

Reported Difficulties in Access to Quality Care for Children With Asthma in the Inner City

Ellen F. Crain, MD, PhD; Carolyn Kerckmar, MD; Kevin B. Weiss, MD; Herman Mitchell, PhD; Henry Lynn, PhD

Objective: To characterize perceived access and barriers to quality health care for asthma among the caregivers of children in the inner city.

Design: Multicenter, cross-sectional survey.

Setting: Eight sites in 7 major metropolitan US inner cities.

Participants: A systematic sample of children with asthma, aged 4 to 9 years, and their caregivers who resided in census tracts in which at least 30% of the households were below the 1990 federal poverty guidelines, recruited from 25 primary care clinics and 13 emergency departments (EDs) from November 1, 1992, through October 31, 1993.

Results: Of the 1528 children enrolled, 1376 had physician-diagnosed asthma and form the basis of this report. This group was further divided into 284 children (20.6%) who met all recruitment criteria for severe asthma and 207 (15.0%) with mild asthma who met none. Of parents in the total sample, 95.6% reported a usual place for short-term asthma care for their child; 75.4% used

the ED. Children with severe asthma were significantly more likely to use the ED than those with mild asthma (84.3% vs 63.0%; $P < .01$). A usual place for follow-up asthma care was reported by 96.7% of subjects. There were no differences in access or type of facility used by asthma severity. More than half the study group reported difficulty in accessing care for acute asthma attacks and for follow-up care with no differences by asthma severity. Among those with severe asthma, 47.5% used inhaled steroids or cromolyn, 52.8% used a spacer device if they had been prescribed a metered dose inhaler, and 21.2% of children older than 6 years were prescribed a peak flowmeter. Patients with mild asthma were significantly less likely to report use of all 3 items (steroids or cromolyn, 1.4%; spacer device, 15.4%; and peak flowmeter, 3.1%, respectively; $P < .01$).

Conclusion: Although access to asthma care among children in US inner cities appears adequate as determined by the traditional measure of reporting a regular source of care, barriers are frequently reported, as are deficiencies in the quality of medical care.

Arch Pediatr Adolesc Med. 1998;152:333-339

Editor's Note: This study provides more grist for the mill that traditional measures of access and quality of care to the socioeconomically disadvantaged just don't get to the wheat of the matter.

Catherine D. DeAngelis, MD

From the Departments of Pediatrics, Albert Einstein College of Medicine, Jacobi Medical Center, Bronx, NY (Dr Crain); Case Western Reserve University School of Medicine, Cleveland, Ohio (Dr Kerckmar); The Center for Health Services Research, Rush Medical College, Chicago, Ill (Dr Weiss); and The New England Research Institute, Watertown, Mass (Drs Mitchell and Lynn). Dr Mitchell is now affiliated with Rho Inc, Chapel Hill, NC.

SINCE ITS advent in the 1960s, Medicaid has dramatically improved access to health care for children living in poverty.¹⁻³ In recent studies, more than 90% of children covered by Medicaid were reported to have access to a regular source of medical care.^{4,5} At the same time as these improvements in access have been noted, there have been numerous reports of increasing morbidity and mortality due to asthma among children living in poverty, particularly in inner cit-

ies.^{6,7} Specifically, studies suggested that hospitalizations and deaths due to asthma may be related to deficiencies in access to quality asthma care.⁸⁻¹¹

There are few large-scale studies of the quality of ambulatory or emergency department (ED) care for inner-city children with asthma. One study by Homer et al¹² examined the relationship between differences in hospitalization rates and the quality of outpatient treatment for children with asthma in Boston, Mass, New Haven, Conn, and Rochester, NY. The authors found that hospitalization rates for children with asthma were 3 times higher in Boston than in Rochester and that children were significantly less likely to have received maintenance preventive therapy, short-term oral steroid therapy, or inhaled β -agonist therapy in Boston compared with Rochester. Haas et al¹³ characterized the relationship among

SUBJECTS AND METHODS

Eight centers in 7 cities participating in the NCICAS enrolled children with asthma from the ages of 4 to 9 years residing in census tracts in which, on average, 30% of households were below the poverty line according to 1990 federal guidelines. To obtain a sample of children using health care systems in the inner city while enhancing the proportion of the sample with severe asthma, on-site NCICAS recruiters approached children with asthma and their caregivers in hospital EDs and primary care clinics serving the targeted inner-city areas after informed consent was obtained. Recruiters attempted to approach all families at the recruitment site, not only those seeking care for asthma. Subjects were recruited in person from community primary care clinics during visits for well-child or asthma care and from inner-city EDs during visits unrelated to asthma or during an acute asthma attack.

