Hispanics and White, non-Hispanics experience a similar number mean visits, with Hispanics still experiencing the highest rates of total visits. Notably, however, Native Americans with asthma have the greatest number of mean visits of any racial group in this category, but reflect a low sample size (n=10). Total visits amongst all asthmatics are compared to total visits for individuals with ≥ 1 visit by gender, race/ethnicity and age in table 4.

Figure 4: Histogram of for a) Total Visits (IP and ED) and b) Total Visits (ED and IP) if Any Visits ≥ 1 in Children With Asthma in 2008

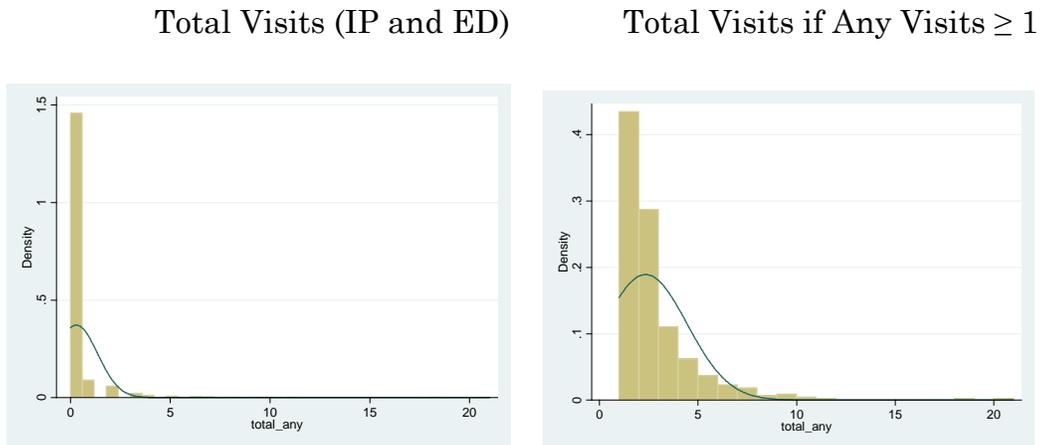


Table 2: Total and Mean Visits (ED and IP) in Children with Asthma by Gender, School Age and Race/Ethnicity in 2008

		Total Visits	Mean Visits	Std Dev
Gender				
	Female	1407	0.30	1.17
	Male	2083	0.29	1.00
	Total	3490	0.29	1.07
School Age				
	Elementary	1848	0.37	1.23
	Junior High School	617	0.18	0.82
	High School	1025	0.21	0.86
	Total	3490	0.29	1.07
Race/ Ethnicity				
	Asian/Pacific Islander	35	0.03	0.17
	African-American	546	0.41	1.17
	Hispanic	1772	0.30	1.10
	Native American	73	0.38	1.28
	White, non-Hispanic	1051	0.22	0.99
	Other	6	0.83	2.04
	Missing	7	0	0
	Total	3490	0.29	1.07

Table 3: Total and Mean Visits (ED and IP) in Children *with Asthma and at Least One Visit for Asthma* by Gender, School Age and Race/Ethnicity in 2008

		Total Visits	Mean Visits	Std Dev
Gender				
	Female	165	2.55	2.44
	Male	270	2.21	1.87
	Total	435	2.34	2.11
School Age				
	Elementary	292	2.37	2.22
	Junior High School	46	2.46	1.87
	High School	97	2.18	1.87
	Total	435	2.34	2.11
Race/ Ethnicity				
	Asian/Pacific Islander	1	1	-
	African-American	99	2.25	1.66
	Hispanic	221	2.39	2.18
	Native American	10	2.80	2.34
	White, non-Hispanic	103	2.25	2.33
	Other	1	5	-
	Missing	0	0	-
	Total	435	2.34	2.11

A chi square test for association is shown in table 5.

Specifically, all analysis was conducted on individuals experiencing “any visits” (at least one ED or IP visit in 2008) compared to “no visits” with respect to gender, school age and race/ethnicity. Total number visits in each category are shown with parenthetical values below indicating the percentage of observations represented by that category. Statistically significant differences were detected between asthma visit and school age ($\chi^2=41.50$; $p<0.001$) and race/ethnicity ($\chi^2=27.07$; $p<0.001$), but not between gender ($\chi^2=1.17$; $p=0.28$). To detect which between group differences are significant between school age and race/ethnicity, an logistic regression analysis to estimate odds ratios was done (table 6). ‘Male’, ‘Elementary’ and ‘White, non-Hispanic’ were designated as the referent groups.

