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Asthma-Related Medical Expenditures in the United States: Distributions and Trends

OCHP Paper Series on Children's Health and the Environment

Paper 2003-4

Prepared by Lauraine G. Chestnut and David M. Mills of Stratus Consulting Inc.

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Acknowledgments

This paper, the fourth in the Office of Children's Health Protection's *Paper Series on Children's Health and the Environment*, examines medical care expenditures for asthma in the United States. The paper also compares asthma-related prescription medicine expenditure estimates based on Medical Expenditure Payment Survey data to estimates based on an evaluation of what expenditures would be if recommended treatment guidelines were followed (U.S. EPA, 1999).

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1 Introduction

Asthma is a chronic respiratory disease that causes periodic episodes of inflammation and obstruction in the airways. Symptoms include coughing, wheezing, tightness in the chest, and shortness of breath. In its most severe manifestations it can cause death. The reasons why certain individuals develop asthma are not well understood, but it is well documented that for some individuals symptoms are aggravated by exposure to allergens, air pollutants, cold temperatures, respiratory illness, and exercise.

There are several sources of information about the number of people with asthma in the United States, but the specific numbers vary depending on how it is defined. Recent estimates suggest that overall about 5 percent of the U.S. population has asthma, with a somewhat higher rate (6 percent to 7 percent) in children under age 18 (NCHS, 1998). Once a person develops asthma there is no cure, but some individuals seem to "grow out of it" or no longer have symptoms after some period of time. Therefore, questions that ask, "Have you ever been told by a doctor that you have asthma?" obtain the highest estimates but tend to overstate the population with currently active asthma.

Recent changes in the way the asthma prevalence questions are asked in the National Health Interview Survey (NHIS), which is conducted annually, illustrate how the estimates of asthma prevalence can vary. Table 1 shows several different estimates of asthma prevalence in the United States. The first row shows estimates of the number of individuals who report any medical care expenditure for asthma in 1996. This defines the lowest rate of asthma at 3.2 percent and clearly understates the number of people with asthma to the extent that some have symptoms but seek no medical treatment. The second row shows an estimate of the number who report that they had asthma in the past year. This is about 5.5 percent of

Table 1. Number of People With Asthma in the United States

Definition of Having Asthma	Under 18 (Row %)	18 and Over (Row %)	All Ages
Asthma-related medical care, 1996[a]	3,188,709 (38%)	5,310,538 (62%)	8,499,247
Asthma this year, 1996[b]	4,429,374 (30%)	10,166,173 (70%)	14,595,547
Ever diagnosed with asthma, 1997[c]	—	—	25,700,000
Asthma symptoms this year, 1997[c]	—	—	11,100,000
U.S. population,[d] 1996	69,109,000 (26%)	196,120,000 (74%)	265,229,000
U.S. population,[d] 1997	69,603,000 (26%)	198,181,000 (74%)	267,784,000

[a] *MEPS (AHRQ, 2001a,b).*
[b] *1996 National Health Interview Survey (NCHS, 1998).*
[c] *1997 National Health Interview Survey (NCHS, 1999).*
[d] *US Bureau of the Census (2001).*

the total population and is based on responses to the 1996 NHIS question, "During the past 12 months did anyone in the family have asthma?" The next two rows illustrate how the format of the question can alter the prevalence estimates. In 1997 the NHIS asked, "Have you ever been told by a doctor or other health professional that you had asthma?" (NCHS, 1999). Nearly 10 percent of the population responded affirmatively. Following this they were asked, "During the past 12 months, have you had an episode of asthma or an asthma attack?" The affirmative responses to this follow-up question reflect about 4.1 percent of the population. The latter may not capture those who are being actively treated for asthma but whose asthma symptoms are fully controlled.

Table 1 also shows that however it is defined, asthma prevalence is higher in children than in adults. Children under age 18 represent about one-quarter of the U.S. population, but they make up about 30 percent of those who report having asthma, and represent nearly 40 percent of those who report medical care expenditures for asthma. This suggests that asthma is more frequent and more severe in children than in adults.

