

HIGH RISK POPULATIONS

Asthma in Underserved Schoolchildren in Miami, Florida: Results of a School- and Community-Based Needs Assessment

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Objective. Asthma is the most common chronic condition in childhood and disproportionately impacts the poorer and ethnic minorities. The objectives of the study were to estimate the prevalence of asthma in Miami–Dade County (MDC) schoolchildren to aid case-finding and linkage to care. **Methods.** We used the CDC Youth Risk Behavior Surveillance System (YRBSS) definition of possible asthma (“Ever told by a doctor or nurse that they had asthma and still had asthma”) and analyzed data from four sources. These included the: (1)-MDC YRBSS 2009, (2)-MDC Health Connect Asthma Survey of school nurses (>2008), (3)-parents’ survey in the five HealthConnect survey elementary schools with highest asthma prevalence, and (4)-focus group with parents of asthmatic children. **Results.** (1)-MDC YRBSS data showed that 21.3% of high- and 21.4% of middle-school students had been diagnosed with possible asthma. Prevalence was the highest in African-American middle-school girls (26.9%). (2)-HealthConnect survey responders reported that 4.9% of the students in 131 MDC schools had possible asthma. Asthma prevalence was higher in elementary schools (median = 7.1%) and in low-income MDC zip codes. (3)-Of the parent survey responders, 24.9% indicated that their child had possible asthma, and 19.2% reported that their children had no usual source of care. (4)-Focus group participants reported frequent loss of Medicaid coverage for their children, landlords’ indifference to the role of poorly maintained housing in asthma, and unmet needs regarding knowledge of health system navigation. **Conclusions.** Asthma may be common in MDC schoolchildren, particularly in poor communities. Formidable structural factors limit the caregivers’ abilities to manage childhood asthma.

Keywords asthma, African-Americans, Hispanics, poverty

INTRODUCTION

Asthma is the most common chronic childhood condition in the United States, affecting 13.1% of children under 18 years of age (1). Poorly controlled asthma is an important cause of school and work absenteeism, low quality of life, and childhood death (2–6). Although asthma mortality appears to be declining, asthma prevalence has increased over the past 20 years and is highest in urban settings among low-income, underserved children (2–6).

In 2008, Florida ranked 49th among all the states in children’s access to healthcare (7). Miami–Dade County (MDC), Florida’s most populous county, had over 110,000 uninsured children (8) and promoting Medicaid enrollment has been difficult due to complex application and qualifying procedures. Much of the MDC pediatric population lives in poverty (8–10). An estimated 50% of MDC housing is over 24 years old, and over 43,000 housing units are substandard because of severe overcrowding or lack of plumbing or kitchen

facilities (9). Poor children, particularly those whose parents are under-employed or unemployed immigrants, tend to live in older substandard housing (11). Beyond its urban poverty, MDC has a substantial population of the rural poor. In Homestead, a largely rural section of MDC, 29.4% of the population was below the poverty level, including 43.9% of those under the age of 18 (12). Although these data suggest the possibility of significant unmet needs for children affected by asthma in MDC, one of the largest and most underserved and rapidly growing US pediatric populations, few local data exist to estimate the prevalence of asthma and assess its impact on the children. The purpose of this study was to estimate the prevalence of asthma in MDC and conduct a needs assessment of asthmatic children and their families. A local coalition, the South Florida Asthma Consortium Planning Group, composed of pediatricians, healthcare providers, researchers, school staff, and other community members conducted a mixed methods study to assess the scope and impact of asthma in schoolchildren in MDC, to identify and link underserved children to medical homes, and to evaluate the unmet needs in some of MDC’s lowest-income neighborhoods.

