Risk Factors for Asthma and Asthma Severity in Nonurban Children in Connecticut*

Pamela Sangeloty Higgins, MS, MPH; Dorothy Wakefield, MS; and Michelle M. Cloutier, MD

Study objective: To examine asthma diagnosis, asthma severity, and the presence of established asthma risk factors in children who reside in nonurban communities.

Design: A cross-sectional study was conducted of 19,076 children (6 months to 18 years of age) who lived in 146 nonurban communities in the greater Hartford, CT, region and who were enrolled in a disease-management program (Easy Breathing II; Michelle Cloutier, MD; Hartford, CT) designed to improve asthma diagnosis and treatment.

Results: The overall frequency of physician-confirmed asthma in children seeking health care was 18%. Asthma frequency was related to low socioeconomic status (SES), non-Caucasian ethnicity, male gender, age ≥ 5 years, and exposure to tobacco smoke, dust, or cockroaches in the multivariate analysis. When controlling for SES, African-American children were 1.33 times more likely (95% confidence interval [CI], 1.15 to 1.53) and Hispanic children were 1.60 times as likely (95% CI, 1.38 to 1.85) as Caucasian children to have asthma. In contrast, asthma severity was related to dust exposure, a family history of asthma, non-Caucasian ethnicity, and age ≤ 4 years in the multivariate analysis. African-American children (odds ratio, 1.31; 95% CI, 1.03 to 1.67) had more severe asthma diagnosed as compared to Caucasian children. Hispanic ethnicity was not associated with an increase in asthma severity.

Conclusion: Risk factors for asthma in nonurban children are similar to risk factors in urban children. Ethnicity is a risk factor for asthma regardless of SES. Even in nonurban environments, African-American and Hispanic children have more asthma, and African-American children have more severe disease than their Caucasian counterparts. (CHEST 2005; 128:3846–3853)

Key words: asthma risk factors; asthma severity; pediatric asthma

Abbreviations: CI = confidence interval; ERG = Education Reference Grouping; OR = odds ratio; SES = socioeconomic status

Asthma is a common, chronic disease in children. Despite effective treatment, asthma is associated with high morbidity and significant mortality.1–4 Asthma prevalence, asthma severity, and health-care utilization disproportionately affect urban minority communities.5–8 The demographics of asthma within low-income urban children have been extensively characterized9–11; however, little is known about the impact of asthma on children living in nonurban communities.12,13 According to the 2000 US Census, 81 million children live in the United States; of these, approximately 50% live in nonurban communities defined as areas with a population density <1,000 people per square mile.14,15

The goal of this study was to examine the demographics of children with asthma who live in nonurban settings. Using a program called Easy Breathing (Michelle Cloutier, MD; Hartford, CT), we examined physician-determined asthma diagnosis, asthma severity, and the presence of established asthma risk factors in children seeking health care who live in 146 nonurban communities in the greater Hartford, CT, region.

Materials and Methods

The Easy Breathing II Program

Easy Breathing is an asthma management program that was originally designed for use by primary care clinicians in urban.
settings. In 2000, the program was expanded into the private sector (Easy Breathing II). The goals of Easy Breathing II are to assist clinicians in private practice to improve recognition of asthma and classification of asthma severity, and to develop a systematic, standardized approach to asthma management including the creation of a written, asthma treatment plan. Program entry begins with the Easy Breathing Survey, which includes four previously validated questions that assist the clinician in diagnosing asthma. Clinicians were encouraged to administer the survey to all children 6 months to 18 years of age who presented for care regardless of chief complaint. Many clinicians, however, preferentially surveyed children with known asthma and children with a history of respiratory symptoms.

A clinical diagnosis of asthma was made by the clinician using information from the survey, from the child’s medical record, and from additional questioning as needed. A diagnosis of asthma was considered “new” if the parent recorded on the survey that the asthma had never been diagnosed in the child and that no asthma medications had been used. A positive response to either of these questions was considered a “previous diagnosis of asthma.” The clinician then determined asthma severity using a scripted set of questions that recorded frequency of daytime and nocturnal symptoms, exercise impairment, and school absenteeism for asthma. Asthma treatment was determined from the asthma severity using a treatment selection guide, and a standardized asthma treatment plan was developed for each child. The program stresses a systematic approach with the creation of a written asthma treatment plan.