Although there are no commonly agreed on criteria for identifying children with severe asthma,¹⁵ at least 50% of recruited children were required to meet certain criteria of disease activity to ensure sufficient symptoms to permit identification of associations between various factors and asthma morbidity. Children were identified as having severe asthma if, at the time of recruitment, they met any 1 of the following criteria: (1) self-reported use of 2 or more asthma medications simultaneously in the past year (59.0% of the sample); (2) any hospitalizations for asthma in the past year (31.2% of the sample); and (3) 2 or more ED visits for asthma in the past year (66.9% of the sample). To minimize misclassification, we studied children at the

extremes of the severity spectrum. By modifying the recruitment definition of severity, we focused on children with the most severe asthma and compared them with children with the least severe asthma; children who met all 3 criteria (20.6% of the sample) were identified as having severe asthma, whereas children who met none of the criteria (15.0% of the sample) were identified as having mild asthma. Both groups were compared in terms of reported access and barriers to quality care for asthma.

Information regarding sociodemographics, site of and access to primary care and short-term and follow-up asthma care, perceived barriers to care, and use of asthma medications and devices such as a peak flowmeter or spacer were obtained during an extensive interview with the child's primary caregiver.

Based on the caregiver's report during the interview, 3 items of care noted in the *Guidelines for the Diagnosis and Management of Asthma*¹⁶ were used as indicators of quality asthma care. These were the use of inhaled steroids or cromolyn sodium, having been prescribed a peak flowmeter for home monitoring, and use of a spacer device if the child was prescribed a metered dose inhaler.

Differences between the mild and severe asthma groups were tested using the Fisher exact test or *t* tests. The McNemar test was used to compare the groups on barriers to short-term and follow-up asthma care, and differences in severity across both types of asthma care (short-term and follow-up) were tested using interaction effects in conditional logistic regression models. Statistical significance was set at $P < .05$, and *P* values were adjusted for multiple comparisons using the Bonferroni method or a bootstrap resampling method with replacement.¹⁷

socioeconomic status, the intensity of care (use of an anti-inflammatory agent, pulmonary function testing, or an asthma specialist) and self-reported health status in adults with asthma following hospital discharge. They noted that adults with asthma of lower socioeconomic status had worse health status and received care that had less continuity and was less intensive after hospital discharge. In a study of 354 children aged 1 to 6 years discharged from a tertiary-care pediatric hospital after an asthma attack, Finkelstein et al¹⁴ noted differences in the quality of care provided before hospitalization and planned after discharge by race, although not by source of payment.

Whereas these studies focused on certain elements of quality of care for hospitalized patients with asthma, few focused on access to quality ambulatory health care for asthma among inner-city children, a population presumably at high risk for morbidity. To begin to understand the disparity between access and the excessive morbidity that these children experience, we sought to characterize parental perceptions of asthma care and barriers to care for a large sample of inner-city children with asthma gathered as part of the National Cooperative Inner-City Asthma Study (NCICAS).

RESULTS

Overall, 1528 children whose symptom history met the study definition of asthma were recruited. Of these, 1376

had physician-diagnosed asthma and formed the basis for the analyses in this report. **Table 1** lists some of the key sociodemographic characteristics of this group. Stratification of the population into children with severe and mild asthma resulted in 284 (20.6%) who met our criteria for severe asthma and 207 (15.0%) who met our criteria for mild asthma. As shown in Table 1, most subjects (1080 [78.5%]) were recruited from the ED. Among subjects with severe asthma, 79.9% were recruited from the ED; 39.8% were there for an asthma attack, and 40.1% were there for some other concern. Children with mild asthma were significantly more likely to be recruited from the ED when they were there for a concern other than asthma, compared with an asthma-related visit (65.7% vs 4.8%).

