

Direct costs of allergic rhinitis in the United States: Estimates from the 1996 Medical Expenditure Panel Survey

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Background: Previous estimates of the cost of allergic rhinitis predate the substantial increase in the use of second-generation antihistamines and intranasal corticosteroids.

Objective: We sought to update estimates of the direct costs of allergic rhinitis in the United States and to estimate prescription medication expenditures by type of insurance coverage.

Methods: Data from the 1996 Medical Expenditure Panel Survey were used in a cross-sectional analysis of resource use and costs. **Results:** Approximately 7.7% of the population are estimated to have had allergic rhinitis in 1996. The total direct medical cost of allergic rhinitis was estimated at \$3.4 billion, with the majority attributable to prescription medications (46.6%) and outpatient visits (51.9%). Fifty-one percent of the prescription medication expenditures were for second-generation antihistamines, 25% for intranasal corticosteroids, and 5% for first-generation antihistamines. Fifty-eight percent of patients with allergic rhinitis received 1 or more prescription drugs for its treatment during the study year. Among these patients, mean prescription expenditures were \$131 (95% CI, \$119-\$143), of which \$50 (95% CI, \$43-\$56) were paid out of pocket. The mean prescription medication expenditure was \$103 (95% CI, \$70-\$136) for persons with Medicaid, \$155 (95% CI, \$140-\$169) for private insurance, \$213 (95% CI, \$0-\$521) for other insurance, and \$69 (95% CI, \$57-\$80) for no prescription drug insurance.

Conclusion: The direct costs of allergic rhinitis have increased substantially since the introduction of second-generation antihistamines and intranasal corticosteroids, especially costs attributable to prescription medications. Individuals with no insurance coverage have higher total out-of-pocket prescription expenditures than those with coverage. (*J Allergy Clin Immunol* 2003;111:296-300.)

Key words: Allergic rhinitis, costs and cost analysis, health insurance

Allergic rhinitis is a common condition in the United States. According to the Centers for Disease Control and Prevention, 23.7 million cases of allergic rhinitis were reported in 1996, including 15.9 million cases among persons aged 45 years or younger.¹ In 1999, 16.7 million physician office visits were attributed to allergic rhinitis.² Despite the high prevalence of the disease, the economic effect of allergic rhinitis is not fully understood. In 1990, the annual cost of allergic rhinitis in the United States was estimated at \$1.8 billion (\$1.16 billion for physician visits and medications and \$639 million for lost productivity).³ An analysis of the 1987 National Medical Expenditure Survey placed the total annual cost of allergic rhinitis at \$1.23 billion (\$1.15 billion for direct medical costs and \$86 million for lost productivity) in 1994 dollars.⁴ In a 1993 survey of 481 persons with self-reported allergic rhinitis, treatment costs extrapolated to the US population were \$3.4 billion, including \$2.3 billion for prescription and over-the-counter medications and \$1.1 billion for physician visits.⁵

Despite such estimates, these figures are not accurate reflections of costs today because they predate the substantial increase in the use of second-generation antihistamines and intranasal corticosteroids, which now represent first-line treatment for allergic rhinitis.⁶⁻⁸ Previous studies, because they were based on self-reported data from respondents, were further limited by their potential for underreporting and recall bias.

Over the last decade, advances in pharmacologic treatment of allergic rhinitis have offered patients improved efficacy, albeit at higher costs. For many individuals with allergic rhinitis, prescription drug insurance helps to insulate consumers from the high cost of prescription medications used to minimize symptoms of allergic rhinitis. Variation in cost sharing has been found to affect the drug-use patterns among elderly persons with coronary heart disease.⁹ Thus we would expect drug expenditures for allergic rhinitis to vary with the type of insurance coverage as well. However, no study to date has determined the magnitude of this relationship.

Using data from the 1996 Medical Expenditure Panel Survey (MEPS), we sought to provide updated estimates of the direct costs of allergic rhinitis to reflect changes in treatment patterns that have occurred in the past decade. We also sought to estimate costs associated with

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Abbreviation used

MEPS: Medical Expenditure Panel Survey

immunotherapy and to explore the effects of prescription drug insurance coverage on differences in medication expenditures attributable to allergic rhinitis.

METHODS

Data sources and study population

Data for this analysis are from the 1996 MEPS, a nationally representative survey of health care use and spending in the civilian, noninstitutionalized population of the United States.¹⁰ Expenditures recorded in the MEPS database represent what was paid for health care services, thus differing from expenditure data available in predecessor surveys (ie, the 1977 National Medical Care Expenditure Survey and the 1987 National Medical Expenditure Survey), which used charges as measures of expenditures. Estimates in MEPS incorporate discounting, but they do not incorporate payments not directly linked to specific medical care visits, such as bonuses and retrospective payment adjustments by third-party payers. Although MEPS is based largely on self-reported data, reports of medication costs, which represent a large proportion of total costs,^{3,5} were validated with pharmacy records for prescription drugs.

