

**Recent Trends in Childhood Asthma-Related Outcomes and  
Parental Asthma Management Training**

by

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## INTRODUCTION

Asthma is one of the most common chronic conditions among children in the United States, affecting nearly 10 percent of children under the age of 18 as of 2009.<sup>1</sup> An extensive literature has demonstrated that having health insurance coverage is associated with expanded access to care, realized in the form of more visits with medical providers and more regular preventive care.<sup>2,3,4,5,6</sup> In the case of children with asthma, regular provider contact is likely an essential piece of managing care, as medical providers are the primary source of information about asthma management, and asthma management training (such as being taught how to recognize early signs of an asthma episode) has been associated with improved asthma-related outcomes.<sup>7,8,9</sup>

Health insurance type (public versus private), however, may have different impacts on outcomes for children with asthma, depending on whether there are differences in the content of asthma management training, limits to the scope of benefits, cost sharing requirements, or barriers in the delivery system related to provider availability or accessibility. Low-income families may face additional challenges related to literacy limitations or lack of English language fluency, parental mental health problems, or lack of transportation that can dampen the effectiveness of health insurance in facilitating access to needed care.<sup>10</sup>

During the last decade, there have been significant changes in the rate of uninsurance and the distribution of coverage among children. According to estimates from the National Center for Health Statistics, the percent of publicly insured children increased by 12.2 percentage points between 2000 and 2008, and the percent of privately insured children decreased by 8.8 percentage points, resulting in a 3.4 percentage point decrease in the uninsured.<sup>11</sup> Given the links found between insurance coverage and various asthma-related outcomes, changes in health insurance coverage may in turn contribute to trends in childhood asthma-related outcomes and receipt of parental asthma management training.

Previous research has examined trends in asthma prevalence and outcomes over time, with a focus on assessing differences by race/ethnicity, gender, and age.<sup>12,13</sup> In particular, between 1980 and 2007, asthma prevalence increased, but asthma-related outcomes such as emergency department (ED) visits, hospitalization rates due to asthma, and asthma-related death rates decreased during the latter part of the period. Rates of asthma prevalence, ambulatory care, ED

visits, and hospitalization rates due to asthma have also been found to vary by race/ethnicity and age.

However, to the best of our knowledge, no published study has examined recent trends in the health insurance coverage of asthmatic children, or asthma-related outcomes and parental asthma management training by asthmatic children's health insurance status. In this paper, we address such issues, and in particular explore the following questions: Does public or private insurance disproportionately cover children with asthma? How has the distribution of coverage changed over the last decade? How do asthma-related outcomes vary with health insurance status? Has the pattern changed over time? Do these trends differ for low-income children? What percentage of parents report having ever been trained in managing their child's asthma? How does the rate and content of training vary by child's current health insurance status?

## **DATA & METHODS**

This study uses data from the 2001 through 2008 National Health Interview Survey (NHIS) to examine recent trends in asthma prevalence and asthma-related outcomes among children and parental asthma management training by health insurance coverage. The NHIS is an annual in-person household survey administered by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC), that focuses on the health and health care use of the civilian noninstitutionalized population in the United States. The basic NHIS module contains three main components: Family Core, Sample Adult Core, and Sample Child Core. The Family Core component collects information on household composition and sociodemographic characteristics, as well as health insurance coverage and basic indicators of health status. Additionally, one sample adult and one sample child (if any children under age 18 are present) are randomly selected from each family and administered the Sample Adult Core and the Sample Child Core questionnaires, respectively. All asthma-related variables, including prevalence of asthma, asthma-related outcomes, and parental asthma management training, are taken from the Sample Child component.<sup>14</sup>

Our key analytic variable of interest is the child's health insurance coverage during the previous 12 months. We define three insurance coverage groups: (1) full-year insured with public coverage at the time of the survey, (2) full-year insured with private coverage at the time of the survey, and (3) uninsured for the full year or part-year uninsured. Public coverage includes

Medicaid/CHIP, state-sponsored health plans, and other government programs. Private coverage includes employer sponsored insurance (ESI) and nongroup private coverage. Children who report both public and private health insurance coverage are assigned to public coverage (less than 2 percent of the sample).

