The Effects of Race/Ethnicity and Income on Early Childhood Asthma Prevalence and Health Care Use

Jane E. Miller, PhD

Asthma is the most common chronic illness among children in the United States and accounts for a substantial number of hospital admissions, physician visits, and school absences. Many clinical or area studies have reported substantially higher rates of asthma prevalence and mortality among Black than White persons. Because asthma is most common among low-socioeconomic status groups and Black persons are more likely than White persons to be poor, an important question is the extent to which racial/ethnic differences in asthma are due to poverty. However, many studies of asthma prevalence and health care use do not include family-level indicators of socioeconomic status (SES) or individual-level risk factors. Other studies are based on clinical samples that are not representative of all children at risk.

We used individual-level data from a population-based, nationally representative sample of children to study relations among poverty, race/ethnicity, and asthma prevalence and rates of hospitalization and emergency room use for asthma. Income was measured over the child’s lifetime to identify more closely the groups at greatest risk. The roles of sociodemographics, health risk factors, and insurance also were examined.

Methods

Sample and Study Variations

The 1988 National Maternal and Infant Health Survey and 1991 Longitudinal Follow-Up studied a sample of children born between 1988 and 1991. In both study years, mothers of sampled children were sent questionnaires about sociodemographic characteristics, health behaviors, and child health. Mothers of 83% of the live births from the 1988 sample participated in the follow-up.

A child was considered to have asthma if the mother answered “yes” to the item on the 1991 questionnaire regarding whether her child had ever been diagnosed with the condition. Indicators of any (1 or more) visits to a hospital or emergency room for asthma were calculated from the medical provider’s reports.

Lifetime income was calculated as the average of the family income-to-needs ratios at baseline and follow-up. We compared poor (below the poverty line; unweighted n = 1629), near poor (1.0–1.85 times poverty; n = 1316), low income (1.85–3.0 times poverty; n = 1530), and middle income or higher (n = 2213). Children with missing income in either year were omitted (9% of the children in the Longitudinal Follow-Up).

Other variables included mother’s age (in 5-year groups), educational attainment, marital history, number of siblings; presence of smokers in the household; and low birthweight (<2500 g) or preterm (<37 weeks’ gestation). Race/ethnicity was classified as (non-Hispanic) Black (n = 3803) and non-Black (n = 4314, of whom 80% were White and 15% were Hispanic); White and Hispanic children were analyzed together because they had similar asthma patterns and there were too few Hispanics to permit separate analyses.

Statistical Analysis

We used the sampling weights from the Longitudinal Follow-Up to weight the data to national levels. Relations among poverty, race/ethnicity, and asthma were estimated with logistic regression to control for sociodemographic factors, health history, and insurance. Standard errors were adjusted for the complex study design with SUDAAN software. To correct for differential nonresponse by medical providers, in the models of hospitalization and emergency room use, we multiplied sampling weights for each child by the reciprocal of the predicted probability of complete provider response for children of similar sociodemographic characteristics.

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Results

Asthma Prevalence

With the data weighted to national levels, the prevalence of asthma was 10.6% among poor children, compared with 5.6% among children in the highest income category. Among non-Black children, asthma prevalence decreased from 9.6% among the poor to 5.3% among the highest income group. Among Black children, asthma prevalence did not decline appreciably with increasing family income (12.2% vs 10.8% for the lowest and highest income groups, respectively). The interaction between race/ethnicity and income remained sizable and statistically significant when sociodemographic characteristics, health behaviors, and the child’s health at birth were controlled. Among non-Black children, poor children were 45% more likely than nonpoor children to have asthma (95% confidence interval [CI]=1.03, 2.04), but among Black children, no statistically significant difference was found between income groups (Table 1). Hence, although the excess risk of asthma for Black compared with non-Black children among the poor was about 15%, the excess risk for Black children among higher-income families was nearly 90% (95% CI=1.47, 2.37).

Risk factors for asthma included maternal cigarette smoking (odds ratio [OR]=1.59, 95% CI=1.25, 2.02), 3 or more siblings (OR=1.58, 95% CI=1.17, 2.13), low birthweight (OR=1.33, 95% CI=1.05, 1.69), and metropolitan residence (OR=1.39, 95% CI=1.05, 1.83); breast-feeding was protective (OR=0.69, 95% CI=0.54, 0.88). Effects of maternal smoking and low birthweight were smaller for Black than for non-Black children.

Health Care Use for Asthma

Emergency room treatment for asthma was strongly associated with both lifetime income and race/ethnicity (Table 2). Non-Black children with asthma in poor and near-poor families were 4.18 and 5.82 times as likely as those from higher-income families to have had 1 or more emergency room visits for asthma, when the effects of other sociodemographic factors and health behaviors were excluded (P<.01). Across the income range, Black children with asthma had a 5- to 7-fold greater rate of emergency room use for asthma than nonpoor, non-Black children (P<.05). Among Black children, the racial/ethnic gap in emergency room use for asthma widened with income, from a 20% to a 30% excess risk among those in near-poor and poor groups, to a 5-fold excess risk for low- and middle-income children. In both racial/ethnic groups, near-poor children were somewhat more likely than poor children to use emergency room treatment for asthma.

