Does Your Child Have Asthma? Filled Prescriptions and Household Report of Child Asthma

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ABSTRACT

Introduction: Surveys are central for information on asthma prevalence. Recently, the validity of parental reports of pediatric asthma has been questioned. Confidence is examined in the report of asthma for children, obtained in a survey from the adult household member most knowledgeable about household health care (MKA).

Method: MKA reports of asthma are compared with pharmacy records of prescriptions beneficial in asthma treatment ("asthma medications") for children 0 to 17 years old in the 1996 Medical Expenditure Panel Survey.

Results: "Asthma medications" were filled for 6.5% of children, yet the MKA did *not* report asthma for 47.3% of them. However, for 61.2% of these children, the MKA reported plausible alternative medical conditions. For 9.0%, diagnosis information was missing. Among children with an "asthma medication," the MKA was *less* likely to report either asthma or a plausible alternative diagnosis for girls and for children 0 to 5 years of age. Reporting was not statistically different by child race/ethnicity, household income, education level, and MKA English language proficiency.

Discussion: Surveys do *not* overlook as many children with asthma as previously reported. Among children with "asthma medications," only sex and age appear to be different for children whose MKA reported either asthma or a plausible alternative diagnosis versus those whose MKA did not report either. J Pediatr Health Care. (2006) *20*, 374-383.

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Asthma is one of the most common chronic illnesses among children younger than 18 years in the United States (Adams, Hendershot, & Marano, 1999; American Lung Association, 2004). The burden of asthma for affected children and their families can be high, as are health care costs resulting from asthma (National Heart, Lung, and Blood Institute [NHLBI], 2003; Smith et al., 1997). It is therefore of interest to know how many children have asthma and how the prevalence and impact of asthma change over time.

Survey responses from parents are an important source of information about the prevalence and

severity of pediatric asthma. Recently, the validity of household-reported asthma information for children living in the household has been questioned (Roberts, 2003). The current article reports results from an analysis that examines confidence in the report of asthma for children, obtained in an interview with the household member most knowledgeable about household health care (MKA).

BACKGROUND

In the United States, several national surveys collect data on asthma. For instance, information on asthma prevalence and on disability resulting from asthma is estimated with data from the National Health Interview Survey (NHIS) and the National Health and Nutrition Examination Survey (Lanphear & Gergen, 2003). Although standards of care for asthma have been published (NHLBI, 1997; 2003), universal scientific consensus is lacking on a clinical definition of asthma for use in surveys (Council of State and Territorial Epidemiologists, 1998; Lanphear & Gergen). Surveys, therefore, rely on several different approaches to ascertain whether a child has the illness and how severe it is. For example, until 1996, the NHIS inquired whether anyone in the family had asthma during the past 12 months. Starting in 1997, the NHIS switched to asking only for a randomly chosen child in the family whether a health professional ever diagnosed asthma and, if so, whether the child had an asthma episode or an asthma attack during the past 12 months. Since 2001, the asthma questions in the NHIS core questionnaire ask about lifetime diagnosis, current asthma, recent asthma attacks, and emergency room visits for asthma (Akinbami, Schoendorf, & Parker, 2003).

The validity of measuring pediatric asthma prevalence by interviewing parents has been questioned in a recent study by Roberts (2003). Roberts' study is based on the following two hypotheses: (a) many children whose parents report that their child has asthma obtain asthma medications; and (b) if a child obtains medications specific to asthma, most parents will report that their child has asthma. With respect to the first hypothesis, Roberts found that 64% of children who were reported to have asthma did *not* have any "asthma medications" filled. Moreover, with respect to the second hypothesis, he found that 45% of children who had an "asthma medication" filled were *not* reported to have asthma. "Asthma medications" are medications that are considered beneficial in the treatment of asthma. Based on these findings, Roberts concluded that surveys that ask parents about their children's asthma "overlook many children with active disease" (p. 449).