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METHODS

Case Definition: In the Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Surveillance System (YRBSS) 2009, asthma was defined as an affirmative answer to the questions “ever told by a doctor or nurse that child had asthma?”, and “ever told by a doctor or nurse that they had asthma, and child still has asthma?” (13) The CDC YRBSS asthma definition was also used in the elementary schoolchildren’s parent questionnaire survey; children of parents who answered in the affirmative to those questions were said to meet the definition of “possible asthma”, as defined by the CDC. In the MDC HealthConnect School Asthma Survey, school nurses defined children as asthmatic if their parent or guardian had submitted a required form signed by a Florida-licensed physician in that school year affirming that the child had a diagnosis of asthma. The children of focus group participants had been discharged from MDC hospitals with a diagnosis of asthma.

Population-based Data Analysis (CDC Youth Risk Behavior Survey 2009)

The online CDC MDC Youth Risk Behavior Surveillance System 2009 data were analyzed, assessing proportions of MDC students in 6th to 12th grade who were characterized as having asthma according to the CDC definition (13). Proportions of respondents with asthma were compared by race, sex, and school type (middle school [6th to 8th grade] versus high school [9th to 12th grade]).

HealthConnect –School Asthma Survey 2008

In 2008, a survey was undertaken by MDC HealthConnect, a health initiative spearheaded by The Children’s Trust, a Florida community-based organization (14). School nurses in 131 schools were asked to report the school type, school address with zip code, number of students attending the school, and number of students with a current diagnosis of asthma as documented by a physician’s student health school form. Proportions of students with asthma were compared by school type and by zip code average income.

Schoolchild Parent Questionnaire Survey

Parents of schoolchildren enrolled in the three elementary schools with the highest asthma prevalence in the HealthConnect Asthma Survey and two additional elementary schools (one in Little Havana in inner-city MDC, and one in Homestead with a large rural population) were surveyed using an adaptation of the Harlem Children’s Zone Asthma Initiative screening survey questionnaire instrument (15–17). Because YRBSS data were only collected in middle and high schools, this survey focused on elementary schools, which were not covered. School principals distributed 2106 surveys to teachers, who sent them with students to deliver to their parents. Students then returned the forms to the teachers. Parent and teacher participation was incentivized with children’s school supplies for children who returned questionnaires and store

coupons for teachers whose classes returned more than half of the questionnaires.

Focus Group

A focus group was conducted with MDC parents of children who had been hospitalized within the prior year with a discharge diagnosis of status asthmaticus from an MDC hospital to obtain qualitative data regarding unmet needs, barriers, and parental suggestions for the South Florida Asthma Consortium. For the purpose of analysis, facilitator comments and questions and redundant comments were eliminated from the transcript. The remaining comments were grouped according to the discussion topics. The focus group lasted 2 hours and was conducted in Spanish. Questions were obtained from peer-reviewed published studies (18–20), and feedback was provided by the facilitator. There were four main topics organized in open-ended questions from general to specifics:

- (1) “What things (factors) affect the kind of care your child gets for his/her asthma?” “What things (factors) have made it difficult to keep your child with asthma healthy?” “Of these things, which are most significant to you and your child with asthma?” “How confident do you feel about handling your child’s asthma? What are the main problems (barriers) of having a child with asthma?”
- (2) How have you handled that your child has asthma? How was the process of accepting this condition? How did you react at first?
- (3) What things in your house can trigger an asthma attack in your children? Are you interested in receiving a home inspection to find out problems in your environment that might contribute to your child’s asthma? Do you have access to medications and health services on a timely basis?
- (4) “What things would you like organizations like ours to do to help you improve your child’s asthma care?” Would you like to be part of a community advisory group to the South Florida Asthma Consortium?

Statistical Methods

Data from the HealthConnect School Asthma Survey were entered in an Excel file, which was converted into an Epi Info file and analyzed using Epi Info version 3.5.3 for Windows (Centers for Disease Control and Prevention, Atlanta, Georgia 2007) (21). Average household incomes of zip codes in the HealthConnect survey schools were obtained from the online Zip Atlas (<http://zipatlas.com/us/fl/miami/zip-code-comparison/median-household-income.htm>) and entered into the Epi Info file. Asthma prevalence was mapped by zip code and zip code average income. Data from the five-school parent questionnaire survey were entered into a separate Epi Info file and analyzed using Epi Info (21). Prevalence of possible asthma, as defined by CDC YRBSS in the parent questionnaire survey, was compared by school and schoolchild characteristics in both surveys. Chi-square and Fisher’s exact two-tailed tests were used for statistical significance

testing for categorical variables and the Kruskal–Wallis test for two groups was used for statistical significance testing for continuous variables (21).