Our analysis focuses on currently asthmatic children: that is, children who have ever been diagnosed with asthma by a doctor or other health professional and who still have asthma at the time of the survey according to the respondent. The asthma-related outcomes we examine are the prevalence of asthma attacks during the past 12 months among currently asthmatic children, and among those who experienced an asthma attack, the prevalence of ED visits and missed school days due to asthma in the past 12 months.<sup>15</sup> In our analysis of asthma-related outcomes, we report results that combine data across several years, since the annual number of observations of children with asthma by health insurance status is small and the standard errors are large. The 2003 and 2008 NHIS asked additional questions on parental asthma management training among currently asthmatic children and those who had an asthma attack in the past 12 months. Parental asthma management training is defined as including (1) an asthma management course, (2) training from a doctor/health professional on how to recognize early signs of an asthma episode, (3) training on how to respond to asthma episodes, or (4) training on how to monitor peak flow for daily therapy, and (5) receipt of an asthma action plan from a doctor/health professional. In addition to analyzing the trend in each component of parental asthma management training between 2003 and 2008, we also analyze a composite indicator of receipt of any parental asthma management training component by either parent. All analyses were adjusted to account for the complex survey design of the NHIS and the multiple imputations of income by using the “svy” and “mi” procedures in Stata 11 (Stata Corp, College Station, TX). Results discussed below are at least significant at the .10 level, unless otherwise indicated, and the tables report statistical significance at the .01, .05, and .10 levels.

There are a number of limitations to our analysis. First, the analytic sample is restricted to children who currently report having asthma in order to target the analysis of asthma outcomes appropriately. However, children with well-managed asthma due to receipt of preventive care and/or parental asthma management training may not be reported as currently having asthma, which could affect the analysis of trends. Second, it is not possible with these data to assess the impacts of parental asthma management training on asthma outcomes since training is likely

targeted at children with more severe asthma, which is not measured here. This means that the data are likely understating the extent to which parents are receiving such training and the effectiveness of training at minimizing poor asthma outcomes. The absence of information on asthma severity and the possibility that diagnosis patterns are changing over time also makes it difficult to draw conclusions about the trends in asthma-related outcomes. Third, the measures of parental asthma management training refer to whether the parent has *ever* been trained in how to manage their child's asthma. While we know the child's health insurance status during the prior year, training could have occurred while the child was insured through a different source. Fourth, due to data limitations, the public coverage categories include children who may have had private coverage at some point in the prior year and vice versa, respectively. Finally, when examining particular subgroups of children, some analyses are limited by small sample sizes (e.g., the low-income asthmatic children with private coverage category).

## **RESULTS**

### *Trends in Asthma Prevalence*

Table 1 shows the annual trend in the prevalence of asthma among children overall and by health insurance status from 2001 through 2008. The trends in asthma prevalence are also analyzed in two 4-year intervals (2001 to 2004 and 2005 to 2008) for all children and among low-income children (those with family incomes below 200 percent of the federal poverty level or FPL).

Rates of asthma increased among children during the last decade. The average prevalence of asthma for the 2001–2004 and 2005–2008 periods was 8.5 percent and 9.2 percent, respectively for all children (a nearly 1 percentage point increase) and 9.7 percent and 10.9 percent respectively for low-income children (a 1.2 percentage point increase). Each health insurance group experienced an increase in the prevalence of asthma, but the increase was statistically significant only for children with public coverage.

Table 1: Changes in the Prevalence of Asthma among Children (Age 0 to 17), by Year and Health Insurance Status

	Overall	Insured for full year		Uninsured for part or full year
		Public	Private	
<i>All children</i>				
2001	8.7%	11.3%	8.0%	8.0%
2002	8.3%	11.9%	7.3%	6.5%
2003	8.5%	11.3%	7.7%	6.8%
2004	8.5%	9.5%	8.4%	6.5%
2005	8.9%	11.7%	7.9%	8.0%
2006	9.3%	12.3%	8.2%	7.3%
2007	9.1%	12.4%	7.8%	7.3%
2008	9.4%	12.1%	8.4%	7.9%
2001–04	8.5%	11.0%	7.9%	7.0%
2005–08	9.2%	12.2%	8.1%	7.6%
Difference	0.7**	1.2**	0.2	0.6
<i>Low-income children</i>				
2001–04	9.7%	11.6%	8.5%	6.6%
2005–08	10.9%	13.1%	9.5%	7.0%
Difference	1.2**	1.5**	1.0	0.4

Source: Urban Institute tabulations of the 2001 to 2008 NHIS

Notes: Public coverage includes Medicaid/CHIP, state-sponsored health plans, and other government programs. Private coverage includes employer sponsored insurance (ESI) and nongroup private coverage. Children who report both public and private health insurance coverage are assigned to public coverage.