To conduct his study, Roberts (2003) used data from the 1996 Medical Expenditure Panel Survey (MEPS) and compared survey responses regarding a child's asthma from the adult household member most knowledgeable about household health care with the child's pharmacy records of prescription medication often used in the treatment of asthma. The MEPS determines the most knowledgeable adult household member as follows: Before the first interview is conducted by the MEPS, each eligible household is contacted by the MEPS via mail and telephone. The purpose of these contacts is to enlist the household respondent into MEPS and to plan the delivery of record-keeping materials before the study observation period begins (Cohen J., 1997). According to Agency for Healthcare Research and Quality (AHRQ) staff, the preferred MEPS respondent is the person who is most knowledgeable about the family's health care and who has been keeping records about health care use and expenses, after MEPS provided record keeping materials to the household (W. Carroll, Agency for Healthcare Research and Quality, personal communication, March 22, 2002).

To further assess the validity of household reported pediatric asthma, the study reported on here expands Roberts' analysis in three ways. One, the current study analyzes MEPS data that cover an entire calendar year. In contrast, Roberts' study relied on MEPS data that covered only the first 5 to 6 months of 1996. Prescription data that cover at most 6 months are likely to underestimate how many children with asthma have an "asthma medication" filled, because children whose asthma is well controlled may not need an "asthma medication" filled during a 6-month period. Thus, because Roberts (2003) restricted prescription data to no more than 6 months, in his study children with asthma may be counted as not having a prescription filled, even though they do when a longer period is considered. Because most asthma medications have a 1-year expiration date printed on them, it is reasonable to expect that an "asthma medication" is filled annually when a child has asthma; thus, the current study analyzed data from an entire calendar year.

Two, the current study examines in detail whether some MKA were correct in *not* reporting an asthma diagnosis even though their child had an "asthma medication" filled; this is possible if providers prescribed "asthma medications" for medical conditions other than asthma. Prescribing asthma medications for nonasthma medical conditions is likely and reasonable if symptoms common to asthma (e.g., wheeze and chest tightness) are present when a child is brought in for an evaluation, because empiric treatment is often recommended (Behrman, Kliegman, & Arvin, 1996). In addition, some medications that are now recommended exclusively for

asthma were considered reasonable for other conditions in 1996, at the time the data analyzed by Roberts (2003) were collected. For instance, use of a bronchodilator was prescribed for bronchitis or recurrent bronchitis then but is no longer routinely recommended for these conditions (National Asthma Education and Prevention Program, 1991; NHLBI, 1997;2003). Moreover, the 1991 Executive Summary of the NHLBI National Asthma Education and Prevention Program Diagnosis and Management of Asthma algorithm in use during 1996 advocated using a trial of a bronchodilator prior to the diagnosis of asthma to help make the distinction between asthma and other possible conditions (National Asthma Education and Prevention Program). Likewise, although inhaled corticosteroids are currently the mainstay of managing chronic pediatric asthma, they too were used for other conditions where inflammation of the airways was suspected (Hay, Groothuis, Hayward, & Levin, 1997). In addition, some drugs (e.g., Flunisolide) come in both a nasal (Nasalide) and inhaled form (Aerobid), making their use for allergic rhinitis plausible, if the specific route of administration is unknown or listed as "inhaled," because "inhaled" may mean oral or nasal inhalation. Thus, some MKA may have been correct in *not* reporting asthma for their child, even though they obtained for their child medications that are commonly associated with a diagnosis of asthma.

Three, the current study further extends Roberts' (2003) assessment of the validity of household reports of pediatric asthma by examining whether sociodemographic differences exist between children whose MKA did or did not report either asthma or a plausible alternative medical condition among children who obtained "asthma medications."

METHOD

Study Population and Data

The analysis is based on data from the Medical Expenditure Panel Survey, a survey of the civilian population living in U.S. communities. MEPS is designed to provide person- and household-level information on health care use, health care expenditures, sources of payment, and insurance coverage for the U.S. civilian noninstitutionalized population. MEPS is cosponsored by the AHRQ and the National Center for Health Statistics (AHRQ, n.d.).