RESULTS

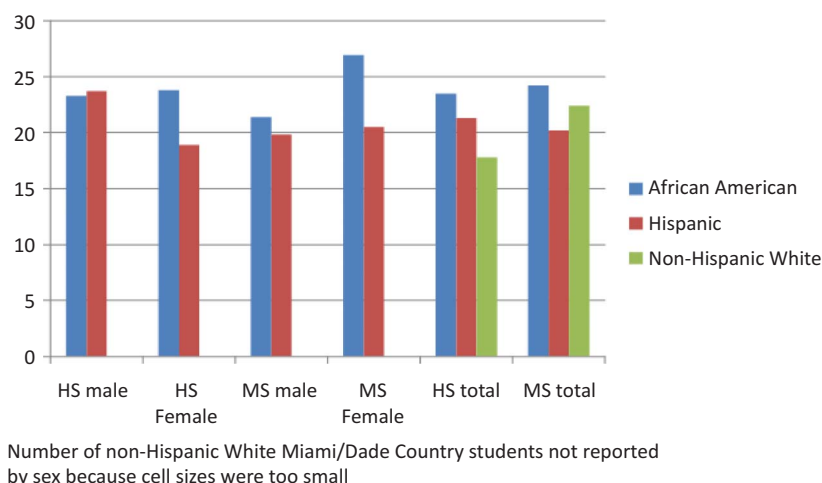
Youth Risk Behavior Survey, 2009

CDC Youth Risk Behavior Survey 2009 data indicated that 21.3% of MDC high-school and 21.4% of MDC middle-school students had been told by a doctor or nurse that they had asthma in their life time; 7.7% and 9.4%, respectively, had been told that they still had asthma. Asthma prevalence varied by student race and ethnicity,

with non-Hispanic Blacks having higher prevalence than Hispanics and whites in both middle- and high-school groups (Figures 1 and 2). Middle-school girls had the highest prevalence among all the groups. The vast majority of students in both the high- and middle-school surveys were Hispanics. The number of non-Hispanic white participants was too small to report data by gender.

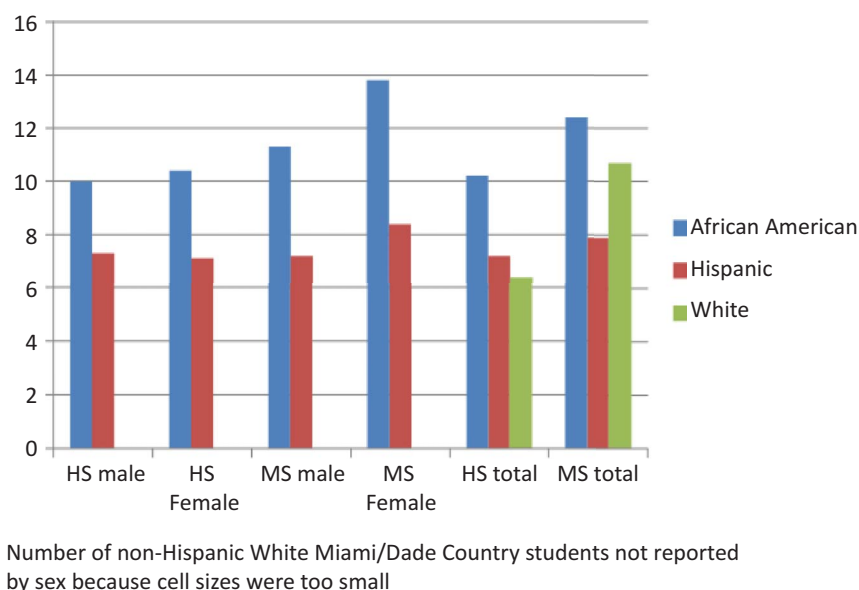
HealthConnect School Asthma Survey

In 2008, 125,479 students enrolled in 131 schools were surveyed, and 6144 (4.9%, range = 0.7%–18.5%) were reported by school nurses to have asthma according to forms signed by licensed physicians. The proportion of students who had asthma varied by the type of the school,