Poor children with asthma were 1.76 times more likely to be hospitalized for asthma than their nonpoor counterparts (95% CI=0.85, 3.64; data not shown). When income was taken into account, no significant difference was found in the rate of hospital admission by race/ethnicity. Asthmatic children with public insurance were more likely to be hospitalized for asthma (OR=2.17, 95% CI=1.56, 2.99); inclusion of insurance in the model reduced the odds ratio associated with poverty to 1.14 (95% CI=0.50, 2.63). The risk of hospitalization for asthma was increased by the presence of other children in the household (OR=2.31 for 1–2 siblings, 95% CI=0.96, 5.56; OR=3.52 for 3 or more siblings, 95% CI=1.22, 10.14), parental divorce (OR=2.62, 95% CI=1.15, 5.94), and having a teen mother (OR=2.00, 95% CI=0.81, 4.92).

Discussion

Analyses of nationally representative, individual-level data found significantly higher rates of asthma among poor than nonpoor preschool-aged children, even when sociodemographic characteristics and health behaviors were taken into account. Among non-Hispanic Black children, however, asthma prevalence was relatively level and high across income groups, resulting in a large racial/ethnic disparity among children in middle- to high-income families. The higher rate of asthma among Black compared with non-Black children in this age group may be the result of earlier asthma onset in Black children.

Some studies have concluded that demographic factors account for racial/ethnic differences in asthma prevalence. However, those analyses relied on a single income observation, which is not adequate to differentiate between long-term poor and nonpoor children. We used average lifetime family income to improve identification of poor children. Our study also avoided the drawback of prevalence estimates drawn solely from medical records, which have been shown to overlook some asthmatic children, particularly the poor and those without insurance. Low birthweight and maternal smoking were associated with a substantial increase in asthma risk. Having been breast-fed had a sizable protective effect. Each of these factors was strongly associated with both income and race/ethnicity, but none completely accounted for racial/ethnic or income differences in asthma.

The smaller income gradient in adverse health outcomes among Black children may reflect the fact that income differences between poor and nonpoor Black children are smaller than those for their White counterparts. Also, for comparable levels of income, household assets are much lower among Blacks than non-Blacks. Other explanations include differences in access to and use of medical care (such as receipt of recommended medications for asthma) and differences in the prevalence of other chronic conditions such as obesity.

Table 1: Number of Children With Asthma and Adjusted Odds Ratios (ORs) of Having Asthma, by Race/Ethnicity and Lifetime Income, and Black–to–Non-Black Ratio Within Income Groups

<table>
<thead>
<tr>
<th>Income Level</th>
<th>No. of Children</th>
<th>No. of Children With Asthma</th>
<th>OR for Asthma (95% CI)</th>
<th>Black–to–Non-Black Ratio Within Income Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>2091</td>
<td>259</td>
<td>1.67 (1.04, 2.58)</td>
<td></td>
</tr>
<tr>
<td>Non-Black</td>
<td>766</td>
<td>90</td>
<td>1.45 (1.03, 2.04)</td>
<td>1.15</td>
</tr>
<tr>
<td>Near poor or higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1712</td>
<td>201</td>
<td>1.87 (1.47, 2.37)</td>
<td></td>
</tr>
<tr>
<td>Non-Black</td>
<td>9548</td>
<td>243</td>
<td>1.00</td>
<td>1.87</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval.

*Based on weighted logistic regression with Longitudinal Follow-Up sampling weights. Reference category for all models is non-Black children who were near poor or who had higher income, based on the lifetime average ratio of income to needs. Model controls for sociodemographic characteristics, child’s health at birth, and health behavior. -2 Log likelihood ratio = 178.95 (P<.001).
TABLE 2—Adjusted Odds Ratios (ORs) for Emergency Room (ER) Visits for Children With Asthma, by Race/Ethnicity and Lifetime Income, and Black-to–Non-Black Ratio Within Income Groups

<table>
<thead>
<tr>
<th></th>
<th>OR for ER visits (95% CI)</th>
<th>Black-to–Non-Black Ratio Within Income Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor Black</td>
<td>5.46 (1.26, 23.64)</td>
<td>1.31</td>
</tr>
<tr>
<td>Non-Black</td>
<td>4.18 (1.45, 12.08)</td>
<td></td>
</tr>
<tr>
<td>Near poor Black</td>
<td>6.92 (2.06, 23.25)</td>
<td>1.18</td>
</tr>
<tr>
<td>Non-Black</td>
<td>5.82 (1.73, 19.58)</td>
<td></td>
</tr>
<tr>
<td>Low income or higher Black</td>
<td>4.88 (1.84, 12.92)</td>
<td>4.88</td>
</tr>
<tr>
<td>Non-Black</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Note. CI = confidence interval.
*Includes children with asthma for whom medical provider data are complete (n = 801, 66% of asthmatic children).
†Based on weighted logistic regression with Longitudinal Follow-Up sampling weights, corrected for medical provider nonresponse. Reference category is non-Black children from families with low income or higher, based on the lifetime average ratio of income to needs. Model controls for sociodemographic characteristics and health behavior. –2 Log likelihood ratio = 40.96 (P < .001).

Acknowledgments

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References