Gender: The odds that a female patient with asthma was either hospitalized or visited the ED for a reason related to asthma was 0.89 (95% CI, 0.72-1.10) compared to a male patient with asthma. This difference was not statistically significant ($\chi^2=1.17$, $p=0.28$).

School age: The odds that a junior high school age patient with asthma was either hospitalized or visited the ED related to asthma was 0.42 (95% CI, 0.30-0.60) compared to an elementary school age

patient with asthma. The odds that a high school patient with asthma was either hospitalized or visited the ED related to asthma were 0.55 (95% CI, 0.43-0.71) compared to an elementary school age patient with asthma.

Race/Ethnicity: The odds that a Hispanic patient with asthma was either hospitalized or visited the ED related to asthma was 1.31 (95% CI, 1.02-1.70) compared to a White, non-Hispanic patient with asthma. The odds that an African-American patient with asthma was either hospitalized or visited the ED related to asthma were 2.03 (95% CI, 1.49-2.78) compared to a White, non-Hispanic patient with asthma. The odds that a Native American patient with asthma was either hospitalized or visited the ED related to asthma were 1.46 (95% CI, 0.647-2.98) compared to a White, non-Hispanic patient with asthma. The odds that an Asian/Pacific Islander patient with asthma was either hospitalized or visited the ED related to asthma were 0.27 (95% CI, 0.007-1.65) compared to a White, non-Hispanic patient with asthma.

Table 4: Total Visits (ED and IP) and Total Visits (ED and IP) in Children with Asthma and at Least One Visit (ED or IP) for Asthma by Gender, School Age and Race/Ethnicity in 2008

		Total Visits	Total in Individuals with ≥ 1 Visit(s)
Gender	Female	1407	165
	Male	2083	270
Grade level	Elem	1848	292
	Junior High	617	46
	High School	1025	97
Race/ Ethnicity	Asian/ Pacific Islander	35	1
	African-American	546	99
	Hispanic	1772	221
	Native American	73	10
	White, non-Hispanic	1051	103

Table 5: Chi² (χ^2) Analysis in Children *with Asthma and At Least One Visit (ED or IP) for Asthma* by Gender, School Age and Race/Ethnicity in 2008

	Did patient have any ED or IP events in 2008?		
Gender	No	Yes	Total
Female	1,242 (88.27)	165 (11.73)	1,407 (100.00)
Male	1,813 (87.04)	270 (12.96)	2,083 (100.00)
Total	3,055 (87.54)	435 (12.46)	3,490 (100.00)
χ^2 and p value $\chi^2=1.17$; p=0.28			
School Age	No	Yes	Total
Elem	1,556 (84.20)	292 (15.80)	1,848 (100.00)
Jnr HS	571 (92.54)	46 (7.46)	617 (100.00)
HS	928 (90.54)	97 (9.46)	1,025 (100.00)
Total	3,055 (87.54)	435 (12.46)	3,490 (100.00)
χ^2 and p value $\chi^2=41.50$; p<0.001			
Race/Ethnicity	No	Yes	Total
Asian/Pacific Islander	34 (97.14)	1 (2.86)	35 (100.00)
African-American	447 (81.87)	99 (18.13)	546 (100.00)
Hispanic	1,551 (87.53)	221 (12.47)	1,772 (100.00)
Native-American	63 (86.30)	10 (13.70)	73 (100.00)
White non-Hispanic	948 (90.2)	103 (9.8)	1,051 (100.00)
Total ¹	3,055 (87.54)	435 (12.46)	3,490 (100.00)
χ^2 and p value $\chi^2=27.07$; p<0.001			

¹ Total value includes six individuals in the “other” race and seven in the “missing” races which are not shown above, but which are reflected in the total numbers

Table 6: Odds Ratios and 95% CI that a Child with Asthma Experienced at Least One Asthma Event (ED or IP) for Asthma by:

a. Gender (Male is Index Gender)