Prior to implementation of the program, < 5% of the children seen in the participating practices received a written asthma treatment plan. All of the elements of the Easy Breathing II program (asthma diagnosis, severity, and treatment) are directly based on National Asthma Education and Prevention Program guidelines. Demographic information on each child including age, gender, ethnicity, town of residence, self-reported exposure to known asthma triggers, and medical services utilization data including self-reported hospitalizations, intensive care admissions, and emergency department and acute office visits for asthma in the previous year were also collected. The program was approved by the Institutional Review Boards of Connecticut Children’s Medical Center and the University of Connecticut Health Center.

Clinicians and Patients

Twenty-seven practices with 76 clinicians who were enrolled in two independent practice associations with high penetration in a managed care organization were invited to participate in the Easy Breathing II program. The two independent practice associations were located in the greater Hartford, CT, region and were chosen because the communities they serve demonstrate cultural and socioeconomic diversity. Sixty-five clinicians (86%) from 20 practices (74%) agreed to participate.

Clinicians, nurses, and office support staff in participating practices were trained in the use of the Easy Breathing II program and were provided with all program materials. The program coordinator supported the practices in implementing the program through regular visits. The study sample included children between 6 months and 18 years of age who presented for care for any reason at any of the 20 private primary care practices between January 2001 and July 2004 and were enrolled in the Easy Breathing II program.

Data Sources

The Connecticut Education Reference Grouping (ERG) was used as a surrogate marker for socioeconomic status (SES). The ERG classification system groups together public school students with a similar SES. School districts were assessed on seven variables (median income, education, occupation, poverty, family structure, home language, and district enrollment) [Table 1]. Based on these variables, each town is assigned to one of nine distinct ERG classifications by the Connecticut Department of Education. For data analysis purposes, the nine categories were divided into high SES (median income, $44,197 to $98,000; percentage receiving welfare assistance, 0.06 to 3.7%) and low SES (median income, $24,000 to $47,036; percentage receiving welfare assistance, 7.0 to 43%). Using the ERG category of the town of residence, each child was classified as high or low SES. To determine whether our sample was representative of the children who live in these communities, we first compared age, gender, and ethnic distribution of the children from the 38 towns in which we had ≥ 75 children in the Easy Breathing II database (86%); to the age, gender, and ethnic distribution of their town of residence using 2000 US Census data. Because the Easy Breathing II project is a partnership with ConnectiCare, Inc. (Farmington, CT), a regional managed care organization that serves children and adults in Connecticut, we also used ConnectiCare enrollment data to compare the gender and age of its pediatric members in practices that declined to participate in the Easy Breathing II program to the members in practices that agreed to participate.

Statistical Analysis

Data from the Easy Breathing II Survey were analyzed using statistical software (Version 8.2, SAS Institute; Cary, NC) for

<table>
<thead>
<tr>
<th>Table 1—Connecticut ERG Categories</th>
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<tbody>
<tr>
<td>ERG</td>
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<tr>
<td>------</td>
</tr>
<tr>
<td>A</td>
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<td>B</td>
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<td>C</td>
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<td>I</td>
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</table>

*Percentage of children attending public school whose families speak a language other than English at home.
†Percentage of children attending public school with at least one parent with a Bachelor’s degree.
descriptive statistics, contingency tables, unadjusted odds ratios (ORs), Poisson regression, and logistic regression. Pearson χ² tests were conducted to compare proportions. Associations between asthma and asthma risk factors and exposures were expressed as ORs with 95% confidence intervals (CIs). Children with “unknown” for answers to risk factors and exposures were excluded from the individual analysis, and ranged from 1 and 5% depending on the question. Poisson regression models were used to compare the number of self-reported hospitalizations, intensive care admissions, and emergency department and acute office visits for “new” asthma diagnosis to previous asthma diagnosis while controlling for gender, ethnicity, age, and asthma severity. Logistic regression was used to develop the multivariate models of the relation between asthma and asthma severity to each of the risk factors.

**Results**

**Study Population**

Overall, in the town-by-town comparison, the gender distribution and ethnic distribution of surveyed children were similar to reports from the 2000 US Census in 92% and 71% of towns, respectively. Of the 29% of the towns that had a different ethnic distribution, there was no consistent pattern in sample differences. For example, ethnic groups were undersampled in some towns and oversampled in others. These differences could reflect nationwide trends in the use of health-care services due to inconsistent health insurance coverage, as well as the constant demographic changes within the US population. Differences in gender were small and did not favor one group over another (three towns had more boys and two towns had more girls). Thus, the children surveyed in Easy Breathing II were representative by ethnicity and gender of the communities in which they resided.