\* (\*\*) (\*\*\*) Significant at the 10% (5%) (1%) level.

### *Trends in Asthma-Related Outcomes*

While the prevalence of asthma has increased among children over the past decade, the rate of asthma-related ED visits and missed school days has decreased. Table 2 shows the difference in the prevalence of asthma attacks as well as ED visits and average school days missed due to asthma during the previous year for the 2001–2004 and 2005–2008 periods overall and by insurance category. The percentage of asthmatic children experiencing an asthma attack during the past 12 months decreased by 4.8 percentage points between the 2001–2004 and 2005–2008 periods, and the number of school days missed due to asthma also decreased by 1.2 days

on average. These changes are largest for asthmatic children with public coverage, where the prevalence of asthma attacks decreased by almost 7 percentage points and school days missed due to asthma decreased by 2.5 days on average. Privately insured children experienced a reduction in asthma-attacks of nearly 5 percentage points as well.

Table 2: Changes in Asthma-Related Outcomes among Asthmatic Children (Age 0 to 17), by Year and Health Insurance Status

	Overall	Insured for full year		Uninsured for part or full year
		Public	Private	
<i>Asthma Attack</i>				
2001–04	45.6%	48.5%	44.8%	43.2%
2005–08	40.8%	41.6%	40.1%	41.0%
Difference	-4.8***	-6.9***	-4.7**	-2.2
<i>ED Visit due to Asthma Attack</i>				
2001–04	33.6%	45.3%	26.0%	38.3%
2005–08	33.4%	42.5%	23.0%	48.0%
Difference	-0.2	-2.8	-3	9.7*
<i>Average Number of Missed School Days due to Asthma<sup>a</sup></i>				
2002–03	4.4	6.9	3.4	5.2
2008	3.2	3.8	2.6	4.1
Difference	-1.2*	-2.5**	-0.8	-1.1

Source: Urban Institute tabulations of the 2001 to 2008 NHIS

Notes: Public coverage includes Medicaid/CHIP, state-sponsored health plans, and other government programs. Private coverage includes employer sponsored insurance (ESI) and nongroup private coverage. Children who report both public and private health insurance coverage are assigned to public coverage.

\* (\*\*) (\*\*\*) Significant at the 10% (5%) (1%) level.

<sup>a</sup> Measure only defined among school-aged children and available on the 2002, 2003, and 2008 NHIS.

The overall percentage of ED visits due to asthma attacks remained largely unchanged, but difference patterns are found for insured compared to uninsured children. In particular, the prevalence of ED visits due to asthma attacks among uninsured children increased by nearly 10 percentage points. While early in the decade, the likelihood of an ED visit among publicly insured asthmatic children was higher than that experienced by uninsured children, in the latter

part of the decade, rates of ED visits due to asthma attacks were not statistically different between the two groups (data not shown).

The trends of asthma-related outcomes among low-income children follow the overall pattern observed above (data not shown). The prevalence of asthma attacks among low-income asthmatic children decreased by 3.6 percentage points (from 46.1 percent to 42.5 percent). The decrease in asthma attacks was greater among low-income children with public coverage, who experienced a decline of 5.1 percentage points (from 49.2 percent to 44.0 percent). The rate of missed school days due to asthma also decreased among low-income children by 2.6 days overall and by almost 3 days for publicly insured children.<sup>16</sup>

#### *Changes in Health Insurance Coverage among Children with Asthma*

Table 3 shows trends in the distribution of health insurance coverage among children with asthma, asthma attacks, and ED visits due to asthma. While most asthmatic children were covered by private health insurance in both the 2001–2004 and 2005–2008 periods, there was a notable shift from private to public health insurance coverage during this period, which is consistent with the trends observed for all children. In the 2001–2008 period, 56.3 percent of currently asthmatic children had private coverage, but that percentage decreased to 49.4 percent in the 2005–2008 period, a decline of a 6.9 percentage points. In contrast, the percentage of currently asthmatic children who had public coverage increased from 32.3 percent to 38.6 percent (a 6.4 percentage point increase). Among low-income asthmatic children, the percentage covered by public health insurance increased between the 2001–2004 and 2005–2008 periods by 5.6 percentage points (from 60.9 percent to 66.4 percent, data not shown). In contrast, the percentage of low-income asthmatic children covered by private insurance decreased from 23.5 percent to 18.5 percent (a 5.0 percentage point decline) between the two periods (data not shown).