	Female	Male	Total	Proportion Exposed
≥1 Visit	165	270	435	0.38
No Visits	1242	1813	3055	0.41
Total	1407	2083	3490	0.40
	Point estimate		95% Confidence Interval	
Odds Ratio	0.89		(0.72-1.10)	
χ^2 and p value	$\chi^2=1.17, p=0.28$			

b. School Age (Elementary is Index School Age)

	Jnr HS	Elementary	Total	Proportion Exposed
≥1 Visit	46	292	338	0.14
No Visits	571	1556	2127	0.27
Total	617	1848	2465	0.25
	Point estimate		95% Confidence Interval	
Odds Ratio	0.43		(0.30-0.60)	
χ^2 and p value	$\chi^2=27.2, p<0.000$			

	HS	Elementary	Total	Proportion Exposed
≥1 Visit	97	292	389	0.25
No Visits	928	1156	2484	0.37
Total	1,025	1,848	2,873	0.36
	Point estimate		95% Confidence Interval	
Odds Ratio	0.56		(0.43-0.71)	
χ^2 and p value	$\chi^2=22.62, p<0.000$			

c. Race/Ethnicity (White, non-Hispanic is Index Race)

	Hispanic	White, non-Hispanic	Total	Proportion Exposed
≥1 Visit	221	103	324	0.68
No Visits	1551	948	2,499	0.62
Total	1772	1051	2,823	0.62
	Point estimate		95% CI	
Odds Ratio	1.31		(1.02-1.70)	
χ^2 and p value	$\chi^2=4.63, p=0.031$			

	African-American	White, non-Hispanic	Total	Proportion Exposed
≥1 Visit	99	103	202	0.49
No Visits	447	948	1,395	0.32
Total	546	1,051	1,597	0.34
	Point estimate		95% CI	
Odds Ratio	2.04		(1.50-2.78)	
χ^2 and p value	$\chi^2=22.58, p<0.000$			

	Native American	White, non-Hispanic	Total	Proportion Exposed
≥1 Visit	10	103	113	0.09
No Visits	63	948	1011	0.06
Total	73	1,051	1,124	0.06
	Point estimate		95% CI	
Odds Ratio	1.46		(0.65-2.98)	
χ^2 and p value	$\chi^2=1.15, p=0.284$			

	Asian-American/ Pacific Islander	White, non-Hispanic	Total	Proportion Exposed
≥1 Visit	1	103	104	0.01
No Visits	34	948	982	0.03
Total	35	1,051	1,086	0.03
	Point estimate		95% CI	
Odds Ratio	0.27		(0.007-1.65)	
χ^2 and p value	$\chi^2=1.89, p=0.170$			

Finally, a sub-analysis of odds ratios was calculated by school age with respect to gender and race/ethnicity (see table 7). In all analyses, White, non-Hispanic was used as the referent group. The odds that an ED or IP event occurred in a child with asthma were significantly increased in African-American children of elementary (OR=2.36; 95% CI 1.61-3.46) and high school age (OR=1.91; 95% CI 1.1-3.38) and in Native American children of high school age (OR=3.40; 95% CI 1.27-9.12) compared to White, non-Hispanic individuals of the same age. There was no race/ethnicity achieving a statistically significant reduction in asthma utilization compared to White, non-Hispanics of the same age. Figure 5 summarizes the main results of the study.

Table 7: Odds Ratios and 95% Confidence Interval that a Child with Asthma Experienced at Least One Asthma Event (ED or IP) by Race/Ethnicity in:

a. Elementary School-Age Individuals (White, non-Hispanic is Referent Group)

Race/Ethnicity	Odds Ratio	<i>p</i> value	95% CI
Asian-American/ Pacific Islander	0.62	0.66	0.07-4.94
African- American	2.36	0.00	1.61-3.46
Hispanic	1.23	0.20	0.90-1.68
Native- American	0.89	0.83	0.30-2.61

b. Junior High School-Age Individuals (White, non-Hispanic is Referent Group)

Race/Ethnicity	Odds Ratio	<i>p</i> value	95% CI
Asian-American/ Pacific Islander	-	-	-
African- American	1.14	0.80	0.43-2.98
Hispanic	1.54	0.23	0.76-3.12
Native- American	-	-	-

c. High School-Age Individuals (White, non-Hispanic is Referent Group)