The 19,076 children enrolled in the Easy Breathing II program (Table 2) were younger than those represented in the 2000 US Census. This oversampling is not unexpected since children < 4 years of age have more provider encounters and therefore have greater opportunity to be enrolled.

There was no significant difference in the gender distribution (49% male, 51% female) of all children receiving care at participating and nonparticipating practices using ConnectiCare claim data. However, there was a slight difference (p < 0.0002) in the average age of children in the participating practices (8.3 years; n = 11,674; SD, 5.10 years) and nonparticipating practices (8.6 years; n = 7,623; SD, 5.08 years).

**Asthma**

Eighteen percent of the children surveyed had a physician-confirmed diagnosis of asthma. Asthma diagnosis in children enrolled in the Easy Breathing II program varied by ethnicity; African-American children were 1.72 times as likely (95% CI, 1.51 to 1.96) and Hispanic children were 1.91 times as likely (95% CI, 1.66 to 2.20) as Caucasian children to have physician-confirmed asthma. The children with asthma were more likely to be male and 5 years of age (Table 3).

**New Asthma Diagnosis vs Previous Asthma Diagnosis**

Twenty-four percent of the children in the Easy Breathing II program had newly diagnosed asthma. Children with newly diagnosed asthma were more likely to be female (OR, 1.37; 95% CI, 1.17 to 1.59), ≤ 4 years of age (OR, 2.38; 95% CI, 2.04 to 2.79), and were 1.53 times as likely (95% CI, 1.29 to 1.83) to have intermittent disease as compared to children with a previous diagnosis of asthma.

Poisson regression models were used to compare the children with a new asthma diagnosis to the

<table>
<thead>
<tr>
<th>Variables</th>
<th>All</th>
<th>Caucasian</th>
<th>African-American</th>
<th>Hispanic</th>
<th>Caribbean/Virgin Islands</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children surveyed, No.</td>
<td>19,076</td>
<td>16,091</td>
<td>1,281</td>
<td>1,025</td>
<td>171</td>
<td>508</td>
</tr>
<tr>
<td>Male/female gender, %</td>
<td>52/48</td>
<td>52/48</td>
<td>51/48</td>
<td>50/50</td>
<td>51/49</td>
<td>49/51</td>
</tr>
<tr>
<td>Age group, yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 to 4</td>
<td>6,960 (37)</td>
<td>5,779 (36)</td>
<td>468 (36)</td>
<td>413 (40)</td>
<td>58 (34)</td>
<td>242 (48)</td>
</tr>
<tr>
<td>5 to 9</td>
<td>5,201 (27)</td>
<td>4,390 (27)</td>
<td>357 (28)</td>
<td>283 (28)</td>
<td>49 (29)</td>
<td>122 (24)</td>
</tr>
<tr>
<td>10 to 14</td>
<td>5,042 (26)</td>
<td>4,328 (27)</td>
<td>331 (26)</td>
<td>237 (23)</td>
<td>42 (24)</td>
<td>104 (20)</td>
</tr>
<tr>
<td>15 to 17</td>
<td>1,873 (10)</td>
<td>1,594 (10)</td>
<td>125 (10)</td>
<td>92 (9)</td>
<td>22 (13)</td>
<td>40 (8)</td>
</tr>
<tr>
<td>Asthma diagnosis</td>
<td>3,466 (18)</td>
<td>2,741 (18)</td>
<td>334 (26)</td>
<td>289 (28)</td>
<td>28 (16)</td>
<td>74 (15)</td>
</tr>
</tbody>
</table>

*Data are presented as No. (%) unless otherwise indicated. A total of 563 children with ethnicity identified as “other” and 350 children with missing/unknown ethnicity are not included.
children with a previous asthma diagnosis and their self-reported medical-care utilization. Controlling for gender, ethnicity, age, and asthma severity, children with an asthma diagnosis prior to enrolling in Easy Breathing II reported more emergency department and acute office visits (p < 0.0001) and more hospital (p < 0.0001) and intensive care admissions (p < 0.0001) than the children with newly diagnosed asthma.

**Risk Factors for Asthma**

In the univariate analysis, greater asthma frequency was associated with a positive family history of asthma, low SES, non-Caucasian ethnicity, and exposure to tobacco smoke, dust, solvents, cockroaches, and rodents (Table 3). Exposure to pets (p = 0.17), gas stove (p = 0.27), and firewood (p = 0.36) was not associated with a diagnosis of asthma. In the multiple logistic regression, the strongest predictor of asthma was a family history of asthma. Other significant risk factors for asthma were low SES, non-Caucasian ethnicity, male gender, age > 4 years, and exposure to tobacco smoke, dust, or cockroaches (Table 3).