Access to short-term and follow-up asthma care is described in **Table 2**. Among the 95.6% of parents who reported that their child had a usual place for short-term asthma care, the ED was the most common site (75.4%). Children with severe asthma were significantly more likely than those with mild asthma to seek short-term asthma care in the ED. Despite nearly universal availability of a usual place for short-term asthma care, 53.2% of the study population reported difficulty in obtaining care for acute exacerbations. However, this difficulty did not vary by asthma severity.

Among the 96.7% of caregivers who reported that their child had a usual place for follow-up asthma care,

a hospital-based pediatric clinic was the most common site (38.5%). Although 75.9% had a place to telephone regarding their child's asthma, 52.8% had difficulty obtaining follow-up care, and 18.2% had difficulty getting appointments. Among all respondents, 51.7% had to pay some of the costs of asthma care. There were no significant differences in terms of these issues by asthma severity.

Parental perceptions of barriers to short-term and follow-up asthma care by asthma severity are noted in **Table 3**. The most frequent barriers to short-term care included needing child care for other children (24.1%), having to wait too long to see the physician (19.6%), and having no way to get there (18.6%). The same barriers were also most common with respect to follow-up care, although frequencies differed. There were some significant differences in the frequencies of barriers to short-term vs follow-up care. In terms of barriers to short-term asthma care, parents were more likely to report that the staff was rude and that they needed someone to take care of other children. Concerning follow-up asthma care for their child, parents were more likely to report that care was not available when needed, that the hours were not good, and that they had to wait too long for an appointment. Within types of care, there were no differences in barriers by asthma severity.

Table 4 reports perceived availability of certain measures of asthma care by asthma severity. Perceptions of availability ranged from 64.9% to 81.5%, with no differences by severity. Information about trigger avoidance and prescription refills were the items perceived to be least available, whereas 81.5% of parents could talk with their child's physician about medication use, and 71.1% could see the same provider at each visit.

Table 5 lists the medications used during the 3 months before the interview by asthma severity. Overall, 84.0% of children with asthma were using β -agonists (58.1%, oral β -agonists). Another 27.1% were using inhaled steroids or cromolyn, and 17.2% were using oral xanthines. Oral steroids were used by 27.1% of children; this included 52.1% of those with severe asthma and 2.4% of those with mild asthma. The oral steroids include short-burst oral steroid preparations prescribed following an ED visit and long-term oral steroid therapy for hard-to-control symptoms.

Of the 284 children whose asthma met the stringent definition of severe, 80 (28.2%) used only oral steroids; 46 (16.2%), only cromolyn; 8 (2.8%), only inhaled steroids; 13 (4.6%), cromolyn and inhaled steroids; and 10 (3.5%), cromolyn, inhaled steroids, and oral steroids. Sixty-nine (24.3%) of the 284 children with severe asthma did not use any preventive medications for asthma.

Frequencies for the entire sample and by asthma severity on 3 items representing quality asthma care are noted in **Table 6**. Of those prescribed a metered dose inhaler, 39.5% were using a spacer device. Among children 6 years or older, 13.7% had been prescribed a peak flowmeter. Among the children with severe asthma, 47.5% used preventive medications, and 52.8% used a spacer device if they had been prescribed inhaled medication.

Table 1. Sociodemographic Characteristics

Characteristics	% of Sample		
	All Patients (N = 1376)	Patients With Mild Asthma (n = 207)	Patients With Severe Asthma (n = 284)
Age, y			
4-5	40.9	37.2	48.6
6-9	59.1	62.8	51.4
Female sex	36.9	39.1	33.8
Race or ethnicity			
Hispanic	19.5	14.6	23.8
Black	73.9	79.5	69.8
Other	6.6	5.9	6.4
Single parent	54.5	55.1	52.5
Mother or caregiver completed high school	65.6	64.2	64.8
Household income, \$*			
<5000	18.9	18.8	19.0
5000-9999	23.8	28.0	24.6
10 000-19 999	28.3	29.0	29.8
\geq 20 000	29.0	24.2	26.6
Insurance			
Medicaid†	74.0	67.5	76.5
Private	8.3	7.7	7.5
Health maintenance organization	10.7	14.1	9.6
None	7.0	10.7	6.4
Lost insurance last year	11.4	15.1	9.5
Site of recruitment			
Emergency department during asthma attack	26.2	4.8	39.8‡
Emergency department not for asthma	52.3	65.7	40.1‡
Primary care during asthma attack	1.4	1.0	1.8
Primary care not during asthma attack	20.1	28.5	18.3

*Household income data were collected by category to avoid participant discomfort. Therefore, determination of each family's standing with regard to federal poverty guidelines cannot be accurately calculated.