HS: High school
MS: Middle school

FIGURE 1.—Proportion of students who had ever been told by a doctor or nurse that they had asthma, YRBS, 2009. HS: High School, MS: Middle School.



HS: High school
MS: Middle school

FIGURE 2.—Proportion of students who had ever been told by a doctor or nurse that they had asthma, YRBS, 2009. HS: High School, MS: Middle School.

with the highest being observed in the 72 elementary schools (median = 7.1%; range = 0.1%–18.5% vs. other school types, median = 4.4%; range = 0.5%–11.4%; $p < .001$). Of 18 schools with asthma prevalence of greater than 10%, 17 were elementary schools. Prevalence in the 35 middle schools was 5.3% (range = 1.6%–11.4%) and prevalence in the 20 high schools was 2.9% (range = 0.5%–8.8%). In the four kindergarten to 8th grade schools, median prevalence was 4.4%. The proportions of students who were reported to have asthma in the HealthConnect survey tended to be higher in MDC zip codes with the lowest average household incomes. Eight of the 14 lowest-income MDC zip codes (\$11,873–\$31,850) had schools with average asthma prevalence of over 5.7% (Figure 3). The three schools with the highest asthma prevalence in the HealthConnect Survey (18.5%, 15.9%, and 13.6%)

(Table 1) were elementary schools located in neighborhoods where 34.9%, 27.1%, and 40.9% of the population lived below the poverty level, respectively (8, 9, 11, 12).

Elementary Schoolchildren Parent Survey

A total of 2106 questionnaires were distributed to principals to distribute to all students enrolled in five MDC elementary schools. Completed questionnaires were received from 1108 (52.6%) parents (Table 1). Ages of students ranged from 3 to 13 (mean age = 7.6) years, and grade levels ranged from pre-kindergarten to fifth grade. The largest proportion of responses came from parents of third-grade students (17.1%), and the lowest proportion of responses came from caregivers of pre-kindergarten children (8.2%). Most questionnaires were completed in English (82.2%); 49.5% of parents reported that their