MEPS conducts three separate but related surveys: the Household Component (HC), the Medical Provider Component (MPC), and the Insurance Component. Data from the MEPS HC and MPC are used in the current study. The sampling frame for the MEPS HC is drawn from households that responded to the prior year's NHIS (AHRQ, n.d.). The sample for the 1996 MEPS Household Component comprised 10,500 households (Cohen S. B., 1997), around one quarter of households responding to the 1995 NHIS, including an oversample of Hispanics and Blacks (Madans, 2002). The overall response rate for the 1996 MEPS HC is 70.2% (Madans, 2002). The MEPS Medical Provider survey is used to supplement and validate information on medical care provided in the HC. To this end, the Medical Provider survey is conducted with medical providers and pharmacies identified by respondents to the MEPS Household Component (AHRQ, n.d.). The current study uses data collected from pharmacies with the MEPS Medical Provider survey.

The family member who identified himself or herself as the one most knowledgeable about family medical care and who kept records about family health care use and expenses reported data for children 0 to 17 years of age. The survey design specifies that each survey respondent is to be interviewed five times to collect information for 2 consecutive calendar years about the respondent, household members, and the household. The interviews are conducted with computer-assisted personal interviewing (CAPI) technology in the respondent's home (Cohen J., 1997).

For the current study, child- and household-level data records were extracted from the MEPS HC and the MEPS MPC after downloading the public use data sets from the official MEPS Web site (http://www.meps.ahrq.gov/). To be able to compare the results from the current study directly with those reported in Roberts (2003), data were extracted from the 1996 MEPS HC for all children 0 to 17 years of age for whom there are data for the entire 1996 calendar year: a total of 6789 different children. If a family had multiple children, data from all children were included in the analysis.

The MEPS MPC includes pharmacy-provided records of filled prescriptions with up to three household-reported medical condition codes (ICD-9-CM) per pharmacy record. For the current study, the pharmacy records were extracted for all children in the sample who were reported to have "asthma medications" filled, but whose MKA did *not* report that the child has asthma: 381 different pharmacy records from 183 different children. Because the MEPS public use data sets do not include direct identifiers, the study protocol was determined to be exempt from Institutional Review Board approval by the Battelle Centers for Public Health Research and Evaluation Institutional Review Board.

Measures

Asthma. The MEPS data include information about children's medical conditions. The MEPS obtains this information as follows: When the MEPS interviews are conducted, respondents are asked for each child: (a) whether there

are medical conditions that bothered the child during the period covered by the interview; and (b) whether the child has medical conditions that resulted in missed school days, in bed days, or in medical events (e.g., health care visit, prescription fill/refill) during the period covered by the interview. The MEPS interviewers record medical conditions reported by the respondents verbatim. Professional coders subsequently create ICD-9-CM medical condition and V codes from the medical conditions reported by the respondents for each child. Thus, the MEPS identifies children as having asthma when the MKA reports either that the child was bothered by asthma and/or that asthma was the reason for a bed day, a school absence, a prescription fill/refill, or a medical visit during the time period covered by the interview.

Prescribed Medications. The MEPS respondents also are asked to provide the name of any prescribed medication they or their family members had purchased or otherwise obtained during the period covered by the interview and the name(s) of any health problems for which the medication was prescribed. "If the respondent with the prescription gave written permission to release his or her pharmacy records, pharmacy providers identified by the household were contacted by mail for the pharmacy follow-back component.

Each establishment was informed of all persons participating in the survey who had prescriptions filled at their place of business, and a computerized printout of all prescriptions filled for each person was sought. For each medication listed, the following information was requested: date filled; national drug code (NDC); medication name; strength of medicine (amount and unit); quantity (package size/amount dispensed); total charge; and payments by source" (AHRQ, 2001). As noted, for the current study, these data were extracted for sample children from the MEPS MPC. If written permission was not given to release pharmacy records, respondents were kept in the analysis sample, using their personally provided data.