†Excludes health maintenance organizations.

‡Severe vs mild groups significant at $P < .05$.

COMMENT

Using traditional measures of access (eg, having a place for routine care), our findings support those of other investigators who have found that more than 90% of poor children have a usual source of follow-up care and some form of health insurance. Halfon and Newacheck¹⁸ analyzed data from the 1988 National Health Interview Survey on Child Health (NHIS) and found that more than 90% of all children with asthma had a usual source of routine and sick care, but that the usual site of care was different for poor children compared with other children. They found that poor children with asthma were significantly more likely to receive their routine care in a neighborhood health care center or hospital-based clinic than in a physician's office and their sick care from an ED.

The purpose of our study was to characterize reported difficulties in access to quality asthma care among children with asthma receiving health care in the inner

Table 2. Access to Short-term and Follow-up Care by Asthma Severity

Access Variable	% of Sample		
	All Patients (N = 1376)	Patients With Mild Asthma (n = 207)	Patients With Severe Asthma (n = 284)
Have a usual place for short-term asthma care	95.6	92.0	97.5
Usual place for short-term asthma care			
Physician's office	5.3	9.8	4.4
Health center, health maintenance organization, or prepaid plan	14.3	19.1	8.4*
Pediatric clinic	4.4	7.5	1.8
Emergency department	75.4	63.0	84.3†
Other	0.6	0.6	1.1
Have difficulty obtaining short-term asthma care	53.2	50.0	56.4
Have a usual place for follow-up asthma care	96.7	94.5	98.5
Usual place for follow-up asthma care			
Physician's office	20.0	23.7	18.6
Health center, health maintenance organization, or prepaid plan	35.8	38.5	29.5
Pediatric clinic	38.5	31.4	45.7
Emergency department	2.1	3.8	1.6
Other	3.6	2.6	4.6
Have difficulty obtaining follow-up asthma care	52.8	50.0	55.8
Have place to telephone regarding child's asthma	75.9	78.1	75.8
Have to pay for medical costs	51.7	49.1	52.0
Have difficulty getting appointments for follow-up asthma care	18.2	17.3	19.0

*Severe vs mild groups significant at $P < .05$.

†Severe vs mild groups significant at $P < .01$.

Table 3. Perceived Barriers to Short-term and Follow-up Asthma Care by Asthma Severity

Barriers to Care	% of Sample					
	Short-term Asthma Care			Follow-up Asthma Care		
	All Patients (N = 1376)	Patients With Mild Asthma (n = 207)	Patients With Severe Asthma (n = 284)	All Patients (N = 1376)	Patients With Mild Asthma (n = 207)	Patients With Severe Asthma (n = 284)
Personal and social						
Needed someone to take care of other children	24.1	20.4	27.7	20.1*	14.0	22.8
Had no way to get there	18.6	18.3	18.8	16.6	15.0	17.6
Did not know where to go	4.6	7.1	3.2	4.2	5.3	3.7
System and organizational						
Had to wait too long to see the physician	19.6	24.0	17.4	21.0	22.6	20.2
Could not make appointment to see child's regular physician	14.3	14.3	12.1	17.3	17.2	18.4
Had to wait too long for appointment	13.3	13.8	8.5	25.8*	26.3	26.5
Staff was rude	11.7	8.7	14.5	8.6*	8.1	9.2
Hours not good	10.2	8.7	9.9	13.5*	11.2	15.8
Care not available when needed	8.7	8.1	8.9	13.0*	12.8	16.9
Staff did not speak your language	4.8	5.1	4.6	4.3	7.0	3.3
Turned away when you took child for care	2.3	2.0	2.1	3.2	4.3	4.0
Financial						
Care cost too much	8.2	6.6	9.2	7.7	6.4	8.5

