Asthma Among Homeless Children

Undercounting and Undertreating the Underserved

Diane E. McLean, MD, PhD, MPH; Shawn Bowen, MD; Karen Drezner, MEd; Amy Rowe, PNP; Peter Sherman, MD; Scott Schroeder, MD; Karen Redlener, MS; Irwin Redlener, MD

Background: In the United States, children of color, children who live in urban medically underserved communities, and children whose families have limited economic resources have excessively high rates of asthma. The identification of high-risk subgroups of underserved children is crucial for understanding the determinants and scope of the childhood asthma epidemic and for developing successful interventions.

Objective: To determine the population prevalence of asthma among homeless children.

Design: Cross-sectional study.

Setting: Three family shelters in New York City.


Main Outcome Measures: Prior physician asthma diagnosis, current asthma symptoms using National Asthma Education and Prevention Program symptom criteria, current medications, and emergency department use in the past year.

Results: Of the children, 26.9% had a prior physician diagnosis of asthma. In addition, 12.9% of the children without a prior physician diagnosis of asthma reported symptoms consistent with moderate or severe persistent asthma. Overall, 39.8% of homeless children in New York City are likely to have asthma. Few children with persistent asthma received any anti-inflammatory treatment. Almost 50% (48.6%) of children with severe persistent asthma had at least 1 emergency department visit in the past year; 24.8% of children with symptoms of mild intermittent asthma had at least 1 visit.

Conclusions: The prevalence of asthma among a random sample of homeless children in New York City is likely to be 39.8%—more than 6 times the national rate for children. Asthma in homeless children is also likely to be severe and substantially undertreated.

Arch Pediatr Adolesc Med. 2004;158:244-249

There is substantial evidence that in the United States there are excessively high rates of asthma among children of color, especially among those who live in urban medically underserved communities and whose families have limited economic resources.1-4 Within New York City (NYC), asthma has been identified as the leading cause of hospitalizations for children from birth to the age of 14 years.3 African American and Latino children have 3 to 51/2 times the hospitalization rate of white children. Among NYC children 14 years and younger, those living in a ZIP code in the lowest 20th percentile of median income had 4 times the hospitalization rate of those living in a ZIP code in the highest 20th percentile of median income.

Within broad categories of socioeconomic status and ethnicity lie subgroups of children whose asthma may be especially severe and untreated, with significant consequences for the child’s and family’s quality of life, including a high risk of asthma-related mortality.6-12 Strategies that have been used to identify high-risk subgroups of children tend to confound the impact of race or ethnicity with socioeconomic status. To identify subgroups that are at high risk associated specifically with low socioeconomic status, ideally a relatively homogeneous population group with few economic resources should be identified. A study of asthma in the population of children whose families have become homeless offers a unique opportunity to investigate the impact of asthma specifically in relationship to low socioeconomic status across race and ethnicity.

In 1997, approximately 25% of homeless children seen as patients by the Division of Community Pediatrics at the Children’s Hospital at Montefiore, the university hospital of the Albert Einstein College of Medicine, had asthma; this is one of the highest rates reported in any medically underserved population nationwide.13-15 No information was avail-
able, however, on the underlying population prevalence of asthma among homeless children in NYC. In response, the division, with support from the Children's Health Fund, launched the Childhood Asthma Initiative, a multilevel program incorporating clinical, educational, psychosocial, and environmental interventions. The program's initial target population was homeless children whose families were living in family shelters in NYC. The Childhood Asthma Initiative team (D.E.M., S.B., K.D., P.S., and I.R.) developed a brief screening instrument and implemented a screening protocol to identify the prevalence of asthma among homeless children in NYC. We hypothesized that the asthma prevalence rate would be high, that symptom severity would be high, that many children would be undertreated, and that many children would seek care in emergency departments.