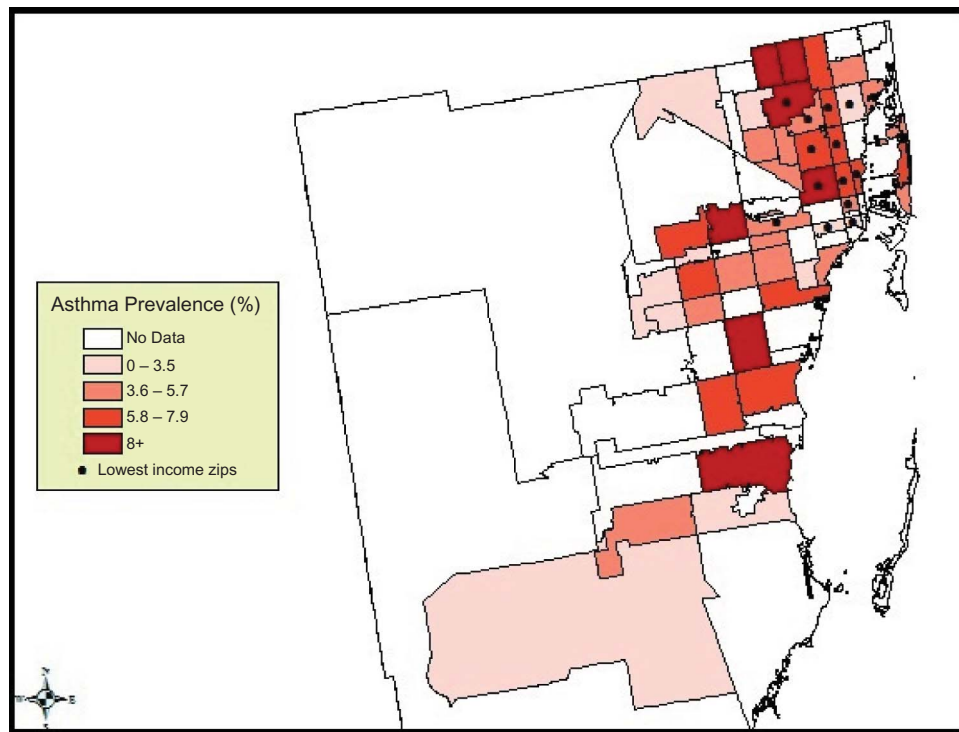


FIGURE 3.—Proportion of elementary schoolchildren whose caregivers reported a physician or nurse diagnosis of asthma in a survey of 131 school nurses in Miami-Dade County, 2010.

TABLE 1.—Enrollment, parent questionnaire survey response rate, and prevalence of wheezing, and asthma prevalence in five Miami-Dade County Elementary Schools, according to the HealthConnect (HC) School Asthma Survey, 2008, and the South Florida Asthma Consortium parent questionnaire survey, 2011.

School Neighborhood	Enrollment by school	Parent Questionnaires Returned, by School	Parent Survey Response Rate*, by school (%)	Parents Reporting Wheezing in Last 12 Months, Parent Survey, by School # (%)	Parents Reporting an Asthma Diagnosis, Parent Survey by Survey, by School # (%)	Students with Asthma, in HC-School Asthma Survey, by School # (%)
Homestead	694	390	56.2	69 (17.7)	98 (25.1)	63 (9.1)
Allapattah	346	249	72.0	42 (16.9)	53 (21.3)	64 (18.5)
Opa-Locka	290	136	46.9	25 (18.4)	39 (28.7)	46 (15.9)
Perrine	404	253	62.6	78 (30.8)	76 (30.0)	55 (13.6)
Little Havana	372	80	21.5	13 (16.3)	10 (12.5)	33 (8.9%)
Total	2106	1108	52.6	227/1108 (20.5)	276/1108 (24.9)	261/2106 (12.4)

child was female, 43.3% reported that their child was male, and 7.2% did not report information on the sex of the child. School response rates varied significantly, ranging from 72% to 21.5% (Table 1).

Just under a quarter (276 [24.9%]) of parents indicated that they had been told that their child has asthma by a doctor or nurse at some time in the past, meeting the CDC YRBSS surveillance definition of asthma (Table 1). The proportion of parents who reportedly had been told their child had asthma by a doctor or nurse varied by school, ranging from 12.5% to 30.0%. Reported symptoms suggestive of asthma, or emergency room use for asthma also varied significantly by school. Parents whose children's sleep had been disturbed in the last 12 months by a dry cough unrelated to a cold or chest infection ranged from 15% to 30.1% (Table 2). The percentage of parents who indicated that their child had experienced wheezing or whistling in the chest in the last 12 months ranged from 16.3% to 30.8%, closely paralleling proportions that reported other symptoms suggestive of asthma. Parents who indicated that, in the last 12 months, their child had wheezed or coughed during or after exercise (when they did not have a cold) ranged from 15.3% to 26.1%. The percentage of parents who indicated that, in the last 12 months, their child had made an emergency visit to a doctor's office or emergency room due to asthma or other breathing problems ranged from 12% to 21.3% (Table 2).