Asthma Medications. To be consistent with the approach used by Roberts (2003), the following filled prescriptions were considered medications beneficial to asthma: long- and short-acting bronchodilators, mast cell stabilizers, methylxanthines, leukotriene receptor inhibitors, and inhaled corticosteroids.

Sociodemographic Characteristics. Data on each child's race/ethnicity, sex, age, maternal education level, household income, and whether the MEPS interview was conducted in English or in another language were extracted from the MEPS HC. The racial and ethnic categories are defined as non-Hispanic Black, non-Hispanic White, Hispanic, and non-Hispanic "other." The "other" category combines Asian, Pacific Islander, Native American or American Indian, and Eskimo groups, because of the small number of sample children with asthma medications in these racial groups. The child's age is represented with the following four categories: 2 years old or younger, between 3 and 5 years, between 6 and 12 years, and between 13 and 17 years. Maternal education is represented with three categories: whether the mother had at most 12 years of education, between 13 and 15 years of education, or 16 or more years of education.

The MEPS adjusts family income levels for family size and survey year to create an index of total family income over the calendar year relative to federal poverty thresholds. This index was used to group children into three income categories: below or near poverty (<125% federal poverty level [FPL]), poor (125-199% FPL), and moderate to high income level (≥200% FPL).

MEPS interviews are conducted in an alternate language by bilingual interviewers, if the respondent does not have sufficient English language proficiency to understand and respond to questions in English. A measure indicates whether the interview was conducted in a language other than English. Nearly all respondents who were interviewed in an alternate language were interviewed in Spanish.

Statistical Analysis

The MEPS sample design includes stratification, clustering, multiple stages of selection, and disproportionate sampling to generate national estimates of the U.S. civilian noninstitutionalized population. Given the complex sample design, MEPS recommends using weights to obtain accurate estimates and appropriate standard errors from MEPS survey data (Machlin, Yu, & Zodet, 2005). For the current study, weighted percentages were estimated of children reported to have: (a) asthma and (b) "asthma medications" filled. In addition, for each child in the sample who had an "asthma medication" prescription filled, but whose MKA did *not* report that the child has asthma (N = 183), each "asthma medication" (N = 381) and its associated ICD-9-CM codes were examined. The purpose of this examination was to see whether the medication was reasonable for the nonasthmatic medical condition reported by the MKA. After this examination, weighted percentages were estimated of: (a) children with an MKA report of either asthma or a plausible alternative medical condition; and (b) children without an MKA report of asthma/plausible alternative medical condition. Pearson chi-square statistics were used to examine whether sociodemographic differences exist between children who have a report of asthma/plausible alternative medical condition versus children who do not have such a report, among the children with "asthma medications." All esti-

TABLE 1. U.S. children reported to have asthma* in 1996 survey with most knowledgeable adult household member

Children	Weighted percent	Standard error	Unweighted N
0-17 years (N = 6789)	5.4	0.4	400
3-17 years (N = 5719)	5.7	0.4	349

Based on survey questions on medical conditions bothersome for child and missed school days, bed days, or medical events (e.g., health care visit, prescription fill) due to medical conditions during period covered in interview.

TABLE 2. U.S. children reported to have "asthma medication"* prescriptions filled based on 1996 survey

Children	Weighted percent	Standard error	Unweighted N
0-17 years (N = 6789)	6.5	0.4	438
3-17 years (N = 5719)	5.6	0.4	334

Long- and short-acting bronchodilators, mast cell stabilizers, methylxanthines, leukotriene receptor inhibitors, and inhaled corticosteroids.