Race/Ethnicity	Odds Ratio	<i>p</i> value	95% CI
Asian-American/ Pacific Islander	-	-	-
African- American	1.91	0.03	1.1-3.38
Hispanic	1.11	0.67	0.67-1.86
Native- American	3.40	0.02	1.27-9.12

Figure 5: A Summary of the Odds that Children with Asthma Experienced any ED or IP Event by a) School Age (Elementary Referent Group) b) Race/Ethnicity (White, non-Hispanic Referent Group) and c) Race/Ethnicity Stratified by School Age (White, non-Hispanic Referent Group)*

a)

School Age	OR	95% CI	p value
Junior High	0.43	(0.30-0.60)	<0.001
High School	0.56	(0.43-0.71)	<0.001

b)

Race/Ethnicity	OR	95% CI	p value
African-American	2.0	1.5-2.8	<0.001
Asian-American/ Pacific Islander	0.27	0.01-1.65	0.17
Hispanic	1.3	1.2-1.7	0.03
Native-American	1.5	0.7-3.0	0.28

c)

School Age	Race/Ethnicity	OR	95% CI	p value
Elementary	African American	2.36	(1.61-3.64)	<0.001
	Asian-American/ Pacific Islander	0.62	(0.07-4.94)	0.66
	Hispanic	1.23	(0.90-1.68)	0.20
	Native American	0.89	(0.30-2.61)	0.83
Junior High	African American	1.14	(0.43-2.98)	0.80
	Asian-American/ Pacific Islander	-	-	-
	Hispanic	1.54	(0.76-3.12)	0.23
	Native American	-	-	-
High School	African American	1.91	(1.1-3.38)	0.03
	Asian-American/ Pacific Islander	-	-	-
	Hispanic	1.11	(0.67-1.86)	0.67
	Native American	3.40	(1.27-9.12)	0.02

*Groups in bold indicate statistical significance

Discussion

Analysis of findings:

AHCCCS Cohort Period Prevalence:

In this study, 4.1% of children enrolled in AHCCCS continuously fulfilled the HEDIS definition as having asthma. This percentage is lower than estimates of period prevalence of asthma obtained from surveys of school-age children both nationally and in Arizona. The percentages differ because the HEDIS criteria include a combination of medication dispensing events and inpatient/outpatient visits to define the study population that may define more severe asthma and because surveys like BRFSS and NHIS collect data on asthma ask about ever having had a diagnosis of asthma and not about current treatment or current symptoms. Therefore, the period prevalence of 4.1% in the AHCCCS cohort of this study population are not comparable to BRFSS period prevalence.

Males had a slightly greater percentage of asthma compared to females in the study population, a trend also observed in the CDC national childhood asthma literature (despite different measures of prevalence) (L. Akinbami & Centers for Disease Control and Prevention National Center for Health Statistics, 2006). Prevalence

amongst various school age groups did not appear to differ, ranging from 4% to 4.7%. Race/ethnicity data, however, reveals some notable trends. Among these are that African-Americans (62%) and White, non-Hispanics (5.4%) have the greatest asthma period prevalence while Native-Americans have the lowest period prevalence (2.4%), with other remaining groups/ethnicities being comparable (3.0-3.4%).

Acute Care Utilization:

As demonstrated in table 3, no significant differences were noted amongst gender in individuals with at least one visit (table 3). Taking all comers for race/ethnicity and gender in all individuals with asthma with at least one asthma acute care event, the odds that a junior high or high school age individual experienced an ED or IP event were about half that of an elementary school-age individual. Younger children are thought to have greater susceptibility to risk factors for asthma exacerbation including rhinovirus infection (Johnston & Sears, 2006). Further, flow through airways is inversely proportional to the fourth power of the radius (r^4) (Costanzo, 2006). The combination of enhanced environmental susceptibility to inciting inflammatory events and smaller airway radius thus offer an explanation as to the protective effect of the junior high and high school individuals

compared to the elementary age cohort with respect to acute asthma care events. This finding is largely concordant with historical trends in asthma care utilization in children. Nationwide in 1998-99 children age 5-10 years old were 1.5 and 2 times more likely to an asthma ED visit and inpatient hospitalization, respectively, compared to children age 11-17⁹(L. J. Akinbami & Schoendorf, 2002).