The change in the distribution of health insurance coverage among asthmatic children who suffered an asthma attack during the past 12 months follows the overall pattern among asthmatic children; there was a shift in the distribution of health insurance away from private coverage (by 5.9 percentage points) toward public coverage (by 5.1 percentage points). Similarly, 43.0 percent of currently asthmatic children with ED visits due to an asthma attack had private health insurance in the 2001–2004 period compared to 34.3 percent in 2005–2008

period (a 8.7 percentage point decline). The pattern of health insurance coverage among low-income children with asthma attacks mirrors the overall pattern among low-income children with asthma—although the observed changes are not statistically significant at conventional levels (data not shown).<sup>17</sup>

Table 3: Changes in Health Insurance Status of Asthmatic Children (Age 0 to 17), Overall and by Asthma-Related Outcomes

	Insured for full year		Uninsured for part or full year
	Public	Private	
<i>Current Asthma</i>			
2001	28.1%	58.3%	13.6%
2002	35.5%	53.2%	11.3%
2003	35.4%	53.7%	10.9%
2004	30.3%	59.8%	9.9%
2005	35.4%	51.9%	12.7%
2006	39.0%	49.1%	12.0%
2007	41.0%	48.0%	11.0%
2008	39.0%	48.5%	12.5%
2001–04	32.3%	56.3%	11.5%
2005–08	38.6%	49.4%	12.0%
Difference	6.4***	-6.9***	0.5
<i>Asthma Attack</i>			
2001–04	32.2%	55.9%	11.9%
2005–08	37.3%	50.0%	12.6%
Difference	5.1***	-5.9***	0.7
<i>ED Visit due to Asthma Attack</i>			
2001–04	43.6%	43.0%	13.6%
2005–08	48.0%	34.3%	18.1%
Difference	4.3	-8.7**	4.5**

Source: Urban Institute tabulations of the 2001 to 2008 NHIS

Notes: Public coverage includes Medicaid/CHIP, state-sponsored health plans, and other government programs. Private coverage includes employer sponsored insurance (ESI) and nongroup private coverage. Children who report both public and private health insurance coverage are assigned to public coverage. Numbers may not sum to 100 percent due to rounding.

\* (\*\*) (\*\*\*) Significant at the 10% (5%) (1%) level.

### *Changes in Prevalence of Asthma Management Training*

Table 4 shows the percentage of parents with a currently asthmatic child in 2003 and 2008 who have ever received asthma management training. Overall, there was little change in parental asthma management training over that period. Among children with private health insurance, there was a statistically significant increase in rate of parents ever receiving an asthma action plan from a doctor or health professional of 8.1 percentage points (from 43.4 percent in 2003 to 51.5 percent in 2008) and an almost equally large decrease in the rate of parents who were ever taught to monitor peak flow for daily therapy (a 7.2 percentage point decrease, from 58.7 percent to 51.5 percent). There were no significant changes in parental asthma management training for asthmatic children with public coverage.

In 2008, the most recent year of data available, 84.2 percent of children with asthma had parents who had received at least one component of asthma management training. But just 12.8 percent had taken a course on how to manage asthma and 49.3 percent and 44.1 percent had been taught how to monitor peak flow or had been given an asthma action plan, respectively. Parents of asthmatic children with private health insurance and those with public coverage appear more likely than those with no insurance to receive at least one component of asthma management training (85.5 percent and 84.6 percent versus 77.9 percent) but the differences are not statistically significant at conventional levels (p-values of .23 and .30 respectively).