TABLE 3. "Asthma medication"* prescriptions filled among U.S. children reported to have asthma† in 1996 survey with most knowledgeable adult household member

Children	"Asthma medication" filled		Standard error
	Yes	No	
0-17 years	62.8%	37.2%	3.4
N, unweighted	255	145	
3-17 years	59.3%	40.7%	3.7
N, unweighted	216	133	

*Long- and short-acting bronchodilators, mast cell stabilizers, methylxanthines, leukotriene receptor inhibitors, and inhaled corticosteroids.
†Based on survey questions on medical conditions bothersome for child and missed school days, bed days, or medical events (e.g., health care visit, prescription fill) due to medical conditions during period covered in interview.*

mates were derived with Stata statistical software version 9 module for survey data (StataCorp, 2005).

RESULTS

The MKA reported asthma for 5.4% of sample children 0 to 17 years of age in 1996 (standard error 0.4) (Table 1). More children in the sample of 0- to 17-year-olds have a filled "asthma medication" prescription than are reported to have asthma, namely 6.5% (SE 0.4) (Table 2). When the sample is restricted to children 3 to 17 years of age, because asthma is difficult to differentiate from upper respiratory infection with wheeze in young children (Kieckhefer & Ratcliffe, 2004) and providers may hesitate to diagnose asthma, the MKA reported asthma for 5.7% (SE 0.4) of the 3- to 17-year-old children (Table 1). About the same percentage (5.6%; SE 0.4) of 3- to 17-year-old sample children have a filled "asthma medication" prescription (Table 2). The National Center for Health Statistics estimates that 6.2% of children aged 0 to 17 years had asthma in 1996 (Akinbami & Schoendorf, 2002). As noted, the definition of asthma used by the MEPS is based on reports that the child was either bothered by asthma, or that asthma was the reason for a bed day, a school absence, a prescription fill/refill, or a medical visit. The estimate by the National Center for Health Statistics is based on the survey question: "During the past 12 months, did your child have asthma?" It thus is not surprising that the more stringent MEPS definition produces a somewhat lower estimate than the more general definition used by the National Center for Health Statistics.

Table 3 shows to what extent children whose MKA reported that they have asthma had pharmacy records of "asthma medications." Among children 0 to 17 years of age whose MKA reported that they have asthma, more than one third (37.2%; SE 3.4) did *not* have a pharmacy record of a filled "asthma medication" prescription. Among children 3 to 17 years old whose MKA reported that the child has asthma, a slightly higher percentage had *no* filled "asthma medication" prescription records: 40.7% (SE 3.5).

Turning to sample children 0 to 17 years old with "asthma medication" prescriptions, about half (52.7%, SE 3.4) were reported to

TABLE 4. Children reported to have asthma* in 1996 survey with most knowledgeable adult household member among U.S. children with filled "asthma medication"† prescriptions

Children	Asthma reported		Standard error
	Yes	No	
0-17 years	52.7%	47.3%	3.4
N, unweighted	255	183	
3-17 years	60.4%	39.6%	3.7
N, unweighted	216	118	

*Based on survey questions on medical conditions bothersome for child and missed school days, bed days, or medical events (e.g., health care visit, prescription fill) due to medical conditions during period covered in interview.
†Long- and short-acting bronchodilators, mast cell stabilizers, methylxanthines, leukotriene receptor inhibitors, and inhaled corticosteroids.

It is crucial to know whether surveys conducted with parents provide valid and reliable information regarding whether a child has been diagnosed with asthma.