Two hundred sixty parents (23.5%) indicated that their child had made an emergency visit to a doctor's office or hospital at some point in the past due to asthma or other breathing problems, and 176 (15.9%) indicated that this had occurred in the last 12 months (Table 2). A total of 342 (30.9%) parents indicated that their child had episodes of wheezing or whistling in the chest in the past, and of these, 227 (20.5%) indicated that this had occurred in the last 12 months. One hundred and ninety-eight (17.9%) parents indicated that their child had ever wheezed during or after exercise, and 265 (23.9%) indicated that their child had ever coughed during or after exercise (when they did not have a cold). Two hundred eleven (19.0%) indicated that wheezing or coughing during or after exercise had occurred in the last 12 months. Finally, 266 (24%) parents

indicated that their child's sleep had been disturbed by a dry cough that was unrelated to a cold or chest infection in the past 12 months.

Of 1108 responders, 733 (66.2%) indicated that the child had a regular source of healthcare outside of the emergency room, and 826 (74.5%) had health insurance coverage for their child. Parents who reported that the child had visited the emergency room for asthma in the last 12 months were more likely to report a regular source of care (149/172 [86.6%]) than other parents (583/879 [66.3%]) $p < .001$. Parents who reported that their children were insured were significantly more likely to report having taken them to the emergency room for an asthma exacerbation (18.4%) than those who reported that their children were uninsured (8.5%; $p < .001$).

Most parents who reported that their child had ever had a physician or nurse tell them that their child had asthma (meeting the CDC YRBSS definition of "possible asthma") reported: episodes of wheezing (92.4%), emergency room visits for asthma (75.7%), cough during sleep (66.9%), and cough during exercise without a cold (66.7%). Most children whose parents reported "possible asthma" reported two or more clinical findings associated with asthma, with the most common combination (73.6%) being episodes of wheezing and emergency room visits for asthma. Surprisingly, (45.6%) of parents who reported emergency room visits for asthma denied that a physician or nurse had ever told them that their child had asthma.

Most responders (799 [72.1%]) gave locating information. One hundred seventy-nine (16.2%) wanted help with finding a regular source of healthcare, and 242 (21.8%) wanted help with finding health insurance for their children. Virtually all who gave the locating information gave email addresses. Most (237/276 [85.9%]) parents who had been told at some point that their child had asthma reported a usual source of care. Asthmatic children with a usual source of care included both insured and uninsured children. Eighty-one (29.4%) requested help in obtaining health insurance for their uninsured asthmatic children. More than 70% of responders expressed interest in having auscultation of their child's chest by a South Florida Asthma Consortium healthcare provider.

TABLE 2.—Number and proportion of responders, by neighborhood of school, who reported that their child's sleep was disturbed by cough, or who had wheezing, without or with exercise, or who had an emergency visit to a physician (MD) or emergency room (ER) in the prior 12 months, South Florida Asthma Consortium Parents Survey, 2011.

School Neighborhood	Responders by School, Number	Percent of Responders by School	Parents Reporting	Parents Reporting	Parents Reporting Wheezing/	Parents Reporting emer-
			Sleep Disturbed by Cough in Last 12 Months # (%)	Wheezing/ "Whistling" in Last 12 Months # (%)	Coughing During/After Exercise, Last 12 months # (%)	gency Visit to MD/ER in Last 12 Months # (%)*
Homestead	390	35.2	86 (22.1)	69 (17.7)	62 (15.9)	57 (14.6)
Allapattah	249	22.5	56 (22.5)	42 (16.9)	38 (15.3)	30 (12)
Opa-Locka	136	12.3	41 (30.1)	25 (18.4)	29 (21.3)	22 (16.2)
Perrine	253	22.8	71 (28.1)	78 (30.8)	66 (26.1)	54 (21.3)
Little Havana	80	7.2	12 (15)	13 (16.3)	16 (20)	13 (16.3)
Total	1,108	100	266 (24.0)	227 (20.5)	211 (19)	176 (15.9)

*Due to asthma or other breathing problems.