However it is specifically defined, asthma prevalence in the United States increased dramatically over the past two decades. The increase in self-reported asthma prevalence from the mid-1980s to the mid-1990s was roughly 67 percent (Mannino et al., 1998; NCHS, 1998), far outstripping the corresponding 11 percent increase in the U.S. population from 1985 to 1996 (U.S. Bureau of the Census, 2001). Over this period, a number of changes were taking place in how all medical services were delivered and paid for with the growth of managed care. At the same time, new prescription medications for asthma and the development and distribution of new asthma diagnosis and treatment guidelines (NHLBI, 1991) resulted in significant changes in asthma treatment protocols. Because of these changes, we may see something other than proportional changes in asthma-related medical expenditures since the mid-1980s.

This paper relies primarily on data from the 1996 Medical Expenditure Payment Survey (MEPS) (AHRQ, 2001a,b) to examine medical care expenditures for asthma in the United States. The MEPS is a very detailed national survey of households' medical expenditures in a full year, which allows examination of the distribution of expenditures and the burden in terms of how they are paid. The paper also examines trends in asthma-related medical expenditures by comparing the 1996 MEPS estimates to results based on a similar survey conducted in 1987 called the National Medical Expenditure Survey (NMES). Finally, we compare asthma-related prescription medicine expenditure estimates based on the MEPS data to estimates based on an evaluation of what expenditures would be if recommended guidelines were followed (U.S. EPA, 1999).

2 Data Sources and Methods

The MEPS used a national probability sample designed to collect information on medical service use and expenditures among the noninstitutionalized civilian U.S. population (AHRQ, 2001b). The MEPS data include the responses of the roughly 22,000 survey subjects regarding their 1996 medical service use and expenditures, and responses to supplemental surveys of medical care providers designed to capture details that the individual subjects may not know or recall. The MEPS data are organized into the following household component event files (AHRQ, 2001a): prescribed medicines, hospital inpatient stays, emergency room visits, outpatient visits, and office-based provider visits. Each record in these files contains information on a single use or purchase of a medical service (i.e., a physician office visit or a prescription medication purchase). The information includes the total expenditures for the service event and the amounts paid by each public and private payment source. Personal characteristics of the MEPS survey respondents, including their unique identifier number, age, and survey population weight, are available in the MEPS population characteristics files (AHRQ, 2001b).

Asthma-related records in the MEPS household component event files were identified using the International Classification of Diseases, 9th revision, Clinical Modification, (ICD-9-CM) (U.S. Department of Health and Human Services, 1998) condition codes in each record (i.e., asthma ICD-9-CM = 493). Records were selected if any of the listed condition codes were for asthma. This approach is consistent with the records selection criteria used by Smith et al. (1997) in their evaluation of asthma-related medical service use and expenditures using the 1987 NMES data. For comparison, we also calculated total asthma-related expenditures excluding records that did not have asthma as the first-listed diagnosis and found that these expenditures are 95 percent of the expenditures for all diagnosis listings of asthma. Thus, any upward bias from using any listed asthma diagnosis is minimal.

We used the unique personal identifier for the subject in each record in the MEPS data to add the age and survey population weights to the event records. Survey population weights are provided by the survey authors based on the probability sampling. The weights are estimates of how many people in the United States are represented by each survey subject, and are required to extrapolate from the survey data to national estimates. For each category of medical service, we summed the survey population weight values across the selected records to estimate the total national asthma-related use in each medical service category in 1996. We calculated corresponding national expenditure and payment source estimates by first multiplying the total expenditure and source-specific payment amounts in a record by the survey population weight for the subject. We then summed the resulting products for total expenditures and for each payment source across the identified records for each medical service category. This was done separately for those under age 18 and those age 18 and over.

3 Asthma-Related Medical Service Use and Expenditure Estimates for 1996

3.1 Total Asthma-Related Medical Expenditures

Table 2 provides the MEPS-based national estimates of the number of people with asthma-related medical service expenditures for each expenditure category by age group for 1996. Table 2 shows that children are more likely to have asthma-related medical expenses than adults: they accounted for nearly 40 percent of the people with asthma-related medical expenses but only about 30 percent of all individuals who reported having asthma (see Table 1).

Prescription medications are the most common asthma-related expense category: about 95 percent of the people who had asthma-related expenses reported some expenses for prescription medicines. Fewer than 5 percent had expenses for either hospitalizations or outpatient facility visits. About 8 percent had expenses for emergency room visits. Thus, a small share of asthma patients accounted for the usage of hospital and emergency room services for treatment of asthma.