HOMLESS CHILDREN IN NYC

In NYC, the average monthly census released by the Department of Homeless Services in 1998 to 1999 reported approximately 5200 families living in homeless facilities (approximately 7600 adults and 9400 children at any one time). The population of homeless families with children is not a static one; however, new families are constantly cycling into the system as others leave. An average of 22 families a day moved into emergency housing, approximately 666 per month. More than 95% of the families were new families are constantly cycling into the system as others leave. A sample of children at any shelter produces sample selection bias. A sample of children at any shelter includes questions on daytime and nighttime symptom frequency during the past month, the timing of nighttime symptoms, whether the child had been previously diagnosed as having asthma by a physician, the child's current medications, the child's use of an emergency department for asthma or breathing problems during the past year, and demographic characteristics (child's age, date of birth, race, and ethnicity). The item on previous diagnosis was similar to that used in the National Health and Nutrition Examination Survey and the National Health Interview Survey ("Has a doctor ever told you that your child has asthma?") to allow comparison with national prevalence rates.

Asthma symptom frequency questions were coded to allow categorization of asthma symptoms according to the daytime and nighttime asthma symptom criteria for staging outlined in the Expert Panel 2 report on Guidelines on the Diagnosis and Management of Asthma.17-19 Parents were asked to report symptom frequency in the past month for 4 specific symptoms (cough, wheezing, shortness of breath, and fatigue). Parents were also asked the frequency in the past month that their sleep or their child's sleep was disturbed by coughing or asthma. Medications used were categorized either as anti-inflammatory agents (oral or inhaled corticosteroids, leukotriene pathway antagonists, or mast cell inhibitors) or bronchodilators. If it was unclear how to categorize the medication because of orthodoxy spelling, the medication was assumed to be an anti-inflammatory agent. To assess the validity of the screening instrument, we compared the screening results for a sample of 117 children with those of a structured clinical assessment conducted within the following 3 months by a pediatrician or a pediatric nurse practitioner (D.E.M. S.B., K.D., A.R., P.S., S.S., and I.R.). By using a definition of a positive screening result that included children with a prior physician diagnosis and/or symptom frequency greater than twice per week, we found a sensitivity of 77% and a specificity of 92%.

Screening was a face-to-face 3- to 5-minute interview conducted by trained shelter case workers at the time of the family's entry to the shelter as part of the routine health screening done for every shelter resident. Asthma screening was considered an extension of the standard shelter evaluation procedures and as a tool to discuss the availability of access to medical services for shelter residents. Participation in the screening was voluntary; no incentives were offered. Consent procedures used by each shelter for their health screening were followed; in one shelter, an additional consent was added to the asthma screening form at the request of the shelter. All residents were invited to participate in the screening; thus, all children in each family were screened unless the family had previously participated in the screening during a prior stay at a participating shelter. Individual children were the units of analysis. Families may have been in the shelter system previously. No information was available on history of homelessness or previous shelter residence; thus, it was not possible to conduct an analysis of the relationship of shelter history to asthma symptoms or asthma management.

In most cases, the mother was the parent interviewed. For 6 months in one shelter, screening was also completed by a trained visiting nurse stationed at the shelter and a trained medical student volunteering with the project. No difference in characteristics of the children screened or results of the screening were apparent in the screenings completed by the case workers compared with those completed by the visiting nurse or medical student. Case workers and other screeners were given a 2-hour training session on the screening instrument. Training included an item-by-item review, with instructions to ask each item as written, to ask all items, to record the parent's responses verbatim, and to conduct a screening for each child. Trainees were instructed to read each item to the parent to ensure item comprehension across levels of parental literacy. A role-play exercise was performed to demonstrate the process of parental interview. Training sessions were repeated as needed in cases of case worker turnover. Staff were also available on an ongoing basis to answer questions as needed. All screening

SCREENING INSTRUMENT AND SCREENING PROCESS

The screening instrument was a 1-page 11-item instrument that included questions on daytime and nighttime symptom frequency during the past month, the timing of nighttime symptoms, whether the child had been previously diagnosed as having asthma by a physician, the child's current medications, the child's use of an emergency department for asthma or breathing problems during the past year, and demographic characteristics (child's age, date of birth, race, and ethnicity). The item on previous diagnosis was similar to that used in the National Health and Nutrition Examination Survey and the National Health Interview Survey ("Has a doctor ever told you that your child has asthma?") to allow comparison with national prevalence rates.
The overall asthma prevalence in homeless children in NYC was 39.8% (Table 1): 26.9% of the children had a prior physician diagnosis of asthma, while 12.9% of the children had symptoms consistent with moderate or severe persistent asthma, yet did not have a prior physician diagnosis of asthma. According to the 1997 National Asthma Education and Prevention Program symptom criteria, 50.3% of homeless children have current symptoms consistent with mild intermittent to severe persistent asthma. The distribution of asthma severity by age was not statistically significant (P = .34) for children younger than 5 years compared with children 5 years and older (Table 2).