Focus Group

Participants in the focus group were four parents of asthmatic children who had required hospitalization because of severe asthma. Two of the four had a severe family history, including several deaths due to asthma. All had lived in rented apartments in Little Havana, and three still lived there. There were three mothers and one father, ranging from 27 to 35 years of age. Occupations included student, housekeeper, seamstress, and legal assistant. All were foreign-born, with birthplaces in Cuba, Honduras, and Costa Rica. All children received Medicaid. All cited lack of knowledge about asthma, asthma medications, and health system navigation as important barriers to optimal management of their children's asthma. All mentioned difficulties in accessing reliable information and cited having little support. This was especially true for the three who were recent immigrants and did not have a family or social network in Miami. Inadequate living conditions were cited by all, including old, poorly maintained apartments, mold, neighbors who smoked, and pest infestations. Parents complained that the landlords were indifferent about the conditions that triggered their children's asthma symptoms. They reported concerns about albuterol and would underuse it because of tachycardia or tremors. Intermittent, unpredictable loss of coverage due to changes in Medicaid policies or bureaucratic processes were cited as serious concerns by all. Parents feared they would lose insurance coverage and that providers would be unwilling to see their children. They expressed unmet needs for information about the asthma process, the medications, and how to navigate the healthcare system. All had faced rejection of their children from daycare centers because of the centers' unwillingness to manage asthma medications, and parents had lost jobs or promotion opportunities due to frequent work absences due to their children's asthma.

DISCUSSION

Based on these findings, we concluded that asthma is an important challenge for parents and schoolchildren in MDC. Children who attended elementary schools in the lowest-income areas were at a particularly high risk. To our knowledge, this is the first study to document prevalence rates of over 25% in Southeastern elementary schoolchildren, an understudied group. This prevalence supports the suspicion that factors contributing to childhood asthma in MDC, one of the most rapidly growing metropolitan areas in the United States, may be as important as in the Northern cities, where childhood asthma has been much better described (15–17, 22).

Our findings suggest that asthma is particularly a problem for children who are African-American. Asthma appeared to affect younger schoolchildren in particular, especially those who attended elementary schools. Almost 25% of the parents in the five elementary schools surveyed reported that they had no health insurance for their children. The strong association between emergency room use and usual source of care and/or health insurance

may suggest that parents may be less willing to utilize the emergency rooms if they have to pay for the care or if their child is not already receiving care. The association of asthma with a regular source of care suggests that among children without a regular source of care, asthma cases may remain unrecognized and undiagnosed.

The relationship between high asthma prevalence and low zip code average income suggests a possible role for poor indoor air quality in schools' catchment area housing, outdoor environmental contamination, or other environmental factors related to poverty and segregation (22–25). A recent meta-analysis found an association between traffic-related air pollutants and asthma (26). Although MDC as a whole has lower levels of most major air pollutants than the United States (27), low-income inner-city zip MDC neighborhoods have been documented to have high soil and air lead levels related to high automobile traffic in these areas (28, 29).

The willingness of the parents to give contact information suggests the feasibility of offering home inspections as one of the tools for assessing the role of environmental factors in the high prevalence of asthma in children in lowest-income zip codes and for linking uninsured children to care. Lack of access to care and health insurance does not completely prevent asthma diagnosis and treatment. However, children who are uninsured, have frequent interruptions of Medicaid coverage, and/or do not have a regular source of care may be less likely to have access to an asthma diagnosis, treatment, and preventive inhaled steroids, the foundation of effective pediatric asthma preventive care. At present, stable health insurance for children in the American South, particularly in the form of Medicaid, and particularly in Florida, remains frustratingly elusive (30–33).

Thus, it is clearly urgent to address the requests of parents for help in obtaining health insurance and regular sources of care for their children. The large proportion of parents requesting assistance finding health insurance (242 [21.8%] of all respondents) suggests that vigorous efforts are needed to close these gaps. To partly address these requests, the authors compiled a list of contact information for free or low-cost insurance to be e-mailed to guardians who requested assistance finding health insurance. This effort focused on Florida KidCare and Medicaid.