*Difference between short-term and follow-up for all samples significant at $P < .05$.

city. Data reported by Stoddard et al² from the 1987 National Medical Expenditure Survey suggest that difficulties with access to health care would be common in the NCICAS sample. Among children with asthma, the odds of not seeing a physician in the past 12 months were 1.72

for children aged 6 to 17 years, compared with children aged 1 to 5 years; 1.55 and 1.34 for black and Hispanic children, respectively, compared with white children; and 1.24 and 2.09 for poor and low-income children, respectively, compared with high-income children. However,

Table 4. Perceived Availability of Items of Care by Asthma Severity

Item	% of Sample		
	All Patients (N = 1376)	Patients with Mild Asthma (n = 207)	Patients with Severe Asthma (n = 284)
Telephone physician for advice	72.7	76.6	74.5
Telephone for prescription refill	68.0	65.8	72.1
Talk with physician about medication use	81.5	82.8	84.0
Talk with physician about home management of asthma attack	75.3	78.0	78.4
Get information about how to avoid triggers	64.9	67.0	68.1
See same physician each time	71.1	72.7	74.7

the sampling frame used for the NCICAS prevents strict comparison with a randomly selected population sample. Respecting the sampling limitations, there still may be lessons to be learned from this large sample of children with asthma receiving health care in the inner city. Reported access to short-term and follow-up care for children in the NCICAS sample was higher than for poor children in the 1988 NHIS survey, and more children in the NCICAS sample were reported to receive their follow-up asthma care at a pediatric clinic and fewer at a physician's office. Parents in our sample seem to differentiate between sources of short-term and follow-up care; despite the high use of the ED for short-term care, only 2% of NCICAS children were reported to receive follow-up asthma care from the ED. The differences in reported sites of asthma care for NCICAS children may in part be due to sources of patient recruitment. Our sample contained only urban children who were more likely to live near hospital-based pediatric clinics than the national sample examined in the NHIS. Moreover, our sample was recruited specifically from census tracts in the poorest urban neighborhoods, where EDs may be more accessible. In addition, most of our subjects were recruited from the ED, although only 26.2% were recruited while in the ED for treatment of an asthma exacerbation. The low rate of reported use of the ED for follow-up asthma care suggests that the frequent use of the ED by inner-city children with asthma may be due to barriers to follow-up care or to perceptions of asthma as an acute illness requiring rapid, aggressive immediate treatment.

Traditional measures of access are relatively crude and may not capture the true limits in the availability of appropriate health care.¹⁹ For instance, a number of services that could facilitate asthma management, ie, telephone access to advice, information, and medication refills, are often provided by health maintenance organizations or physicians in office practices, but may not be available to families whose children are cared for in other types of health care systems. When questioned specifically, nearly one third of the NCICAS sample reported that these services were unavailable to them. More than one fourth of subjects re-

Table 5. Medication Use by Asthma Severity*

Medication	% of Sample		
	All Patients (N = 1376)	Patients With Mild Asthma (n = 207)	Patients With Severe Asthma (n = 284)
Bronchodilators			
Oral β -agonist	58.1	38.2	59.2
Inhaled β -agonist	47.9	10.6	74.3
Oral or inhaled β -agonist	84.0	48.8	98.9
Oral xanthines	17.2	6.8	25.0
Only oral xanthines or β -agonists	61.7	55.6	52.5
Anti-inflammatory medications			
Oral steroids	27.1	2.4	52.1
Cromolyn sodium or inhaled steroid	25.2	1.4	47.5

*All comparisons between mild and severe groups significant at $P < .01$ except for "only oral xanthines or β -agonists."

ported that they were unable to see the same physician at each follow-up visit, suggesting that continuity of care was frequently impaired. Difficulty in obtaining short-term and follow-up asthma care, even when such care was reported to be available, was reported by most respondents. Reasons for difficulties in access could be grouped into the following 3 major domains: those intrinsic to the family or social situation, those related to the health care system, and those related to finances.