have asthma by their MKA (Table 4). The percentage increases to 60.4% (SE 3.7) among the 3- to 17-year-old sample children with "asthma prescriptions." Taken at face value, these figures, like Roberts' (2003) study, would suggest that a considerable number of children with asthma are *not* reported to have the condition when the MKA is interviewed in a survey. To examine whether this is indeed the case, Table 5 lists the names of all "asthma medications" for which prescriptions were filled for children 0 to 17 years old and whose MKA did *not* report that the child has asthma. Next to each "asthma medication" is a list of the ICD-9-CM codes for which the medication was prescribed according to the MKA. For nonhighlighted medical conditions we were able to create a scenario where the child's presenting symptoms could have included those for which a provider might have attempted a course of the listed "asthma medication" (plausible alternative medical condition). Medical conditions are highlighted grey if the corresponding medication *cannot* reasonably have been expected to manage the medical condition under circumstances we know of, given medical practice in 1996 (less plausible alternative medical condition). Based on the classification of medical conditions into plausible and less plausible conditions, the MKA reported a plausible alternative medical condition for 61.2% (SE 4.4) of children 0 to 17 years old with a filled "asthma medication" prescription but no MKA report of asthma (figures not presented in tables). Thus, for these children, it appears that the MKA was correct to *not* report an asthma diagnosis. For an additional 9.0% (SE 3.5) of children 0 to 17 years old, ICD-9-CM information was missing for the filled "asthma medications." Only the remaining 29.7% (SE 3.9) of children 0 to 17 years old had medical conditions for which the prescribed "asthma medications" would not be expected to have desirable therapeutic effects.

When the sample is restricted to children 3 to 17 years old with filled "asthma medication" prescriptions but no MKA-reported asthma, 63.1% (SE 4.8) had medical conditions other than asthma for which the "asthma medications" might reasonably have been prescribed. Again, it appears that for these children the MKA was correct to *not* report that the child has asthma. For an additional 4.3% (SE 0.2) of children 3 to 17 years old, ICD-9-CM information was missing. For the remaining 32.6% (SE 4.6) of these older children, the ICD-9-CM codes represent medical conditions for which the "asthma medications" are unlikely to have had desirable therapeutic effects.

Table 6 provides additional information about the children for whom "asthma medications" were filled. Children younger than 6 years and girls are more likely to have *no* MKA report of asthma/plausible alternative medical condition than are older children and boys. Specifically, the MKA did not report asthma/plausible alternative medical condition for 9.9% of boys and for 23.4% of girls. Further, the MKA did not report asthma/plausible alternative diagnosis for about 20% of children between 0 and 5 years old, compared with 13% of children 6 to 12 years, and 5.8% of children 13 to 17 years of age. Differences in reporting asthma/plausible alternative medical condition were not statistically significantly different by child race/ethnicity, household income, and education level and English language proficiency of the MKA.

TABLE 5. Medications commonly prescribed for asthma and additional medical conditions for which prescriptions were filled for U.S. children in 1996 according to most knowledgeable adult household member