While many studies have demonstrated higher rates of acute asthma care events in various groups, most notably Hispanics and African-Americans (Bloom et al., 2009);(Stranges et al., 2008);(National Institute of Allergy and Infectious Disease, 2001);(Boudreaux et al., 2003), fewer have attempted to analyze acute care events by race/ethnicity when socioeconomic variables limiting access to care have been reduced or eliminated. This is an essential step in understanding the influence of asthma acute care seeking behavior as it relates to race/ethnicity disentangled from socioeconomic status, as the latter has been suggested as a probably etiologic variable in many such cases (Williams, 1999). Many studies and reports that have attempted to take SES into consideration have often found that leveling income differences between racial groups reduces between-race/ethnicity differences in asthma acute care seeking and that

race/ethnicity is correlated with other indicators of poverty, making SES a likely a confounder (Stranges et al., 2008);(National Institute of Allergy and Infectious Disease, 2001);(Bloom et al., 2009). However, others have demonstrated that racial disparities persist, particularly in African-Americans, in acute care seeking in spite of theoretically equal access to healthcare through entities such as Medicaid (Lozano et al., 1995; Nash et al., 1999). (Williams, 1999)

In this study population, variable of socioeconomic status as a barrier to care was reduced by considering only asthmatics on Medicaid/AHCCCS, implying that all races/ethnicities had access to at least basic access to routine preventive care and medications. Hispanic and African-American individuals with asthma were approximately one-third and twice as likely to have experienced either an ED or IP event related to asthma. When this analysis is performed within various age sub-strata, significant differences were observed between the race/ethnicity groups in elementary and high school age individuals, but not in junior high school age individuals. In the elementary and high school age individuals, African-Americans had a 2.4 and 1.9 respective odds of having an ED or IP event compared to White, non-Hispanics of the same age group. In the high school age

group, Native Americans were also found to have 3.4 the odds of having an ED or IP event compared to White, non-Hispanics, though the confidence interval was less tight due to smaller sample size. These results seem to agree with the findings of Lozano (1995) and Nash (1999) that controlling for SES through equal access to healthcare (Medicaid enrollment) does not lead to parity in acute care seeking events. The strongest case for disparate rates of acute-care seeking seem to be in African Americans, who experienced approximately two fold increase in acute care seeking amongst all ages and genders as well as in elementary and high school sub groups compared to White, non-Hispanics of similar age. Hispanics experienced statistically significant odds of use amongst all ages and gender while Native American experienced greater odds of use in high school age individuals, but neither group experienced unequivocal significance in both categories.

These observed differences could be attributed to a variety of non-socioeconomic variables. Faults of trust between the African American community and the American healthcare system are ubiquitous. From the exhumation of corpses from tombs for dissection to the Tuskegee experiments, African Americans have repeatedly been

the abject displays of racialism in medicine (Gamble, 1997). Contemporary studies suggest that distrust between African-Americans continues to play a key role in the doctor patient relationship, concerns for privacy and harmful experimentation (Boulware, Cooper, Ratner, LaVeist, & Powe, 2003). The potential for perceived experimentation certainly exists in the preventive treatment of asthma, as the progressive/stepwise treatment which is the standard of care for asthma with inhaled steroids, long acting beta agonists, leukotriene antagonists and other adjuvant therapies may be misconstrued as experimentation(Expert Panel Report 3 (EPR3), 2007). This problem is compounded by the gaps in communication which have been shown to contribute to disparate outcomes in minority patients with asthma(Diette & Rand, 2007). There also may exist an inherent genetic element that explains inter-racial differences in asthma care seeking. There are known polymorphisms in the genes which encode the beta-2-adrenergic receptor (BAR2) genes in African Americans compared to White, non-Hispanic and Chinese individuals (Xie et al., 1999) which suggests that intrinsic differences in response to conventional asthma treatments (especially short and long acting beta agonists). In aggregate, the distrust of the healthcare system,

gaps in communication and genetic polymorphisms offer an explanation for the non-socioeconomic differences in acute asthma care seeking behavior in African-American children with asthma. However, quantifying the exact contribution of each of these entities is less important than knowing that these disparities existed in this population in 2008 and will continue to exist without targeted interventions.