Waiting too long for an appointment, unavailability of care when it was perceived to be needed, and inconvenient hours suggest that many barriers are related to the health care service infrastructure in the inner city, where evening appointment hours and telephone advice are typically lacking. Waiting too long for an appointment and inconvenient hours of operation were significantly more common deterrents to obtaining follow-up care compared with short-term care. However, needing someone to care for the other children in the family and difficulties with transportation were commonly identified barriers to short-term and follow-up care, suggesting that lack of social supports within the family also contributes to difficulty with access. Designing health care systems that accommodate the schedules and other needs of indigent families might improve access to health care.

Children with the most severe asthma might be expected to require more frequent physician visits, adjustment of treatment plans, education about the inflammatory nature of asthma, and acquisition of disease management skills. Consequently, they might be expected to have more or different problems with access to health care compared with children with mild asthma. We used a definition of asthma severity that allowed us to delineate a group of children who have significant exacerbations despite receiving substantial medical treatment. Children who simultaneously receive more than 1 asthma medication, who have multiple visits for short-term care, and who have been hospitalized should reflect the population with the most severe asthma. How-

Table 6. Selected Items of Quality Asthma Care by Asthma Severity

Item	No. (%) of Sample		
	All Patients	Patients With Mild Asthma*	Patients With Severe Asthma*
Prescribed cromolyn sodium or inhaled steroids	336/1333 (25.2)	3/214 (1.4)	135/284 (47.5)
Prescribed a peak flow meter if child is older than 6 years	108/788 (13.7)	4/129 (3.1)	31/146 (21.2)
Has a spacer device if uses inhaled medication	183/463 (39.5)	4/126 (15.4)	66/125 (52.8)

*All comparisons significant at $P < .01$.

ever, there were no differences between children with severe and mild asthma in terms of identifying a usual place for short-term or follow-up asthma care or in the percentage reporting difficulty obtaining care. Patients with severe disease were as likely to identify a hospital-based pediatric clinic as a source of follow-up care. However, different types of facilities were used for short-term care. The significantly greater use of the ED for short-term care by children with severe disease compared with those with mild asthma may reflect a perceived need for more aggressive treatment of severe asthma available in the ED. Our findings are supported by those of Wasilewski et al.²⁰ who noted that frequency of days with asthma symptoms and a previous hospitalization for asthma, both markers of the severity of a child's asthma, were significantly associated with more ED visits.

Reliance on the ED for short-term asthma care may reflect instructions given to patients by their primary care physicians and be a result of the lack of availability of alternative after-hours resources, lack of a home management plan for acute asthma, or poor asthma management skills. A study by Davidson et al²¹ of children with asthma attending the ED of a large urban hospital in Rhode Island found that although 95% of patients could identify a primary care physician, only 46% called the physician before coming to the ED. Twenty percent of the patients had come to the ED as the only component of their emergency management plan. These data are consistent with our findings; 24.1% of our respondents reported not having a place to telephone for advice on asthma management.

Our data also suggest that the type of medical care to which inner-city children have access may affect successful asthma management. As measured by reported type of medication used, quality of care appears to be inadequate. Children with severe asthma were likely to be undertreated as indicated by their reliance on oral and inhaled bronchodilators and the relative lack of preventive anti-inflammatory medications. The *Guidelines for the Diagnosis and Management of Asthma*¹⁶ suggests that severe asthma should be treated with long-term administration of anti-inflammatory medications, such as cromolyn or inhaled corticosteroids. Using this definition, all children in our severe group should have received anti-inflammatory medications, yet only 47.5% used cromolyn, and fewer than 5% of the children in the severe group also used inhaled corticosteroids. Moreover, 52.5% of children with severe asthma did not use any preventive medications. Our findings are similar to data reported by Richards²²; children seen frequently in the ED for asthma exacerbations were less

likely to report the use of preventive medications, unless asthma care was provided by a specialist. Our data are also supported by findings from a recent report of inner-city children with asthma using a New York City ED.²³ Only 16% of parents reported that a physician discussed a prospective plan to manage asthma and slightly more than 50% reported that the physician had discussed ways to prevent symptoms.

Use of other medical devices, such as a peak expiratory flowmeter, is also recommended for patients with moderate to severe asthma, yet we found that only 21.2% of children older than 6 years with severe asthma had been prescribed a peak flowmeter.