Table 4: Changes in Parental Asthma Management Training among Asthmatic Children (Age 0 to 17), by Year and Health Insurance Status

	Overall	Insured for full year		Uninsured for part or full year
		Public	Private	
<i>Parental Asthma Management Training</i>				
At least one parent received one or more components of asthma management training				
2003	81.1%	79.9%	83.2%	75.7%
2008	84.2%	84.6%	85.5%	77.9%
Difference	3.1	4.6	2.3	2.2
Child/parent ever took course on how to manage asthma				
2003	10.7%	8.6%	11.8%	12.5%
2008	12.8%	12.9%	12.5%	13.8%
Difference	2.1	4.2	0.7	1.4
Doctor/health professional ever taught parent how to recognize early signs of an asthma episode				
2003	72.0%	69.3%	75.3% †	65.5%
2008	72.1%	71.4%	74.4%	65.0%
Difference	0.1	2.1	-0.9	-0.6
Doctor/health professional ever taught parent how to respond to asthma episodes				
2003	77.1%	76.3%	79.2%	70.5%
2008	78.2%	76.9%	80.7%	72.8%
Difference	1.1	0.6	1.6	2.3
Doctor/health professional ever taught parent how to monitor peak flow				
2003	56.6%	54.9%	58.7%	52.3%
2008	49.3%	48.1%	51.5%	43.7%
Difference	-7.3	-6.8	-7.2*	-8.6
Doctor/health professional ever gave parent an asthma action plan				
2003	39.3%	33.6%	43.4%	37.8%
2008	44.1%	38.3%	51.5% †	33.6%
Difference	4.8	4.7	8.1*	-4.2

Source: Urban Institute tabulations of the 2003 and 2008 NHIS

Notes: Public coverage includes Medicaid/CHIP, state-sponsored health plans, and other government programs. Private coverage includes employer sponsored insurance (ESI) and nongroup private coverage. Children who report both public and private health insurance coverage are assigned to public coverage.

† Significantly different from 'Uninsured' at the 10% level.

\* (\*\*) (\*\*\*) Significant at the 10% (5%) (1%) level.

## **DISCUSSION**

Asthma is one of the nation's top chronic conditions in children and is particularly common among low-income children, with some communities reporting a prevalence rate as high as 40 percent.<sup>18</sup> It is also one of the most costly pediatric conditions—according to Medicaid directors, expenditures for asthma-related emergency department care and hospitalizations rank among their highest pediatric health care costs.<sup>19</sup> Medicaid and CHIP cover a large and growing number of the nation's asthmatic children. In 2003, 32.3 percent of children with asthma were covered by Medicaid/CHIP and that number increased to 38.6 percent in 2008; in 2008, fully two-thirds (66.4 percent) of low-income asthmatic children were covered by Medicaid/CHIP.

While we do not have information on asthma severity or how it may have changed over time, our findings suggest that over the last decade, there has been a trend towards improvement in asthma-related outcomes and receipt of parental asthma management training for asthmatic children with Medicaid/CHIP coverage. Despite these improvements, rates of ED use remain high among children with Medicaid/CHIP coverage, with over 40 percent having had an ED visit due to asthma in the prior year. Successful efforts aimed at reducing ED use and related costs in Medicaid and CHIP programs could reduce overall program costs and reduce the extent to which asthmatic children miss out on school or other activities.

Studies have shown that health insurance coverage is associated with better access to asthma management training and that such training leads to improvement of asthma-related outcomes and reductions in associated costs. Thus, expanding health insurance coverage to more uninsured asthmatic children and increasing rates of asthma management training among those with coverage could lead to reductions in negative asthma outcomes and their associated costs.

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- <sup>14</sup> Most measures of parental asthma management training are only available on the 2003 and 2008 NHIS.
- <sup>15</sup> We define the measure of missed school days due to asthma among children aged 5 and older.

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<sup>16</sup> Decreases in the number of missed school days experienced by privately insured and uninsured asthmatic children were not statistically significant.

<sup>17</sup> The distribution of asthmatic children with ED visits due to an asthma attack is not reported because the sample size is too small for robust statistical inference.

<sup>18</sup> Markus, A., M. Lyon, and S. Rosenbaum. 2010. *Changing Policy: The Elements for Improving Childhood Asthma Outcomes*. Washington, D.C.: The George Washington University School of Public Health and Health Services, the Department of Health Policy.

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