**Asthma Severity**

In the univariate analysis, greater asthma severity was associated with a positive family history of asthma, non-Caucasian ethnicity, age ≤ 4 years, and exposure to dust (Table 4). Greater asthma severity was not associated with SES (p = 0.72), gender (p = 0.92), exposure to tobacco smoke (p = 0.36), cockroaches (p = 0.72), rodents (p = 0.15), pets, (p = 0.09), solvents, (p = 0.09), and gas stove (p = 0.45). In the multiple logistic regression analysis, the strongest predictors of asthma severity were exposure to dust, a positive family history of asthma, non-Caucasian ethnicity, and age ≤ 4 years. Children who reported exposure to pets were more likely to have intermittent disease.

African-American ethnicity (OR, 1.31; 95% CI, 1.03 to 1.67) was associated with more severe asthma as compared to Caucasian ethnicity (Fig 1). Hispanic ethnicity was not associated with greater asthma severity. Asian and Caribbean children had a similar proportion of persistent asthma. The sample sizes of the Asian and Caribbean children, however, were small.

**SES**

The overall prevalence of asthma was found to be significantly higher (p < 0.0001) in children from the low SES group as compared with the high SES group in this nonurban setting (Fig 2). Asthma diagnosis varied by SES for all ethnic groups. Non-Caucasian children had more persistent asthma (OR, 1.29; 95% CI, 1.08 to 1.55) as compared to Caucasian.

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**Table 3—Self-Reported Risk Factors for Asthma in Nonurban Children**

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Univariate Analysis</th>
<th></th>
<th></th>
<th>Multivariate Logistic Regression</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p Value</td>
<td>OR</td>
<td>95% CI</td>
<td>p Value</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>History of family asthma</td>
<td>&lt; 0.0001</td>
<td>2.83</td>
<td>2.63–3.06</td>
<td>&lt; 0.0001</td>
<td>2.64</td>
<td>2.43–2.87</td>
</tr>
<tr>
<td>Age ≥ 5 yr</td>
<td>&lt; 0.0001</td>
<td>1.44</td>
<td>1.33–1.55</td>
<td>&lt; 0.0001</td>
<td>1.44</td>
<td>1.32–1.57</td>
</tr>
<tr>
<td>Low SES</td>
<td>&lt; 0.0001</td>
<td>1.72</td>
<td>1.55–1.92</td>
<td>&lt; 0.0001</td>
<td>1.46</td>
<td>1.33–1.62</td>
</tr>
<tr>
<td>Male gender</td>
<td>&lt; 0.0001</td>
<td>1.39</td>
<td>1.29–1.49</td>
<td>&lt; 0.0001</td>
<td>1.47</td>
<td>1.36–1.60</td>
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<tr>
<td>Non-Caucasian ethnicity</td>
<td>&lt; 0.0001</td>
<td>1.50</td>
<td>1.37–1.63</td>
<td>&lt; 0.0001</td>
<td>1.34</td>
<td>1.20–1.49</td>
</tr>
<tr>
<td>Tobacco smoke exposure</td>
<td>&lt; 0.0001</td>
<td>1.71</td>
<td>1.53–1.89</td>
<td>&lt; 0.0001</td>
<td>1.45</td>
<td>1.28–1.63</td>
</tr>
<tr>
<td>Rodents</td>
<td>&lt; 0.0471</td>
<td>1.31</td>
<td>1.00–1.71</td>
<td>NS*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust</td>
<td>&lt; 0.0001</td>
<td>1.80</td>
<td>1.67–1.94</td>
<td>&lt; 0.0001</td>
<td>1.65</td>
<td>1.52–1.79</td>
</tr>
<tr>
<td>Solvents</td>
<td>&lt; 0.0001</td>
<td>1.75</td>
<td>1.34–2.28</td>
<td>NS*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cockroach</td>
<td>&lt; 0.0001</td>
<td>4.15</td>
<td>2.25–7.67</td>
<td>0.0065</td>
<td>2.67</td>
<td>1.32–5.43</td>
</tr>
</tbody>
</table>

*Not significant (NS): not included in final model.