Patient cost-sharing has been noted to be a significant barrier to medical care.²⁴ Some of the explanation for the apparent undertreatment of children with severe asthma may be due to perceived financial constraints rendering the cost of some medications and devices too high for indigent families. Indeed, more than half of the NCICAS sample reported having to pay some costs related to the medical care of asthma, including medications.

One limitation of our study is its reliance solely on parental report without validation by medical records; thus, we may have overestimated or underestimated health care use. In addition, we may have missed some important markers of care, such as the number of preventive visits scheduled compared with the number of appointments kept. Information on the number of scheduled, preventive physician visits by age and severity status might provide better insight into actual use of resources and quality of care. Characterizing the quality of care by parental report of medications used or devices prescribed may result in misclassification due to poor understanding or adherence. Care that is misreported by families who have difficulty adhering to a prescribed regimen may appear to be inadequate.

The use of health care sites to recruit families made it difficult to study access to health care as a risk factor for asthma morbidity. The rationale for the sampling frame was that children, unlike adults, usually present for some type of medical care at primary care sites and in the ED, including regular vaccinations or trauma, and families with no medical care would have no experience to study. Recruitment at nonmedical sites, such as schools, day-care centers, or churches, might have enabled us to identify some families with less access to medical care, but would have been inefficient and costly, and would not have allowed us to oversample children with more severe disease.

Our data indicate that traditional measures of access to care are likely to underestimate the magnitude of problems faced by indigent urban children and their families who are seeking health care for asthma. To improve asthma care for inner-city children, family, social, and health care infrastructure barriers must be addressed. However, our data suggest that in addition to addressing these barriers, the quality or content of asthma care for these children must be improved. Further research is needed to assess the relative importance of these risk factors in understanding the disproportionate burden from asthma on inner-city children.

Accepted for publication November 14, 1997.

Supported by grants U01 A1-30751, A1-30756, A1-30772, A1-30773-01, A1-30777, A1-30779, and A1-30780 and contract NO1 A115105 from the National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Md.

Presented in part at the 36th annual meeting of the Ambulatory Pediatric Association, Washington, DC, May 7, 1996.

We are grateful to Loretta Reynolds and Cerenna Reynolds for their assistance in preparation of the manuscript.

Phase 1 of the NCICAS was a collaboration of the following institutions and investigators (asterisk indicates principal investigator): Johns Hopkins University, Baltimore, Md (P. Eggleston, * R. A. Wood, C. Ewart, A. M. Butz, L. Wisow, D. Roter, L. Moore); Albert Einstein College of Medicine, Bronx, NY (E. Crain, * L. Bauman, D. Rosenstreich); Children's Memorial Hospital, Chicago, Ill (R. Evans, * Y. S. Senturia, C. M. Weil, K. K. Chrisoffel, H. J. Binns); Cook County Hospital, Chicago (M. Sullivan, J. H. Mayefsky, M. F. McDermott); Rainbow Babies and Children's Hospital, Cleveland, Ohio (C. Kercsmar, * S. Redline, S. Wade); Henry Ford Hospital and Medical Center, Detroit, Mich (J. A. Anderson, F. E. Leickly, * D. R. Ownby, C. L. M. Joseph, C. Johnson); The Mount Sinai School of Medicine, New York, NY (M. Kattan, * C. Lamm, M. T. Tin, G. Butts, E. Luder, D. Baker); Washington University Medical School, St Louis, Mo (H. J. Wedner, * R. G. Slavin, G. Evans); Howard University, Washington, DC (F. J. Malveaux, * A. Thomas, S. Molock, M. Richard); National Institute of Allergy and Infectious Disease, National Institutes of Health, Program Office, Bethesda, Md (K. Weiss, R. Kaslow, P. Gergen, E. Smartt); New England Research Institutes, Watertown, Mass (Data Coordinating Center) (H. E. Mitchell, * E. Wright, K. M. Mortimer, S. Islam).

Reprints: Ellen F. Crain, MD, PhD, 1W20 Jacobi Hospital, Pelham Parkway and Eastchester Road, Bronx, NY 10461.