Children accounted for about 40 percent of asthma-related medical expenses in all categories except emergency room visits, where they represented more than one-half of all expenses. The figures in Table 2 suggest that about 12 percent of children with any asthma-related medical expenses had one or more emergency room visits in the past year (1996), while this figure was only about 6 percent for adults with asthma-related expenses.

National estimates of the number of asthma-related medical service occurrences by medical service category and by age in 1996 are presented in Table 3. As expected, the more serious events were less frequent. Children accounted for 55 percent of the emergency room visits for asthma, but only about one-third of the hospitalizations and physician visits.

The national asthma-related medical expenditures for 1996 calculated from the MEPS are also presented in Table 3. In 1996, an estimated $5.8 billion was spent on the medical treatment of asthma. Expenditures for prescriptions account for 42 percent of the total, and inpatient hospital and inpatient physician services account for 33 percent of the total. Physician office visits account for 18 percent. Outpatient facility and emergency room visits account for 7 percent. Outpatient facility visits are for care received at sites such as respiratory clinics, but not in a physician's office.

Table 2. U.S. Population With Asthma-Related Medical Expenditures in 1996
Source: MEPS (AHRQ, 2001a,b).

Medical Service Category	Under 18 (Row %)	18 and Over (Row %)	All Ages
Inpatient hospitalizations	112,894 (39%)	175,646 (61%)	288,540
Outpatient facility visits	100,400 (34%)	196,630 (66%)	297,030
Emergency room visits	380,163 (56%)	296,083 (44%)	676,246
Physician office visits	2,034,015 (40%)	3,013,123 (60%)	5,047,138
Prescription medicines	2,979,435 (37%)	4,971,183 (63%)	7,950,618
Any asthma-related medical care	3,188,709 (38%)	5,310,538 (62%)	8,499,247

Table 3. National Estimates of Asthma-Related Medical Expenditures in 1996
Source: MEPS (AHRQ, 2001a,b).

	Under 18		18 and Older		All Ages	
Medical Service Category	Number (1,000s)	1996 Dollars (Millions)	Number (1,000s)	1996 Dollars (Millions)	Number (1,000s)	1996 Dollars (Millions)
Inpatient hospitalizations	134.2	$54.3	259.6	$1,481.4	393.7	$1,735.7
Inpatient physician services	—	$40.4	—	$141.6	—	$182.1
Outpatient facility visits	269.2	$47.0	345.3	$98.3	614.4	$145.4
Emergency room visits	482.6	$97.6	400.7	$162.3	883.3	$259.9
Physician office visits	5,293.0	$317.0	9,720.5	$726.3	15,013.6	$1,043.3
Prescription medications	—	$486.8	—	$1,951.5	—	$2,438.3
Total expenses	—	$1,243.2	—	$4,561.6	—	$5,804.7

3.2 Distribution of Asthma-Related Medical Expenditures

Of the total medical expenses for asthma, roughly 20 percent was spent providing care and treatment to those under the age of 18. This is lower than the share of those with asthma expenses who are younger than 18 (see Table 1), implying lower average individual expenditures for children. For all those younger than 18 who received any medical care for asthma, the average annual expenditure was $384, while the average annual expenditure for those age 18 and older was $848. Because the frequencies of medical care events are proportional to, or higher than, the number of children with asthma expenses, this implies that expenditures per event are lower for children than for adults.

Figure 1 shows that asthma-related expenditures were distributed very unevenly across the population reporting such expenditures. About 50 percent of asthma-related expenses were incurred for the treatment of only 5 percent of the patients: a small share of the patients had very high annual expenses, and the remainder had much more modest expenses.

Table 4 shows the annual expenditures by medical service category for the 5 percent of asthma patients with the highest average total expenditures across all services and for the remaining 95 percent of the asthma patients who reported any medical expenditures. The average annual total expenditure per patient was about $6,500 for the 5 percent of asthma patients with the highest expenditures, while average expenditures for the remaining 95 percent of the asthma patients were about $350. The 5 percent of patients with the highest expenditures account for 94 percent of all inpatient hospitalization expenditures (including inpatient physician services) and 42 percent of all expenditures for emergency room visits. Although the highest 5 percent spent much more per person on prescription medicines, 60 percent of the expenditures for the lower 95 percent of patients were for prescription medicines. For the lower 95 percent of the asthma patients, expenses for prescription medicines and physician offices visits combined to account for 87 percent of their total asthma-related medical expenses.