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**Table 4—Risk Factors for Increasing Asthma Severity**

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Univariate Analysis</th>
<th></th>
<th></th>
<th></th>
<th>Multivariate Logistic Regression</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p Value</td>
<td>OR for Persistent vs</td>
<td>95% CI</td>
<td>p Value</td>
<td>OR Persistent vs</td>
<td>95% CI</td>
<td></td>
</tr>
<tr>
<td>History of family asthma</td>
<td>0.0003</td>
<td>1.33</td>
<td>1.14–1.56</td>
<td>0.0037</td>
<td>1.29</td>
<td>1.09–1.52</td>
<td></td>
</tr>
<tr>
<td>Age ≤ 4 yr</td>
<td>0.02</td>
<td>1.20</td>
<td>1.03–1.40</td>
<td>0.0236</td>
<td>1.22</td>
<td>1.03–1.44</td>
<td></td>
</tr>
<tr>
<td>Non-Caucasian ethnicity</td>
<td>0.006</td>
<td>1.26</td>
<td>1.07–1.50</td>
<td>0.0138</td>
<td>1.27</td>
<td>1.05–1.53</td>
<td></td>
</tr>
<tr>
<td>Dust</td>
<td>0.0165</td>
<td>1.21</td>
<td>1.04–1.41</td>
<td>0.0023</td>
<td>1.30</td>
<td>1.10–1.54</td>
<td></td>
</tr>
<tr>
<td>Pets</td>
<td>0.09</td>
<td>0.84</td>
<td>0.72–0.97</td>
<td>0.02</td>
<td>0.85</td>
<td>0.71–1.00</td>
<td></td>
</tr>
</tbody>
</table>
sian children when controlling for SES. When controlling for SES, there was no difference in asthma diagnosis in Asian children (p = 0.052), Caribbean children (p = 0.09), and children of other ethnicities (p = 0.73) as compared to Caucasian children. In contrast, African-American children were 1.33 times as likely (95% CI, 1.15 to 1.53) and Hispanic children were 1.60 times as likely (95% CI, 1.38 to 1.85) as Caucasian children to have asthma even when controlling for SES.

Caucasian children (OR, 1.66; 95% CI, 1.49 to 1.84), Hispanic children (OR, 1.86; 95% CI, 1.42 to 2.46), and African-American children (OR, 1.36; 95% CI, 1.03 to 1.78) in the low SES group had significantly higher asthma frequencies than those in the high SES group. SES had no effect on asthma frequency in Asian and Caribbean children (p = 0.60 and p = 0.82, respectively).

**Discussion**

This is the first large-scale study to our knowledge that examines physician-confirmed pediatric asthma, its risk factors, and asthma severity in US children who do not reside in an urban community. Our data confirm that even in nonurban communities, SES and ethnicity are independent risk factors for asthma diagnosis and severity. Lower SES was associated with a higher frequency of asthma for all children, even children who reside in nonurban settings. Being African-American or Hispanic is associated with

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**Figure 1.** Asthma severity by ethnicity. Bars indicate the percentage of children with asthma in each ethnic category separated by asthma severity.

**Figure 2.** Asthma prevalence by SES. The Connecticut ERG was used as a surrogate marker for SES. The ERG system groups together public school students with a similar SES, including median income, percentage receiving welfare, and percentage of children whose families speak a language other than English (Table 1).
a greater risk for asthma whether the child is from an urban or nonurban setting, and being in a lower SES is associated with a greater risk for asthma regardless of ethnicity. Furthermore, the combination of Hispanic or African-American ethnicity and lower SES is associated with an even greater risk for asthma in this nonurban setting.

Urban residence, African-American or Hispanic ethnicity, a family history of asthma, and tobacco smoke exposure are well-documented risk factors for pediatric asthma. Maternal history of asthma and maternal cigarette smoking are reported risk factors for asthma prevalence among nonurban and urban African-American children. Our findings replicate and extend these findings in a nonurban setting, where African-American or Hispanic ethnicity, a family history of asthma, and tobacco smoke exposure remain significant risk factors for asthma frequency and disease severity. In these risk factors, asthma in nonurban settings is similar to that in urban settings.