Generic medication name (brand name)	Plausible alternative medical conditions	Less plausible alternative medical conditions
Albuterol sulfate (Albuterol, Proventil, Ventolin)	079 – Viral and chlamydial infection in conditions classified elsewhere and of unspecified site 465 – Acute upper respiratory infections of multiple or unspecified sites 466 – Acute bronchitis and bronchiolitis 478 – Other diseases of upper respiratory tract 486 – Pneumonia, organism unspecified 487 – Influenza 490 – Bronchitis, not specified as acute or chronic 518 – Other diseases of lung 519 – Other diseases of respiratory system 786 – Symptoms involving respiratory system and other chest symptoms	008 –Intestinal infections due to other organisms 135 – Sarcoidosis 136 – Other and unspecified infectious and parasitic diseases 382 – Suppurative and unspecified otitis media 386 – Vertiginous syndromes and other disorders of vestibular system 429 – Ill-defined descriptions and complications of heart disease 460 – Acute nasopharyngitis 464 – Acute laryngitis and tracheitis 473 – Chronic sinusitis 477 – Allergic rhinitis 514 – Pulmonary congestion and hypostasis 747 – Other congenital anomalies of circulatory system 780 – General symptoms
Beclomethasone Dipropionate, nasal or inhaled (Beclovent, Vanceril)	473 – Chronic sinusitis 477 – Allergic rhinitis 490 – Bronchitis, not specified as acute or chronic	519 – Other diseases of respiratory system
Cromolyn sodium, nasal or inhaled (Intal)	473 – Chronic sinusitis 477 – Allergic rhinitis 482 – Other bacterial pneumonia 486 – Pneumonia, organism unspecified 490 – Bronchitis, not specified as acute or chronic 491 – Chronic bronchitis 518 – Other diseases of lung 786 – Symptoms involving respiratory system and other chest symptoms	583 – Nephritis and nephropathy, not specified as acute, chronic 610 – Benign mammary dysplasias 719 – Other and unspecified disorders of joint 728 – Disorders of muscle, ligament, and fascia 847 – Sprains and strains of other and unspecified parts of back
Diprophylline, Guaifenesin (Dilor-G)	460 – Acute nasopharyngitis 987 – Toxic effects of other gases, fumes, or vapors	
Flunisolide, nasal or inhaled (Aerobid, Nasalide)	477 – Allergic rhinitis	
Guaifenesin, Pseudoephedrine (Hydrophed Exp)	388 – Other disorders of ear 490 – Bronchitis, not specified as acute or chronic	
Ipratropium bromide (Atrovent)	460 –Acute nasopharyngitis 466 – Acute bronchitis and bronchiolitis 482 – Other bacterial pneumonia	
Metaproterenol sulfate (Alupent, Metaproterenol)	490 – Bronchitis, not specified as acute or chronic 786 – Symptoms involving respiratory system and other chest symptoms	
Pirbuterol acetate (Maxair)	518 – Other diseases of lung	
Sodium chloride (Broncho Saline*)	490 – Bronchitis, not specified as acute or chronic	
Triamcinolone acetonide, nasal or inhaled (Nasacort, Azmacort)	477 – Allergic rhinitis 490 – Bronchitis, not specified as acute or chronic 987 – Toxic effects of other gases, fumes, or vapors	787 – Symptoms involving digestive system

*Used as administration medium.

TABLE 6. Report of asthma† or plausible alternative medical condition: Weighted percent distributions by sociodemographic characteristics among children with filled "asthma medications"‡

Sociodemographic characteristics	Report of asthma or plausible alternative medical condition	
	Yes (No.)	No (No.)
Child's age in years		
0-2	80.7* (77)[1]	19.3 (16)
3-5	79.5 (71)	20.5 (20)
6-12	87.0 (126)	13.0 (16)
13-17	94.2 (89)	5.8 (6)
Child's sex		
Female	76.6** (123)	23.4 (33)
Male	90.1 (241)	9.9 (25)
Child's race/ethnicity		
Non-Hispanic African American	82.9 (63)	17.1 (10)
Non-Hispanic White	86.5 (178)	13.5 (28)
Hispanic	85.9 (110)	14.1 (16)
Non-Hispanic other	76.0 (13)	24.0 (4)
Mother's education		
≤12 years	86.5 (202)	13.5 (31)
13-15 years	89.6 (81)	10.4 (11)
≥16 years	78.6 (66)	21.4 (13)
Household income		
<125% Federal poverty level	88.5 (128)	11.5 (18)
125-199% Federal poverty level	76.2 (58)	23.8 (15)
≥200% Federal poverty level	86.4 (178)	13.6 (25)
Interview language		
Interview in English	85.4 (330)	14.6 (51)
Interview not English	82.6 (34)	17.4 (7)
Total	85.3 (364)	14.7 (58)

†Based on survey questions on medical conditions bothersome for child and missed school days, bed days, or medical events (e.g., health care visit, prescription fill) due to medical conditions during time period covered in interview.
††Long- and short-acting bronchodilators, mast cell stabilizers, methylxanthines, leukotriene receptor inhibitors, and inhaled corticosteroids.
1No. of observations in cell.
***$P < .01$;*
**$P < .05$ based on Pearson χ^2 statistic.*

DISCUSSION

Survey responses from parents are an important source of information about the prevalence of asthma in children, trends in pediatric asthma, and racial and socioeconomic disparities in pediatric asthma. Thus it is crucial to know whether surveys conducted with parents provide valid and reliable information regarding whether a child has been diagnosed with asthma.

