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Use of a School-Based Survey to Screen Students for Symptoms Concerning for Asthma

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Background

Asthma is underdiagnosed in minority children.¹ Early identification of asthma in these children can lead to reduced asthma morbidity, mortality, and health care utilization. This could be addressed through developing tools, such as screening surveys, to identify children at risk for asthma and with appropriate referral for follow-up care.² Prior studies examining the role of screening surveys have been limited by their smaller sample sizes.^{2,3} Our goal was to determine if we could apply similar screening approaches to our larger, inner-city, school-based cohort. We hypothesized that the surveys would identify a large group of students with asthma symptoms and no previous diagnosis of asthma, and quantify the morbidity experienced by these students.

Methods

The National Institute of Health/National Institute of Allergy and Infectious Diseases–funded School Inner-City Asthma Study (SICAS) is a longitudinal study conducted between 2008 and 2013 evaluating the association between classroom/school-specific allergen and

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Author Contributions

ML: concept and design, analysis and interpretation of the data; drafting the article and revising the article critically.

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PL: analysis and interpretation of the data; revising the article critically; final approval.

WP: concept and design, analysis and interpretation of the data; acquisition of the data; revising the article critically, final approval.

Declaration of Conflicting Interests

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pollutant exposures and asthma morbidity in urban students with asthma.^{4,5} A detailed description of the recruitment, design, and screening visit process for SICAS-1 has been reported previously.⁵ As part of the recruitment process for SICAS, we collected information on asthma symptoms and other atopic conditions, through a 1-page validated, 20-question screening survey in English and Spanish. The survey was distributed to all parents of students attending participating elementary schools. The study protocol was approved by the institutional review board of Boston Children's Hospital and the participating school system.

Participants were defined as having parent-reported asthma if the parent gave an affirmative response to, "Has a doctor or nurse told you that your child has asthma, reactive airway disease, or wheezy bronchitis?"

Of those who did not report a history of asthma, participants were defined as having a positive asthma screen if they answered "sometimes" or "a lot" to at least 2 questions about asthma symptoms (Figure 1). Questions about asthma symptoms are the first 8 questions of our screening survey. These defining criteria were based on findings by Redline et al, who examined the association between validated questionnaires and clinical assessment in several inner-cities and subsequently developed sensitivity and specificity cutoffs for the questionnaires.²

Participants were defined as having a negative asthma screen if they did not meet criteria for positive asthma screen or parent-reported asthma.

Participants were defined as having a positive allergic rhinitis screen if they answered "sometimes" or "a lot" to the questions, "Have eyes that itch, get puffy, or bum?" and "Have problems with runny, stuff nose?"

Race/ethnicity, clinical history, symptoms, and family history were parent-reported.

Comparisons were made between the categories of students using Pearson χ^2 , Fisher's exact, or 2-sample *t* tests depending on the distribution of the dependent variable. Alpha was set at .05. All analyses were performed using STATA 13.1.

Results

A total of 7032 screening surveys were returned, and 6490 of those surveys had data needed to define the categories of students. Mean age was 8 years, with the majority composed of Hispanics (43%) and blacks (30%). A total of 1033 (15%) did not report race; 1482 (23%) participants had a parent-reported history of asthma. Fifty-six percent (830) of participants with parent-reported asthma stated a family history of asthma.

In participants without parent-reported asthma, 1564 (31%) participants were found to have a positive asthma screen and 3444 (69%) participants were found to have a negative asthma screen (Figure 1). Participants with a positive asthma screen had a significantly higher proportion of a family history of asthma (28% vs 19%; $P < .001$), eczema (44% vs 19%; $P < .001$), food allergies (9% vs 3%; $P < .001$), and allergic rhinitis (37% vs 13%; $P < .001$) compared with those with a negative asthma screen. Participants with a positive asthma

screen also reported more hospital care for asthma/breathing problems in the past year, compared with those with a negative asthma screen (8% vs 1%; $P < .001$). Fifty-two percent (771) of participants with parent-reported asthma reported hospital care for asthma/breathing problems in the past year.

Discussion

In our large, inner-city, school-based cohort, nearly one third of participants without parent-reported asthma had a positive asthma screen. When compared with those with negative asthma screens, the students with positive asthma screens are at higher risk for hospital care for asthma/breathing problems, highlighting the need for appropriate identification of these children at risk of having an asthma diagnosis. Additionally, those with a positive screen appear to be more atopic compared with those with a negative screen.

The diagnosis of asthma can be challenging in all children,⁶ but particularly in low-income, minority communities that have limited access to consistent, high-quality medical care where the prevalence of asthma can be as high as 20% to 30%.⁷ The Centers for Diseases Control and Prevention has suggested that successful asthma management stems from implementing effective asthma management systems in schools, particularly in underresourced communities with low-income, minority populations and inner-city residents.⁸ One approach to asthma surveillance involves identifying and characterizing students with asthma or asthma symptoms and focusing efforts to create management and support systems for them. We utilized a simple screening survey distributed to parents to identify children with symptoms of asthma that require follow-up. Our study is unique in that we utilized a large sample size of urban school-aged students. Our study is limited as we only screened respondents and did not provide follow-up confirmatory evaluations. However, our findings suggest that this approach can be easily executed in large, underresourced urban communities and can appropriately identify children with symptoms of asthma.

Conclusion

In summary, in our large, inner-city school-based cohort, we found a significant number of children with a positive asthma screen and no parent-reported asthma. These children with symptoms suggestive of asthma had elevated rates of hospital care for breathing problems and an atopic background. These children without known asthma but who experience increased morbidity can be easily identified with a school-based asthma screening survey and should be closely monitored. Clinicians and researchers may consider screening surveys as the framework for surveillance programs identifying possible asthma in minority communities, which tend to have high prevalence rates of asthma.

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Figure 1. Screening algorithm of participants and comparison of screened participants.