

Comparison of asthma prevalence among African American teenage youth attending public high schools in rural Georgia and urban Detroit

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Background: The high prevalence of asthma among urban African American (AA) populations has attracted research attention, whereas the prevalence among rural AA populations is poorly documented.

Objective: We sought to compare the prevalence of asthma among AA youth in rural Georgia and urban Detroit, Michigan.

Methods: The prevalence of asthma was compared in population-based samples of 7297 youth attending Detroit public high schools and in 2523 youth attending public high schools in rural Georgia. *Current asthma* was defined as a physician diagnosis and symptoms in the previous 12 months. *Undiagnosed asthma* was defined as multiple respiratory symptoms in the previous 12 months without a physician diagnosis.

Results: In Detroit, 6994 (95.8%) youth were AA compared with 1514 (60.0%) in Georgia. Average population density in high school postal codes was 5628 people/mile² in Detroit and 45.1 people/mile² in Georgia. The percentages of poverty and of students qualifying for free or reduced lunches were similar in both areas. The prevalence of current diagnosed asthma among AA youth in Detroit and Georgia was similar: 15.0% (95% CI, 14.1-15.8) and 13.7% (95% CI, 12.0-17.1) ($P = .22$), respectively. The prevalence of undiagnosed asthma in AA youth was 8.0% in Detroit and 7.5% in Georgia ($P = .56$). Asthma symptoms were reported more frequently among those with diagnosed asthma

in Detroit, whereas those with undiagnosed asthma in Georgia reported more symptoms.

Conclusions: Among AA youth living in similar socioeconomic circumstances, asthma prevalence is as high in rural Georgia as it is in urban Detroit, suggesting that urban residence is not an asthma risk factor. (*J Allergy Clin Immunol* 2015;136:595-600.)

Key words: Urban, rural, African American, asthma, prevalence, inner-city, high school students, youth

In the United States, many studies have focused on the increased prevalence and greater morbidity of asthma among both adults and children in impoverished urban areas, often colloquially referred to as “inner cities.”¹⁻⁷ However, few studies have compared the prevalence of asthma between impoverished urban populations and populations of similar racial and socioeconomic status living outside urban areas.^{1,8} Comparisons of urban and nonurban populations for asthma prevalence are complicated by numerous factors including the marked residential segregation of African Americans (AA) in urban areas.⁹⁻¹¹ The understanding that asthma is unusually frequent and severe in urban populations has led to major funding initiatives to study asthma among urban residents. For example, funding initiatives of the National Institutes of Allergy and Infectious Diseases have ranged from \$18.7 million to approximately \$70 million for urban asthma.⁵ The areas studied in these initiatives are not only urban but also areas in which relatively large proportions of the population live in impoverished circumstances. These intensely funded efforts have described many features related to urban asthma under the assumption that these features are unique to urban environments.^{1,2,4,12,13} It is also assumed that the same factors lead to both higher prevalence and greater morbidity of asthma. However, few investigators have directed their attention to asthma in rural AA populations of similar socioeconomic status.^{1,3,5,14,15} This is in spite of the fact that 19.3% of the population lives in rural areas of the United States according to the 2010 census.

It is important to assess whether AA children living in urban environments are at a higher risk of asthma than those living in rural areas because clear differences would suggest that specific environmental dissimilarities, such as the built environment or urban pollution, were causally related to the prevalence of asthma. By way of contrast, if the prevalence of asthma was the same in populations living in similar socioeconomic circumstances, whether urban or rural, it would suggest that socioeconomic factors or ancestral heritage constitute a major risk for asthma and not living in an urban environment.

Statistics from government agencies are highly valuable for looking at asthma across the United States, but these statistics rarely attempt to compare urban and rural populations within

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Abbreviations used

AA: African American
LHS: Lung Health Survey

socioeconomic strata.^{16,17} Statistics based on samples broadly representative of the entire United States do show dramatic disparities in asthma by self-identified racial or ethnic groups.¹⁷ Although a number of studies have shown that the prevalence of asthma is similar in rural children and urban children, none of these studies has compared populations living in the large Northeastern or Midwestern cities where high rates of asthma were originally reported.^{8,18-20} To properly compare populations from widely varying areas, it is important that the same screening instrument be used in both locations and that study methodologies be similar.

The purpose of this study was to compare the prevalence and morbidity of asthma among high school students attending 6 public high schools in urban Detroit, Michigan, with students of similar age and race attending 4 public high schools in 4 rural counties of Georgia using identical methods.