Half of all children screened had some current symptoms consistent with asthma (mild intermittent to severe persistent); this group serves as the primary population base for the remaining analyses. Many children with asthma symptoms had current daytime or nighttime symptoms with sufficient frequency to be classified as having moderate to severe persistent asthma (160 [43.0%]); 19.9% reported current symptoms consistent with severe asthma, and 23.1% reported current symptoms consistent with moderate persistent asthma (Table 3). Subgroup analyses were conducted on children who had received a prior physician diagnosis of asthma because these children would be known to have asthma and have at one point been in contact with the medical care system; this subgroup would be most likely to be taking appropriate medication and to have asthma that was better controlled. However, when the population of children was restricted to those who had a prior physician diagnosis of asthma (n=202), the proportion of children with moderate to severe symptoms was high. Of these children, 27 (13.4%) did not have current symptoms.

We were concerned that, although asthma is seasonal, when children were screened during fall and winter, when the prevalence of respiratory tract infections affecting children is high, symptoms reported could be due to those conditions and not asthma. To address this concern, we conducted an analysis restricted to children screened during a period in which respiratory tract infections were less frequent (June 30, 1998-September 18, 1998, n=372). The rates of overall prevalence in the restricted sample are not significantly (P=.41) different from those in the full sample: 113 (30.4%) reported a prior physician diagnosis of asthma, and 33 (8.9%) reported symptoms con-
sistent with moderate or severe persistent asthma, yet did not have a prior physician diagnosis of asthma, for a conservative estimate of asthma prevalence of 39.2%. Of the children overall, 176 (47.3%) reported current symptoms consistent with asthma. These rates are not statistically different from the rates for the full sample.

Few children with current symptoms consistent with persistent asthma received current treatment with any anti-inflammatory medications (Table 4). At the extreme, only 37 (9.6%) children with severe persistent asthma received any anti-inflammatory treatment. While the percentages of children with persistent asthma receiving anti-inflammatory treatment are slightly higher for those with a prior physician diagnosis of asthma, they are far below the recommended guidelines. They are also not statistically different from those of children without a prior physician diagnosis of asthma. In addition, more than 40.2% of children with persistent asthma symptoms were not taking any asthma medication whatsoever.

Many children had frequent visits to an emergency department for asthma or breathing problems (Table 5). Almost half of the children with severe persistent asthma had at least 1 emergency department visit in the past year; 24.8% of children with current symptoms of mild intermittent asthma had at least 1 emergency department visit in the past year. This percentage was even higher for children with a prior physician diagnosis of asthma. Between 54.9% and 68.0% of children, depending on level of severity, who had been previously identified by a physician as having asthma reported at least 1 visit to an emergency department in the past year.

**Comment**

We estimate that the prevalence of asthma among a random sample of homeless children in NYC is likely to be at least 39.8%—more than 6 times the national rate for children. It is also substantially higher than that reported for several of the highest-prevalence geographic areas within NYC. Our estimate of asthma prevalence is conservative; we elected to include only children with symptoms of moderate to severe persistent asthma in addition to those with a prior physician diagnosis so that the estimate is less likely to include children who might have had other conditions with symptoms that overlap with those of mild intermittent or mild persistent asthma.

The striking prevalence of asthma among homeless children offers strong evidence that there are high-risk subgroups of children that cut across geographic location. Not only is the prevalence of physician-diagnosed asthma high among homeless children, but 12.9% of children reported significant levels of symptoms that were undiagnosed. Of homeless children with asthma, 43.0% have symptoms likely to be moderate or severe, in contrast to the approximately 30% of children with asthma who are commonly described as having moderate to severe symptoms. Our data suggest that the introduction of screening using an asthma symptom checklist of daytime and nighttime symptoms, in addition to asthma history, for all children in homeless families entering the shelter system in NYC, would identify many children likely to have asthma, and would be an essential first step in providing them with needed and appropriate medical care.