Figure 1. Distribution of 1996 Asthma-Related Medical Expenditures

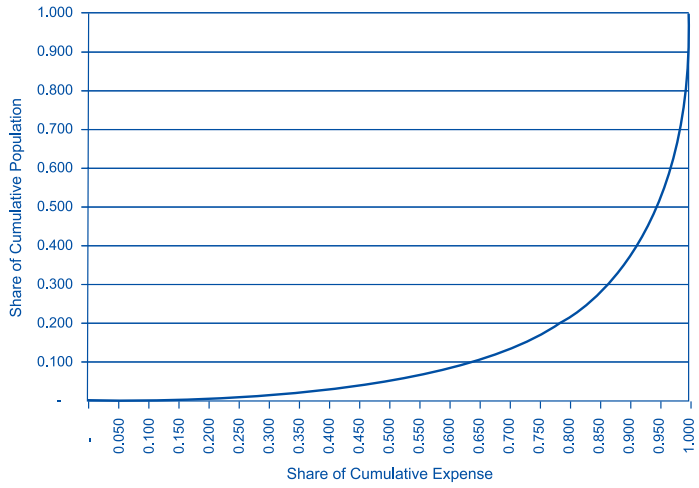

Table 4. Annual Expenditures for High-Expense Asthma Patients and All Others in 1996
Source: MEPS (AHRQ, 2001a,b).

	5% of Patients with Highest Expenses		Remaining 95% of Patients	
Medical Service Category	Total expenditures ($1996 Millions)	Patient Annual Average	Total Expenditures ($1996 Millions)	Patient Annual Average
Inpatient hospitalizations	$1,652.3	$3,580	$83.5	$10
Inpatient physician services	$159.6	$346	$22.5	$3
Outpatient facility visits	$41.2	$89	$104.2	$13
Emergency room visits	$109.6	$237	$150.4	$19
Physician office visits	$287.8	$624	$755.5	$94
Prescription medications	$739.6	$1,602	$1,698.7	$211
All services	$2,990.0	$6,478	$2,814.7	$350

3.3 Sources of Payment for Asthma-Related Medical Care

The right side of Table 5 presents the sources of payment for asthma-related medical expenses, as calculated from the MEPS data. These results show private insurance accounted for 42 percent of the total asthma-related medical service expenditures. About 23 percent of the total asthma-related expenses were paid out of pocket by the patients and their families. The remaining 32 percent were paid by public funding sources, primarily Medicare (which primarily covers those over age 65) and Medicaid (which primarily covers low income households). There are some significant differences across the medical service categories as to who paid the expenses. Less than 10 percent of the expenses for inpatient hospitalization, outpatient facility, and emergency room services were paid out of pocket, but 40 percent of the expenses for physician office visits and prescription medicines were paid out of pocket. For hospitalization services, the difference was made up by public programs. However, for outpatient facility and emergency room visits, the difference was made up primarily by private insurance.

There are some notable differences in sources of payment for children and adults for asthma-related medical expenses. Out-of-pocket shares are similar, but private insurance covered a higher share for children (49 percent), and public programs (primarily Medicare) covered a higher share for adults (35 percent). For those under age 18, public programs (primarily Medicaid) were the primary payment source for emergency room visits and outpatient facility visits, accounting for 47 percent and 73 percent of payments for these services, respectively. This contrasts with expenses for physician visits and prescription medicines for children for which 24 percent and 21 percent, respectively, were paid by public programs. These findings, combined with the high share of asthma-related emergency room visits accounted for by children (see Table 2), suggest that low-income families rely disproportionately on emergency rooms for treatment of children with asthma.

Table 5 also contrasts medical expenditures and sources of payment for all conditions to those for asthma-related medical care. The most striking difference between medical expenses for asthma and medical expenses for all conditions is that 42 percent of asthma expenses were for prescription medicines, whereas these made up only 15 percent of the expenditures for all conditions. Prescription medicines are less likely to be covered by private insurance or public programs than other medical care services, so the higher share of

Table 5. Payment Sources for All-Condition and Asthma Medical Expenditures for 1996 (Expenses in $1996 Millions) Source: MEPS (AHRQ, 2001a,b).