This study also demonstrates that the ethnic differences in asthma diagnosis and severity reported in urban residing children exist in the diagnosis and severity of asthma in children residing in nonurban areas. Multivariate analysis demonstrated that African-American or Hispanic ethnicity were associated with a higher frequency of asthma than Caucasian ethnicity independent of SES. Previous studies have also shown higher asthma frequency in African-American or Hispanic children compared to Caucasian children in national, international, and local samples independent of SES. Yet, the few studies that focus on children living in nonurban settings are limited by small sample sizes, narrow age groupings, or unclear ethnic categories. We found that African-American ethnicity was associated with more severe asthma compared to Hispanic, Asian, or Caribbean ethnicity. This is in contrast to recent findings among children aged 4 to 18 years who were enrolled in the Easy Breathing program in Hartford, CT, in which predictors of severe asthma included not only African-American ethnicity but also Hispanic ethnicity. The difference in asthma severity between Hispanic children from urban and nonurban communities may reflect differences in environmental exposures in Hispanic children (ie, poverty in association with poorer housing) or could reflect differences in susceptibility to exposures that may be genetically controlled. These findings confirm that ethnicity itself is a factor in asthma frequency and severity whether a child resides in an urban or nonurban community.

Despite the widespread dissemination of the National Asthma Education and Prevention Program guidelines during the past 13 years, underdiagnosis of asthma remains widespread in the pediatric population. The increased morbidity, economic burden, and quality-of-life consequences of unrecognized asthma are well documented. Maier et al demonstrated that children living with unrecognized asthma-like symptoms had a similar or greater risk of school absenteeism, sleep disruption, and reduced participation in physical education classes when compared to children with a physician diagnosis of asthma. To date, most of the studies of unrecognized asthma have focused on limited age groups or did not include clinician-confirmed current diagnosis. In contrast, 18% of the children surveyed in the present study had a physician-confirmed diagnosis of asthma. Of these children, 24% had newly diagnosed asthma by a clinician, and one third of these children had a diagnosis of persistent asthma.

We believe that many families do not recognize the symptoms of asthma and that the Easy Breathing Survey opens up a dialogue between the clinician and the family. Consequently, the 800 children in the present study with newly diagnosed asthma confirm that asthma remains underdiagnosed even in nonurban settings.

The study is limited by several factors. First, the study sample is representative of children who seek health care; in addition, many clinicians who participated in the Easy Breathing II program targeted children with asthma and respiratory symptoms. As a result, the sample does not represent asthma prevalence in these private practices. Second, our socioeconomic data are limited to Connecticut ERGs on a group level. Thus, each child is not directly linked to his or her individual family income or parental level of education. Nevertheless, it is beneficial to group children with a similar SES together to make pertinent comparisons between children living in different communities, as the ERG reflects the richness and resources available in a community.

Third, because rural communities can vary markedly from suburban and urban periphery communities, and ERG does not distinguish between them, we classified the 38 towns using The Five Connections, a description of town-level Connecticut demographics in which each town is assigned to one of five groups reflecting discrete demographic and economic areas. Overall, 13.5% of the towns were rural, and all fell into the high SES group.

Despite these limitations, the results provide important information regarding the risk factors for asthma in children who reside outside of urban communities. Similar to urban settings, African-American or Hispanic ethnicity and low SES regardless of ethnicity are associated with a greater risk for asthma in this nonurban setting. Furthermore, the combination of African-American or Hispanic eth-
nicity and lower SES is associated with an even greater risk for asthma. The high frequency of asthma in this sample and the similarity of the results to findings in urban settings suggest that asthma is a concern for nonurban as well as urban communities.

ACKNOWLEDGMENT: We thank the clinicians and office staff of the 20 primary care practices for their willingness to participate in the Easy Breathing II Program: Central Pediatrics and Adolescent Medicine; Children’s Medical Group, Hamden; Connecticut Valley Pediatrics; Leonard Former, MD; John J. Fote, MD; John H. Lavalette, MD; Jennifer L. Schwab, MD, and Jennifer L. Nichols, APRN; Kids Station Pediatrics; Sobhly Ghabrial, MD; Healthwise Medical Associates, LLP; Nassem Deen, MD, Wanda Merced, MD, Barbara Renshaw, APRN, Vernon Pediatrics; Pediatric, P.C.; Pediatric Associates of Marlborough; Prohealth Physicians MSO, Inc.: Children’s Medical Group; Sherry Banack, MD and Candra Smith-Slatas, MD, PhD; Vandana Sacheti, MD; Shoreline Pediatrics and Adolescent Medicine, P.C.; Michael S. Levine, MD and Leah Gajan Post, MD; Robert R. Toscano, MD, and UCONN Health Partners. We also thank Steven Delaronde, MPH, MSW, for his contributions to this article; Melissa Cowen, RN, BSN, MPH, and Alicia Ignatowicz, MPH for data entry and program support, and Ms. Krissy Larrow, Ms. Glenda Ramirez, and Ms. Jennifer Adkins for their administrative assistance.

REFERENCES

Clinical Investigations