Recent data (Charles Homer, MD, MPH, oral communication, January 11, 2001) from the Pediatric Research Outcomes Study, a network of primary care pediatric practices across the country, show that nationally, 60% of children with persistent asthma are treated with anti-inflammatory medications by primary care physicians. Thus, while homeless children with asthma in NYC are clearly in contact with the medical care system, evidenced by a history of prior physician diagnosis and frequent recent emergency department visits, the level of appropriate treatment is far below the level of usual care in primary care settings. The high rate of undertreatment among these children is of grave concern, given evidence that the chronic inflammation associated with untreated asthma can lead to irreversible and detrimental thickening of the alveolar basement membrane and permanent lung damage.1,16

Education on the basic facts about asthma is crucial for this high-risk population. Although a 1995 meta-analysis25 does not show an impact of patient edu-
the previous week. Parents were, thus, asked to give their
tation and Prevention Program symptom criteria as possible,
as close an approximation to the National Asthma Educa-
sifying severity. The screening instrument attempted to be
the validity of the screening instrument.

can, however, and are not strictly generalizable to
omato children in families nationwide. Another pos-
ibility for selection bias is in the sample of children actually
screened. Approximately 75% of all children entering the
shelters during the screening period were screened. For the
true prevalence of asthma among homeless children to be
similar to the national rates, we would have to have missed
80% of children entering the shelter, none of whom could
have had a history of asthma or current symptoms consist-
tent with asthma. This is highly unlikely. Even for our rates
to approach those of the high asthma rate of geographic areas
in NYC (15%-20%), we would have to have missed approxi-
ately 50% of the children entering the shelters, none of
whom could have had a history of asthma or current symp-
toms consistent with asthma.

A second potential limitation is inherent in the na-
ture of screening itself. Clinical symptoms reported may
due to other conditions and not asthma. To address this
imply, we used a question to identify prior physician
diagnosis of asthma that was similar to that used in 2
ational surveys. While a positive answer to this question is
not a guarantee that a child actually has asthma, its use al-
ows comparison with national data that have the same po-
tential for error. Thus, while it may be possible that our
finding that 26.9% of homeless children had a prior phy-
sician diagnosis of asthma has a degree of error, it is still
more than 4 times the national rate with the same poten-
tial for error. In addition, we were conservative in in-
cluding only children with symptoms consistent with mod-
erate to severe asthma who had not had a prior physician
diagnosis in our overall prevalence estimate; there are few
conditions in childhood that produce the same cluster of
symptoms at a high frequency other than asthma. The high
sensitivity and specificity of the screening instrument when
compared with a structured clinical assessment by a trained
pediatrician or pediatric nurse practitioner add support to
the validity of the screening instrument.

A third potential limitation is the scheme used for clas-
sifying severity. The screening instrument attempted to be
as close an approximation to the National Asthma Educa-
tion and Prevention Program symptom criteria as possible,
yet the criteria themselves combine different symptom pro-
files under the same category. For instance, a child may have
symptoms on 4 days during 1 week but on only 1 day in
the previous week. Parents were, thus, asked to give their
best estimate of the child’s average symptom frequency dur-
ing the past month. While this may overestimate the num-
ber of children likely to have mild persistent asthma by
including children with a more intermittent pattern of symp-
toms, this should be less of a problem for estimates of mod-
erate to severe symptoms. Another limitation of the sever-
tity classification scheme is that peak expiratory flow rate
and β-agonist use are not incorporated into the assessment
of severity; only the National Asthma Education and Pre-
vention Program symptom criteria were used. Data were
collected on peak expiratory flow rate, because most
children entering the shelters did not have a peak flow me-
ter; data on β-agonist use were considered in analyses of
treatment, rather than in assessment of severity.