Medical Service Category	Patient Age Group	All Conditions				Asthma			
		Total Expense	Private Insurance	Out of Pocket	Public[a]	Total Expense	Private Insurance	Out of Pocket	Public[a]
Inpatient hospitalization facility services	Under 18	$14,794	64%	2%	31%	$254	76%	11%	13%
	18 and over	$165,905	43%	2%	46%	$1,481	33%	1%	65%
	All ages	$180,699	44%	2%	45%	$1,736	39%	3%	57%
Inpatient physician services	Under 18	$2,999	74%	4%	20%	$40	81%	5%	14%
	18 and over	$23,506	61%	4%	32%	$142	16%	2%	82%
	All ages	$26,505	63%	4%	31%	$182	31%	2%	67%
Outpatient facility visits	Under 18	$4,011	77%	7%	14%	$47	14%	1%	73%
	18 and over	$50,719	58%	6%	30%	$98	81%	6%	8%
	All ages	$54,730	60%	6%	28%	$145	59%	4%	29%
Emergency room visits	Under 18	$4,330	56%	11%	12%	$98	32%	15%	47%
	18 and over	$12,558	49%	11%	34%	$162	60%	4%	26%
	All ages	$16,888	51%	11%	28%	$260	50%	8%	34%
Physician office visits	Under 18	$12,934	53%	28%	14%	$317	44%	26%	24%
	18 and over	$92,547	48%	22%	25%	$726	39%	26%	33%
	All ages	$105,481	49%	23%	24%	$1,043	41%	40%	13%
Prescription medications	Under 18	$5,541	44%	40%	15%	$487	43%	35%	21%
	18 and over	$65,566	39%	45%	12%	$1,952	44%	41%	11%
	All ages	$71,106	40%	45%	13%	$2,438	44%	40%	13%
All services	Under 18	$44,608	60%	16%	20%	$1,243	49%	24%	24%
	18 and over	$410,801	46%	14%	33%	$4,562	40%	23%	35%
	All ages	$455,409	48%	14%	31%	$5,805	42%	23%	32%

[a]*Public programs include Medicaid, Medicare, other state, other federal, and workers' compensation.*

all asthma expenditures paid out of pocket by patients and their families (23 percent for asthma versus 14 percent for all conditions) is a result of the high share of expenditures on prescription medicines for asthma.

3.4 Comparison to Another Estimate of Asthma-Related Medical Expenditures

Table 6 compares the MEPS-based estimates of asthma-related medical expenditures for 1996 to estimates reported by Weiss et al. (2000) for 1994 based on data from 1993 through 1995. The Weiss et al. estimates are based on annual surveys of medical care utilization in the United States, including the National Hospital Discharge Survey and the National Ambulatory Medical Care Survey. These data sources do not provide the detailed individual patient expenditure data in the MEPS that allow for an examination of the distribution of expenditures across patients, but they collect limited information on a much larger share of the more rare medical care events such as hospitalizations and emergency room visits realized by the U.S. population. For specific illnesses such as asthma, the MEPS-based national estimates for these more rare types of events are based on extrapolations from a fairly small sample. Thus, it is important to compare the findings to those

Table 6. Comparison of National Estimates of Asthma-Related Medical Expenditures

Medical Service Category	1994 Estimates[a] Number (1000s)	1994 Estimates[a] 1994 Dollars (Millions)	1996 Estimates[b] Number (1000s)	1996 Estimates[b] 1996 Dollars (Millions)
Inpatient hospitalizations	477	$1,897	394	$1,736
Inpatient physician services	—	—	—	$182
Outpatient facility visits	1,708	$633	614	$145
Emergency room visits	1,592	$477	883	$260
Physician office visits	10,757	$647	15,014	$1,043
Prescription medications	—	$2,452	—	$2,438
Total expenses	—	$6,108	—	$5,805

[a]*Weiss et al. (2000). Costs for inpatient physician services are included in hospitalization costs.*
[b]*MEPS (AHRQ, 2001a,b).*

obtained from other data sources to assess their accuracy.