METHODS

Reports of asthma and asthma symptoms were collected using a Lung Health Survey (LHS) administered to students attending 6 public high schools in urban Detroit, Michigan, and those attending 4 public high schools in 4 rural counties of Georgia. The LHS has been used in previous studies.^{21,22} This survey contains questions from well-recognized instruments including the International Study of Asthma and Allergy in Children and is based on recommendations and classifications used in the National Asthma Education and Prevention Program (Expert Panel Report III).^{23,24} Specifically, youth reporting any physician diagnosis of asthma were considered to have lifetime asthma. *Current asthma* was defined as a physician diagnosis and use of either medications or acute respiratory symptoms in the previous 12 months. *Undiagnosed asthma* was defined as multiple respiratory symptoms in the previous 12 months but no reported physician diagnosis of asthma. The schema of variables used to classify youth as having current diagnosed asthma, undiagnosed asthma, or no current asthma is the same as used in our previous studies as shown in Fig 1.²⁵

The methods and results of using the LHS in the Detroit high schools have been previously reported.²⁵ Students were recruited from the fall of 2007 through the fall of 2008. All the studies in the Detroit public high schools were approved by the Institutional Review Board of Henry Ford Health System and the Detroit Public Schools Office of Research, Evaluation, and Assessment. All the high schools approached agreed to participate in the study. Studies in the Detroit public schools attempted to reach all students through their English class because school policy requires all students to be enrolled in an English class during each year of high school.

In Georgia, participating schools were located in Burke, Jefferson, Wilkes, and McDuffie counties. Each of these counties has a single public high school and all 4 of these counties fit the most commonly used US Department of Agriculture definition of "rural": no county has a population center of more than 50,000 inhabitants (the total population of the largest county was 23,316 in the 2010 US census). Each school was approached through the county school superintendent and high school principal, and all schools approached agreed to participate. The counties selected were also selected for their proximity to the medical school in Augusta, Georgia. All the studies in Georgia were approved by the Human Assurance Committee of Georgia Regents University and by the respective school superintendent in each county. The parents of all students in the 4 Georgia high schools were given the option of not allowing their child to participate in the LHS (passive opt-out). The students were told that if they did not wish to participate they did not need

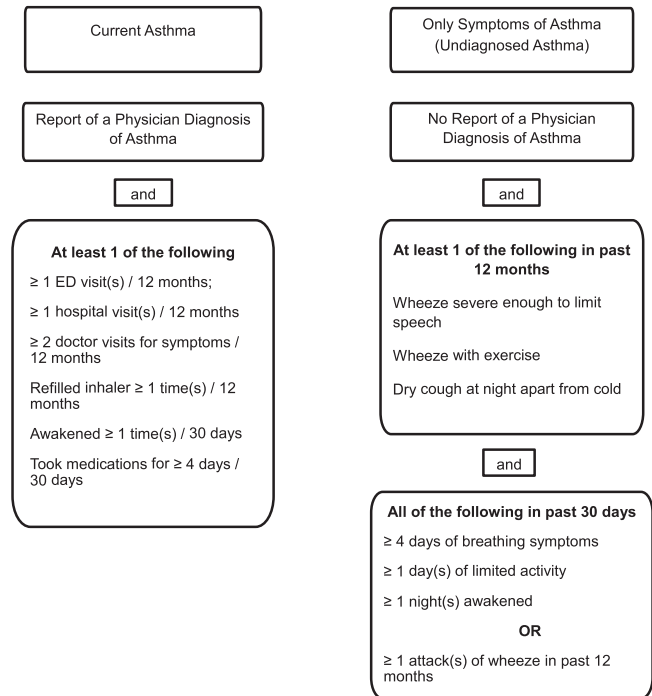


FIG 1. Schematic of criteria for classifying subjects as having current diagnosed or current undiagnosed asthma. ED, Emergency department.

to complete the LHS. Completion of the survey was considered as student assent for participation. These were the same parental consent/student assent processes approved and used in the Detroit survey. The LHS was completed by students during their homeroom period from August 2009 through December 2010. School policies stated that all students in these 4 schools were to be assigned a homeroom.

In both Detroit and Georgia, students were asked to indicate their race as Latino/Hispanic, black/African American, Asian, Native American/American Indian, white/non-Latino, and other.

To provide a better understanding of key differences between the Detroit and Georgia schools, public data sources were used to find the number of students in each school during the year of the survey, the percentage of students reported as black (AA), the percentage of students eligible for free or reduced price lunch, the population density (defined as the number of persons per square mile), and the number of physicians practicing in the postal (ZIP) codes where the schools are located. Physicians were divided into those typically providing primary care, who could be expected to provide care for adolescents with asthma (family practice, internal medicine, pediatrics, preventive medicine, obstetrics, and gynecology), and those providing specialty care for asthma (allergy and pulmonology) and all other specialties. When a practice was listed but no indication of the number of physicians was given for the practice, it was counted as 1 physician.

One parent or guardian of each participating high school student was invited to participate in 2 telephone interviews concerning their student's health. Among the interview questions were questions related to socioeconomic status including whether they owned or rented their home, the highest level of education they had completed, the total annual income of the home, and the amount they paid each month for their home, either as rent or as mortgage. The responses to these questions were compared to assess differences in the socioeconomic status of the students.

Statistical methods

Characteristics between groups, including the prevalence of lifetime and current asthma, were compared using Pearson χ^2 tests with exact (Clopper-Pearson) CIs. Wilcoxon rank sum tests were used to compare groups on the

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