Based on filled prescription data from an entire calendar year, considerably more children 0 to 17 years of age who were reported to have asthma had an "asthma medication" filled than in an earlier study (Roberts, 2003) based on prescription data from at most 6 months: 63% versus 36%. As in Roberts' study, for a number of children the MKA did not report that their child has asthma, even though the child had prescriptions filled for medications commonly used in the treatment of asthma. However, according to the current study, in almost two thirds of these cases the MKA was most likely correct to *not* report an asthma diagnosis, because the medications, given the right symptom presentation, might reasonably have been expected in 1996 to have a therapeutic effect for the medical condition the MKA did report, or the medications might have been tried empirically by the health care provider to gauge its effectiveness in improving symptoms. For cases in which the medical condition reported by the MKA does not appear plausible, it is not possible to determine, based on the available data, whether the MKA reported an incorrect medical condition, whether health care providers prescribed medications inappropriately, whether the wrong ICD-9 code was entered into the database, or whether other logical ex-

Providers must make clear the specific reasons for their treatment choices, even when the diagnosis is in question, the treatment empiric, or the treatment "off label."

planations would explain the discrepancy.

Because there may be less certainty about a child's asthma diagnosis in an intermittent, chronic condition like asthma when children are young, it is reasonable that the current study finds more uncertainty in the MKA report of either asthma or a plausible alternative medical condition for children who are younger than 6 years. However, there is no obvious explanation for the finding that girls with an "asthma medication" are less likely than boys with such a medication to have an MKA report of either asthma or a plausible alternative medical condition.

It is important to keep in mind that the sociodemographic differences reported here are based on a relatively small number of observations. It is thus important to replicate the analysis reported in this article with a larger sample of children with medications beneficial to asthma before definite conclusions can be drawn about the confidence in the report of pediatric asthma based on surveys with adult household members.

CONCLUSIONS

In summary, it seems to us that there is insufficient evidence to conclude that "surveys of parental reports of asthma overlook many children with active disease" (Roberts, 2003, p.449). The intermittent nature of asthma symptoms requires a sufficiently long time window for data review. Survey questions need to be more focused and detailed to include the prescriber's rationale for specific conditions to get the breadth of information needed to make judgments, but that does not in and of itself mean that the household member most knowledgeable about household health care does not accurately report their children's medical conditions.

Although the purpose of this study was to evaluate the validity of MKA reports of asthma in survey data, clinical implications may be drawn. First, making sure providers keep up with the latest recommended treatments for asthma is critical. The 1997 and 2002 NHLBI treatment Guides (NHLBI, 1997; 2003) have each refined care, and future Guides will do the same. Providers must keep informed to provide best-practice, evidence-based, appropriate care in line with the emerging understanding of asthma's underlying pathophysiology rather than rely on outdated treatments. Second, the results from the current study emphasize the importance of provider-parent communication. A recent study found that providers and families differ in how they report symptoms of asthma (Yoos et al., 2005). These communication differences may extend to communication about diagnosis and treatment as well. Thus, providers must make clear the specific reasons for their treatment choices, even when the diagnosis is in question, the treatment empiric, or the treatment "off label." This is the foundation for true informed consent for care. Third, families are considered the most central member of their child's health care team (Institute of Medicine, 2001). They cannot effectively take on this role unless they are given accurate and understandable information from the child's provider. In an environment where the family may change providers multiple times in the child's life and the transfer of medical records is less than ideal, a correctly informed parent is critical so the next provider receives accurate information from the parent and care can be smoothly transitioned without unnecessary discontinuities and costly repetitive diagnostic work.

At this point we conclude that insufficient evidence exists to infer that surveys of parental reports of asthma overlook many children with active disease.

Whether post-1996 improvements in provider education, communication skills, or acceptance of the National Asthma Treatment Guidelines would show greater accuracy in MKA reports of childhood asthma remains to be determined. At this point we conclude that insufficient evidence exists to infer that surveys of parental reports of asthma overlook many children with active disease.

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