Total annual expenditures for asthma-related medical care estimated by Weiss et al. for 1994 were $6.1 billion, which is comparable to the estimate of $5.8 billion based on the MEPS data for 1996.[1] In the two largest expenditure categories, prescription medications and inpatient hospitalizations, the estimates are also quite comparable. There are some differences between the estimates for outpatient facility visits and physician office visits, but the total expenditures for the two categories are comparable. This suggests there may be differences in how these expenditures are categorized in the different data sources.

One important difference in the two expenditure estimates is in their age-based distribution (not shown). Weiss et al. (2000) report that asthma-related medical expenditures for those under age 18 accounted for roughly 32 percent of the total expenditures. This is roughly proportional to the age distribution of asthma prevalence. The equivalent figure in the MEPS-based estimates for asthma patients under age 18 is 20 percent of total expenditures. The MEPS-based result reflects lower expenditures for children per event such as emergency room visit, rather than fewer events.

[1] Weiss et al. (2000) also estimated the value of asthma-related indirect expenses such as the loss of income associated with premature mortality, lost work days, and lost school days. Their estimates for 1994 were $3.0 billion for the value of lost productivity due to asthma-related morbidity and $1.6 billion for the value of lost future earnings due to asthma-related mortality. A comparison of results for these categories is not possible with the MEPS data, which do not provide condition-specific estimates of these outcomes.

4 Trends in Asthma and Asthma-Related Medical Expenditures

4.1 Changes in Expenditures Since the 1980s

Table 7 provides two estimates of asthma-related medical occurrences and expenditures based on data from the mid-1980s, allowing a comparison to the two estimates from the mid-1990s. The estimates for 1985 and 1994 are both reported by Weiss et al. (2000) and are based on similar data sources. The 1987 estimate reported by Smith et al. (1997) is based on the National Medical Expenditure Survey, the second in the series of medical service use and expenditure surveys in which the MEPS is the third survey. Thus, we compare the 1985 estimates to the 1994 estimates and the 1987 estimates to the 1996 estimates. The two estimates from the mid-1980s are reasonably consistent with each other, as are the two estimates from the mid-1990s.

Total asthma-related medical expenditures in the mid-1990s were 2 or 2.5 times higher than those from the mid-1980s. This increase is less than the tripling of expenditures that we would expect to see if the increase were strictly proportional to changes in asthma prevalence and medical prices. This implies expenditures per asthmatic declined.

Trends in individual categories of medical service use and expenditures based on the different data sources are not quite as consistent

Table 7. Asthma-Related Medical Care Trends

		Facility Surveys			Patient Surveys		
Medical Service Category		1985[a]	1994[a]	% Change from 1985	1987[b]	1996[c]	% Change from 1987
Inpatient hospitalizations[d]	Occurrences	464	477	+3%	445	393	-12%
	Expenditures	$1,140	$1,897	+66%	$1,534	$1,918	+25%
Outpatient Facility visits	Occurrences	1,500	1,708	+14%	1,500	614	-59%
	Expenditures	$129	$633	+390%	$303	$145	-52%
Emergency Room visits	Occurrences	1,810	1,592	-12%	1,200	883	-26%
	Expenditures	$200	$479	+139%	$187	$260	+39%
Physician Office visits	Occurrences	6,500	10,757	+65%	13,000	15,014	+15%
	Expenditures	$193	$647	+235%	$397	$1,043	+163%
Prescription medications		$713	$2,452	+244%	$499	$2,438	+389%
Total medical costs		$2,376	$6,108	+157%	$2,920	$5,805	+99%

[a] *Weiss et al. (2000).*
[b] *Smith et al. (1997).*
[c] *MEPS (AHRQ, 2001a,b).*
[d] *Costs include inpatient physicians.*

Occurrence estimates in thousands.
Expenditures in millions of nominal year dollars.

Table 8. Estimated Asthma Prescription Costs Per Patient Based on Guidelines Source: U.S. EPA (1999).