Nevertheless, a more definitive solution needs to be identified. Low Medicaid reimbursement rates and increasingly frequent Medicaid eligibility renewals have been associated with poorer healthcare access for low-income children in the Southern states and are particularly onerous for low-income Florida families (30–32). The efforts of non-government organizations, particularly HealthConnect (The Children's Trust) are laudable (14). But clearly, the failure of the state government to address the preventive health needs of these neglected children is a missed opportunity.

This mixed-method study had several important limitations. The YRBSS did not include elementary schools (13), which in the HealthConnect School Asthma Survey had the highest asthma prevalence. The HealthConnect

School Asthma Survey required medical forms signed by a Florida-licensed physician for identification of students with asthma. These physicians may not always necessarily have had access to the children's medical records or history while filling out the form. Particularly in the case of asymptomatic children without a usual source of care, physicians may have relied entirely on the parents to recall a diagnosis of asthma at the moment of the form preparation leading to underestimation of asthma prevalence in these children. The reporting of asthma or other chronic illnesses to school authorities is not compulsory, and parents may be more willing to disclose it confidentially. Moreover, the CDC YRBSS surveillance case definition of asthma, the definition also used in the Harlem Children's Zone Asthma Initiative, relies on the recollection of an asthma diagnosis and may be subject to recall bias (13, 15–17). The failure of many parents of children treated in emergency rooms for asthma to report their children as having "possible asthma" suggests barriers to the understanding of asthma as a chronic, persistent disease that exists even in the absence of symptoms at the moment. Adjuncts to asthma diagnosis, such as serial spirometry, improve the reliability of an asthma diagnosis; however, asthma is not routinely excluded by any laboratory assay (2), and the sensitivity and specificity of the CDC YRBSS "possible asthma" diagnosis in this case-finding project, as in the case of most real-world asthma diagnoses, was not 100%.

The use of average income in the schools' zip codes as a proxy for schoolchildren's household income, while convenient, may be insufficiently precise since some schools' catchment areas may overlap several zip codes of different average incomes. However, the schools with the highest asthma prevalence were located in the poorest MDC neighborhoods surveyed (8–12). While the parent questionnaire survey response rate of over 50% is encouraging, there was no way to characterize non-responders. Moreover, the survey estimates of asthma prevalence tended to be higher than that in the HealthConnect survey. It is conceivable that non-responders may have had lower levels of asthma or non-insured children, and therefore might have been less motivated to participate. It is equally possible that non-responders may have been more likely to have other priorities competing with responding to a survey, including socioeconomic issues associated with lower likelihood of insurance or a medical home. Another limitation is that only one focus group with four parents was performed due to the difficulty in finding parents of children with severe asthma available to commit an afternoon for this activity.

CONCLUSION

Despite these limitations, the findings of this project, the first to explore the issue of childhood asthma in one of the most rapidly growing underserved pediatric populations in the country, suggest that possible asthma, as defined by CDC YRBSS, is a serious problem in MDC. Particularly

affected are schoolchildren in low-income families. The Florida governor's decision to decline federal funding providing greater access to Medicaid in this state contrasts with the finding that parents of chronically ill children in states with greater barriers to public insurance enrollment (in the form of more stringent income guidelines) are more likely to spend more than 3% of their total income on their child's healthcare, and to perceive greater barriers to healthcare access for their chronically ill children (18, 30–32). This increase in barriers to preventive services, based presumably on a desire to limit the state spending on services to children, may be counterproductive because of higher hospitalization rates in asthmatic children who do not receive preventive services and may result in higher expenses.

The data from this project suggest the need for a comprehensive community-level response to the problem of children's asthma in MDC's poorest neighborhoods, possibly similar to the Harlem Children's Zone Asthma Initiative (15–17, 34). The efforts of Harlem Children's Zone activists, physicians, and parents addressed the problem of negligent landlords, and led to achievements not traditionally seen as "public health". An adaptation of this approach in MDC may reduce costly hospitalizations and improve school attendance and quality of life for thousands of MDC children and their parents. Moreover, further studies are needed to improve the sensitivity and specificity of the surveillance definition of childhood asthma, and parents' understanding of that diagnosis.

DECLARATION OF INTEREST

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