Limitations and confounding variables:

These data are observational and retrospective, which inherently limit the generalizability of the results. As discussed previously, the HEDIS definition of asthma was used to define the asthma in the AHCCCS database. A number of studies suggest that HEDIS criteria lack specificity and that the one year lead-in period required to define asthma prior to the study period is suboptimal(Cabana et al., 2004)(Mosen et al., 2005). Further, racial categorization for the sake of data input/output may be inherently misleading. A California study points to broad differences in “Hispanic” child asthma prevalence when Mexican-American, Puerto Rican and Cuban American subgroups were considered and in Asian-American/Pacific Islander subgroups when Korean and Filipino

American groups were separated (Davis, Kreutzer, Lipsett, King, & Shaikh, 2006). This was a limitation to the study, especially given that racial/ethnic categories were not considered by both Hispanic and non-Hispanic ethnicities. The value of epidemiologic research in minority populations is further marred by data that often yield inconsistent and non-specific meanings. Race/ethnicity is often ill-defined and with inadequate methods to separate correlation from causation, leading to vacuous conclusions that invariably command more detailed study (Bhopal, 1997). This, in turn, can unintentionally propagate the misconception that certain racial groups are predisposed to an illness which can be especially damaging when the disease carries a moral undercurrent, as is the case with STDs, drugs of abuse, violence and underachievement (Osborne & Feit, 1992). While this is not necessarily germane to asthma, caution is still warranted when interpreting the meaning of race/ethnic-specific differences in acute care events.

A key goal of the study was to consider differences in acute asthma care unencumbered by SES. The methods of controlling for this were to consider an exclusively Medicaid/AHCCCS cohort, wherein affluent families would be categorically excluded from the study population, freeing up race/ethnicity as an independent variable.

However, such an approach does not control for minimum incomes. Any given individual in the study might therefore have equal access to care through Medicaid/AHCCCS but lack the ability to pay for transportation, medication co-pays, trigger mitigation efforts at home and other factors with which individuals at the extremes of poverty might have less ability to cope. Correcting for extreme poverty might reduce the observed interracial differences as has previously been demonstrated with hospitalization rates (Wissow et al., 1988)

Finally, the extent to which low birth weight contributes to increased ED and IP utilization, especially in African-Americans, is unknown. Asthma prevalence varies inversely with birthweight (Brooks, Byrd, Weitzman, Auinger, & McBride, 2001). In Arizona in 2008, the low birth weight rates in African Americans was 11.7% compared to 6.9% in White, non-Hispanics, 6.7% in Hispanics, 6.7% in American Indian/Alaska Natives and 9.1% in Asian American/Pacific Islanders(Arizona Department of Health Services, 2008). Therefore, because of study design, low birth weight may be contributing to increased acute asthma utilization rates in African Americans and falsely lowering rates in Hispanics.

Future Directions

A prospective study of AHCCCS/Medicaid population in a population with disaggregated demographic data would be useful in elucidating some of the subtle questions unanswered by this study. Such data would account for further subgroup analysis of groups including Mexican-American, Puerto Rican and Cuban American groups in the Hispanic population, which showed statistically significant increases in ED and IP use for all comers, but not within any specific school age strata. Accompanying this study with questionnaires from individuals representing various demographic categories (such as gender, age, race/ethnicity, educational attainment, income level, religion) would allow for a more sophisticated understanding of the types of non-socioeconomic factors (medication and disease beliefs, trust in the medical system, transportation and geographic barriers to care) contributing to disproportionate acute asthma care utilization. All attempts to better describe the burden of disease on specific populations should be matched with equal emphasis on implementing programs that reduce known acute care seeking disparities in both the AHCCCS/Medicaid system and in safety net programs like school based and federally qualified health centers.

Conclusions

Race/ethnicity-based differences in acute asthma service utilization by children on AHCCCS in 2008 are not entirely accounted for by SES, but implicate an array of social factors. These include cultural distrust of governmental healthcare, inadequate communication between patients and healthcare providers in minority race/ethnicities, immunobiologic polymorphisms mediating response to environmental allergens and treatment response and the confounding variables of extremes of poverty and low birth weight which were not controlled for in this study. The generalizability of these findings is limited, but nevertheless necessitates targeted outreach in the school age AHCCCS asthmatic population to reduced ongoing acute care disparities.

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