		Estimate Annual Prescription Cost Per Patient (1998 Dollars)		
Symptom Severity	Share of Asthma Population	Bronchodilator	Anti-Inflammatory	Total
Mild-intermittent	35%	$25	$0	$25
Mild-persistent	35%	$25	$259	$284
Moderate	25%	$274	$1,139	$1,413
Severe	5%	$299	$2,489	$2,789
Weighted average		$101	$500	$601

Figures are age-weighted averages assuming 10% of all asthma patients are age 6 and younger.

as the totals, but some trends are clear. Hospital admissions and emergency room visits stayed the same or declined, so that expenditure increases in these categories reflect only price increases. Physician office visits and expenditures increased, according to both data sources. Weiss et al. report an increase in expenditures for physician office visits proportional to the increases in asthma prevalence and medical prices, but the patient surveys show a somewhat less than proportional increase. The greatest increase in expenditures based on both types of data sources was for prescription medicines, which show greater than proportional increases in both cases. Overall, it looks like there was a shift in expenditures away from hospital and emergency room services and toward physician office visits and prescription medications. This is consistent with the emphasis in the medical community to promote the advances in asthma symptom prevention and control that were made in the past decade (NHLBI, 1991; 1997).

However, expenditures for hospital and emergency room services are still substantial, and, although asthma mortality did not increase in proportion to the increase in asthma prevalence, it did increase by about 40 percent over the same period (Mannino et al., 1998). An obvious question is, therefore, can more progress be made in reducing rates for the more serious asthma-related health outcomes?

4.2 Prescription Medicine Usage for Asthma

Although expenditures for prescription medications for asthma have clearly increased, it is unclear whether the full benefits of the available preventative medications are being realized.In this section we compare estimates of what prescription medication expenditures would be per asthma patient if the current guidelines were followed to the actual expenditures per patient as reported in the MEPS.

Estimates provided by a U.S. EPA-sponsored asthma cost-of-illness study (U.S. EPA, 1999) provide an interesting contrast to the prescription medication expenditure estimates from the MEPS. For the EPA study, current treatment guidelines (NHLBI, 1997) were used to estimate what annual prescription medication expenditures would be for asthma patients with varying levels of asthma severity if asthma medication guidelines were followed. This evaluation was done separately for those age 6 and under and for those over age 6. The results are summarized in Table 8, averaged across the age groups by assuming that 10 percent of asthma patients are age 6 and under. Table 8 also presents the EPA study's estimates of the shares of the asthmatic population in each severity category. These estimates are based on the judgments of an expert medical panel because data on the distribution of asthma severity in the population are not available.

Table 9. Annual Asthma Prescription Expenditures Per Patient Based on MEPS
Source: MEPS (AHRQ, 2001a,b).

	Annual Asthma Prescription Expenditure Per Patient in 1996			
Share of Asthma Population	**Bronchodilator**	**Anti-Inflammatory**	**Other**	**Total**
35%	$11	$3	$6	$21
35%	$46	$25	$28	$102
25%	$236	$171	$88	$506
5%	$877	$774	$539	$2,199
Weighted average	$123	$91	$60	$280

Shares are percentiles of the national population with asthma medical expenditures (8.5 million people), including those with no asthma-related prescription medicine expenditures, sorted by size of the prescription medicine expenditure.

The EPA study estimates are based on the usage of five types of medicines, which are either bronchodilators (short-acting and long-acting albuterol) or anti-inflammatories (cromolyn, beclomethasone dipropionate, or methyl prednisolone). The much higher expected annual costs for those with moderate or severe asthma is the result of the treatment guidelines recommended usage of anti-inflammatory medications several times a day as a preventative treatment.

Table 8 shows that the expected average annual (1998) prescription medication cost for an asthma patient is about $600, but the MEPS data show that for all individuals with any medical expenditures for asthma in 1996, the average annual expenditure for asthma-related prescription medicines was less than $300. Because of this difference between estimates of expected average asthma prescription costs based on the treatment guidelines and the reported expenditures in the MEPS, we examined the MEPS data on asthma-related prescription medicine expenditures in more detail to see if the differences could be accounted for.