1. Wan TH, Gray LC. Differential access to preventive services for young children in low-income urban areas. *J Health Soc Behav.* 1978;19:312-324.
2. Stoddard J, St Peter RF, Newacheck PW. Health insurance status and ambulatory care in children. *N Engl J Med.* 1994;330:1421-1425.
3. St Peter RF, Newacheck PW, Halfon N. Access to care for poor children: separate and unequal? *JAMA.* 1992;267:2760-2764.
4. Newacheck PW, Hughes DC, Stoddard JJ. Children's access to primary care: differences by race, income, and insurance status. *Pediatrics.* 1996;97:26-32.
5. Wood DL, Hayward RA, Corey CR, et al. Access to medical care for children and adolescents in the United States. *Pediatrics.* 1990;86:666-673.
6. Gergen PJ, Weiss KB. Changing patterns of asthma hospitalization among children: 1979-1987. *JAMA.* 1990;264:1688-1692.
7. Carr W, Zeitel L, Weiss KB. Variations in asthma hospitalizations and deaths in New York City. *Am J Public Health.* 1992;82:59-65.
8. Engel W, Freund DA, Stein JS, Fletcher RH. The treatment of patients with asthma by specialists and generalists. *Med Care.* 1989;27:306-314.
9. Strunk RC, Mrazek DA, Geri S, Fuhrmann W, LaBrecque JF. Characteristics associated with deaths due to asthma in childhood: a case-controlled study. *JAMA.* 1985;254:1193-1198.
10. Rao M, Kravath RE, Abadio D, Arden J, Steiner R. Childhood asthma mortality: the Brooklyn experience and a brief review. *J Assoc Acad Minor Phys.* 1991;2:127-130.
11. Birkhead G, Attaway NS, Strunk RC, Townsend MC, Teutsch S. Investigation of a cluster of deaths from asthma: evidence implicating inadequate treatment and poor patient adherence with medications. *J Allergy Clin Immunol.* 1989;84:484-491.
12. Homer CJ, Szilagyi PG, Rodewald L, Bloom SR, et al. Does quality of care affect rates of hospitalization for childhood asthma? *Pediatrics.* 1996;98:18-23.
13. Haas JS, Clare PD, Guadagnoli E, Fanta C, Epstein AM. The impact of socioeconomic status on the intensity of ambulatory treatment and health outcomes after hospital discharge for adults with asthma. *J Gen Intern Med.* 1994;9:121-126.
14. Finkelstein JA, Brown RW, Schneider LC, et al. Quality of care for preschool children with asthma: the role of social factors and practice setting. *Pediatrics.* 1995;95:389-394.
15. O'Conner GT, Weiss ST. Clinical and symptom measures. *Am J Respir Crit Care Med.* 1994;149(2 pt 2):S21-S28.
16. National Heart Lung and Blood Institute, National Institutes of Health. *Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report.* Bethesda, Md: Public Health Service; 1991. Publication 91-3042.
17. Westfall PH, Young SS. *Resampling-Based Multiple Testing: Examples and Methods for P-value Adjustment.* New York, NY: John Wiley & Sons Inc; 1993.
18. Halfon N, Newacheck PW. Childhood asthma and poverty: differential impacts and utilization of health services. *Pediatrics.* 1993;91:56-61.
19. Lozano P, Connell FA, Koepsell TD. Use of health services by African-American children with asthma on Medicaid. *JAMA.* 1995;274:469-473.
20. Wasilewski Y, Clark NM, Evans D, Levison MJ, Levin B, Mellins RB. Factors associated with emergency department visits by children with asthma: implications for health education. *Am J Public Health.* 1996;86:1410-1415.
21. Davidson AE, Klein DE, Steepane GA, Alario AJ. Access to care among children visiting the emergency room with acute exacerbations of asthma. *Ann Allergy.* 1994;72:469-473.
22. Richards W. Hospitalization of children with status asthmaticus: a review. *Pediatrics.* 1989;84:111-118.
23. Dinkevich E, Cunningham SJ, Crain EF. Parental perceptions of access to quality care for inner city children with asthma. *J Asthma.* 1998;35:63-71.
24. Billings J, Kretz SE, Rose R, et al. National Asthma Education and Prevention Program Working Group report on the financing of asthma care. *Am J Respir Crit Care Med.* 1996;154(3 pt 2):S119-130.