A fourth potential limitation is the possibility for er-
or in the recording of medications. To give every pos-
able chance to work against our hypothesis that chil-
dren were likely to be substantially undertreated, all
medications with an unknown or unclear description were
assigned to the anti-inflammatory category. Thus, the true
rate of undertreatment with anti-inflammatory medica-
tions is likely to be even higher than our results demon-
strate. While children within families are likely to have
the same potential for medication use, the rate of anti-
flammatory medications was so low that no attempt was
made to analyze it using family as the unit of analysis. A
fifth potential limitation is error in the reporting of emer-
gency visits for asthma. It is possible that parents re-
ported all visits to emergency departments, not just those
for asthma or breathing problems, although these were
specifically asked about on the screening instrument. Data
were not collected on recent hospitalizations for asthma.

Speculation on factors likely to contribute to the high
rates of asthma prevalence, severity, undertreatment, and
emergency department use among homeless children is use-
ful, because it may point to routes of intervention. Lack of
access to a medical home and to continuity of care is likely
to contribute strongly to severity, lack of appropriate treat-
ment, and heavy emergency department use. Factors on the
physician side may also play an important role—whether
it is lack of knowledge of the standards of asthma treatment
or a hopeful (but misplaced) perspective on the part of emer-
gency department physicians that the child’s chronic asthma
management will be taken care of somewhere else. High lev-
els of exposure to allergens and irritants found in poor hous-
ing before homelessness may play a role, yet the housing
of families who become homeless is of similar housing com-
position, with a similar allergenic burden, as the housing
of families who are poor but do not become homeless. It is
possible that overcrowding due to living “doubled up” be-
fore becoming homeless might be associated with increased
exposure to respiratory tract infections that could contrib-
ute to current asthma symptom severity.

It has long been recognized that psychosocial fac-
tors play an important role in asthma management; there
is growing evidence that these factors may play a role in
triggering and maintaining asthma exacerbations, yet they
through behavioral and physiologic mechanisms. The re-
cent study by Weil et al129 reporting an association of ma-
ternal depression and hospitalization in inner-city chil-
dren with asthma offers important evidence that maternal
mental health status is directly related to asthma-

©2004 American Medical Association. All rights reserved.
related morbidity in children. Homeless children are particularly likely to have high levels of exposure to stressors, trauma, and mental health issues. Families that become homeless often do so after experiences of domestic violence, loss of jobs, and loss of social support. While adverse psychosocial factors occur at every level of socioeconomic status, the degree of exposure may be substantially greater among families that become homeless. High levels of exposure to adverse psychosocial factors may play a critical role in determining the high levels of severity and undertreatment found among homeless children.

The striking prevalence of asthma among homeless children speaks to the substantial burden of illness due to asthma faced by these children and their families. Unfortunately, no information was available on asthma history, outpatient visits for asthma, lost school days due to asthma, or other health burdens, such as the need for additional use of health services or the presence of comorbid conditions. A recent study by the Children’s Health Fund, however, documents that the rates of incomplete immunizations, undiagnosed vision and hearing problems, and mental health problems among homeless children follow a similar pattern to the findings for asthma. The investigation of asthma among homeless children, thus, provides a broader view of the health status of children whose families are on the edge, and are at levels of economic and social difficulty that require urgent attention and action, in the arenas of health care policy and delivery of medical care.

Accepted for publication September 18, 2003.

This study was supported by the Children’s Health Fund, New York, NY, and by an unrestricted educational grant from Schering-Plough, Kenilworth, NJ.

Corresponding author and reprints: Diane E. McLean, MD, PhD, MPH, Department of Psychiatry, Residency Training, New York State Psychiatric Institute, Campus Box 81, 1051 Riverside Dr, New York, NY 10032 (e-mail: dem3@columbia.edu).

What This Study Adds

The identification of high-risk subgroups of underserved children is crucial for a better understanding of the determinants and scope of the childhood asthma epidemic and for the development of successful interventions. A study of asthma in the population of children whose families have become homeless offers a unique opportunity to investigate asthma specifically in relationship to low socioeconomic status across race and ethnicity. To our knowledge, this study is the first to document a high rate of asthma (likely 39.8%) among a randomly selected population of homeless children whose families entered the shelter system in a major urban area. To our knowledge, it also is the first to document the extent of asthma severity, undertreatment, and frequent emergency department visits in this population of children. Systematic screening for current asthma symptoms and asthma history is recommended for all families entering a homeless shelter system to identify high-risk children in need of appropriate medical care.

REFERENCES