Table 9 shows the average asthma-related prescription medicine expenditures from the MEPS data for percentiles of the population with any asthma-related medical expenditures. These percentiles are selected to match the allocation of asthma severity used for the EPA estimates in Table 8. Prescription medicine names are included for each purchase in the MEPS data. We grouped these into three categories: bronchodilator, anti-inflammatory, and other, based on the JAMA (2001) list of asthma drugs. We were unable to distinguish between short-acting and long-acting bronchodilators because the names are the same. Medicines in the "other" category are those that are not listed as asthma drugs by JAMA. Some of these may be other names for the same types of asthma medicines, but some were other types of medicines such as antibiotics and antihistamines that were recorded in the MEPS data with a diagnosis of asthma. Even if all of the medicines in the "other" category were anti-inflammatory medicines, the ratio of expenditures for anti-inflammatories to expenditures for bronchodilators is no more than 1.5 to 1. The EPA estimates suggest that for all asthma patients except those with mild-intermittent asthma, the ratio of anti-inflammatories to bronchodilators should be at least 4 to 1. For the 5 percent of the asthma patients with the highest expenditures, the MEPS data show average prescription medicine expenditures are about 80 percent of what the EPA study estimates for the top 5 percent of all asthma patients, but the EPA estimates suggest that about 10 percent would be for bronchodilators. The MEPS data show that at least 40 percent of the medicine expenditures for this group are for bronchodilators.

5 Conclusions

The MEPS-based estimate of total annual medical care expenditures for asthma for 1996 is about $5.8 billion. The largest category of expenditures is prescription medications and the second largest is inpatient hospitalizations. These results are consistent with estimates by Weiss et al. (2000) for the mid-1990s based on different data sources.

The comparison of the mid-1990s estimates to the previously published mid-1980s estimates shows some significant trends in asthma-related medical care usage. There were declines, or at most very small increases, in the frequencies of the most severe of the direct medical outcomes (i.e., hospitalizations and emergency room visits) relative to the 67 percent growth in asthma prevalence from the mid-1980s to 1996 (Mannino et al., 1998; NCHS, 1998). At the same time, there were proportional or greater increases in physician office visits and prescription medicine expenditures. Both trends are consistent with the goals of the asthma treatment and diagnosis guidelines that were first released in 1991 (NHLBI, 1991). These guidelines emphasize the use of prescription medications and physician office visits, as well as reducing exposures to asthma triggers, to help increase control over asthma symptoms. As noted by Weiss et al. (2000), hospital facility usage declined for all illnesses because of the increased emphasis under managed care on controlling the use of high cost medical services, and the decline overall was greater than the decline for asthma-related hospitalization when the increase in asthma prevalence is accounted for. Weiss et al. (2000) further note that between 1985 and 1994 there was a roughly 11 percent decline in the average length of stay for an asthma-related hospitalization.

An important remaining question then is whether increases in prescription medicine usage and physician office visits reflect reasonably comprehensive adoption of recommended guidelines for asthma treatment (NHLBI, 1991; 1997). The U.S. EPA (1999) estimated what average annual expenditures of prescription medications for asthma would be if current treatment guidelines were followed. These estimates reflect assumptions about the distribution of asthma severity in the population with asthma and estimates of the prescription medication treatment protocol consistent with the most recent treatment guidelines for patients with varying levels of asthma severity (U.S. EPA, 1999; NHLBI, 1997). In contrast to these estimates, the MEPS data show that asthma patients are not, on average, using asthma medicines, especially anti-inflammatory medications, at the rate that the guidelines appear to recommend. The average annual prescription medication expenditure per asthma patient is about one-half of what the guidelines would recommend, given the assumptions used for the EPA estimates. Also, the relative expenditure shares for bronchodilators versus anti-inflammatories suggest that the former are being used more and the latter less than the guidelines recommend.

It appears that there is room for improvement in terms of adoption of the treatment guidelines, especially regarding the use of anti-inflammatory medications to prevent or reduce asthma symptoms. Increased compliance with these guidelines might continue the trend of reducing rates of hospitalization and emergency room visits for asthma patients. However, the data presented here also suggest that compliance with these guidelines may face some barriers. One potential barrier is likely to be the high share of prescription medication expenses that must be paid out of pocket by patients and their families. These out-of-pocket payment levels are especially noteworthy given that they suggest asthma places a relatively high economic burden on the patient relative to other medical conditions: the average share of out-of-pocket payments for all national health expenditures was 14 percent while the out-of-pocket share for asthma-related expenditures was 23 percent, according to the MEPS data for 1996. Further substitution of prescription medications and physician office visits for hospital and emergency room services would push the out-of-pocket share even higher, causing an even greater financial burden for asthma patients' families.

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