For this study, we analyzed the direct costs of prescription medications, outpatient visits, and emergency department visits. Inpatient treatment for allergic rhinitis was not considered because only one survey respondent had a record indicating an inpatient stay for allergic rhinitis. Indirect or productivity costs were not included because of insufficient data in MEPS for estimating the number of missed workdays or schooldays attributed to allergic rhinitis. The specific methods used to estimate costs attributable to allergic rhinitis are described in greater detail below.

Prevalence

The prevalence of allergic rhinitis was based on subjects who reported having allergic rhinitis in the "Medical Conditions" file of MEPS and for those who sought medical treatment for allergic rhinitis, which was defined as a visit to a medical provider or receipt of a prescription drug for allergic rhinitis, but who might not have reported it as one of their medical conditions.

Direct medical costs

Pharmacy costs. The information collected in the "Prescribed Medicines" file of MEPS was retrieved directly from pharmacy records. Only prescription medications were included; records for over-the-counter medications were excluded from the analysis (0.3%). The file includes a mix of nonproprietary and trade names, their National Drug Code numbers, and associated expenditure data, including the amount paid for each prescription on the basis of source of payment. Each prescription is associated with up to 3 International Classification of Diseases, Ninth Revision, Clinical Modification codes. We included medications with code 477 (allergic rhinitis) as the primary or secondary medical condition.

We converted all medication names to generic names and assigned a drug class to each medication. Medications were coded as missing if the name could not be matched to those listed in the 1996 Redbook.¹¹ We excluded records that contained a missing code (0.8%), records for medical supplies (0.1%), and records for medications not associated with the treatment of allergic rhinitis or its symptoms (6.0%).

We computed total and out-of-pocket prescription medication spending by category of prescription drug insurance coverage for

each person who filled a prescription medication for allergic rhinitis. Each subject was classified into an insurance category determined by the source or sources of payment for all prescriptions in the previous 12 months, as indicated in pharmacy records. The "Medicaid" category includes individuals with prescription drug insurance through Medicaid at any time throughout the study year. The "private insurance" category includes patients with prescription drug insurance from a private payer at any time throughout the study year. Five patients who received drug coverage from both private insurance and Medicaid were grouped into the private insurance category. Individuals with prescription drug insurance from a source other than a private insurer or Medicaid were grouped into the other insurance category (eg, state and local government and Veterans Administration). Five patients who received drug coverage from private insurance or Medicaid plus some other type of insurance were grouped into the "other insurance" category. The "no drug insurance" category includes patients who did not receive prescription drug insurance from any third-party payer at any time during the study year. Eight patients who reported having drug coverage through Medicare were grouped into the no drug insurance category, because Medicare currently does not provide an outpatient prescription drug benefit.

Ambulatory care costs. Expenditure information for ambulatory care visits was retrieved from 3 event files of the MEPS—emergency department visits, clinic visits, and office-based provider visits. Each file contains the date of the visit, medical condition codes (eg, the purpose of the visit), expenditures, and the source or sources of payment associated with the visit. Because of the design of the survey, the costs of procedures and laboratory tests were not listed separately; only the total amount paid for each visit was identified. As with prescription medication costs, costs associated with ambulatory care visits for allergic rhinitis included all visits for which allergic rhinitis was identified as the primary or secondary medical condition. Because there was not a clear distinction between clinic visits and office-based provider visits, costs for both types of outpatient visits were combined.

Statistical analysis

All analyses used patient-specific sampling weights provided by MEPS and were performed with SAS version 8.2 (SAS Institute, Cary, NC) and STATA version 7.0 (STATA Corp, College Station, Tex) statistical software packages to account for the complex sampling design of the survey and to provide nationally representative population estimates. Data manipulation was performed with SAS, and STATA was used to compute nationally representative estimates. STATA was also used to compute 95% CIs for the national estimates of allergic rhinitis prevalence, resource use, and expenditures. The results were validated for consistency with both SAS and STATA. Cost estimates are reported in 1996 US dollars.

RESULTS

On the basis of survey responses, visits to medical providers, and drug prescriptions for allergic rhinitis, approximately 7.7% ($n = 20.9$ million [95% CI, 18.9-22.8 million]) of the civilian, noninstitutionalized population of the United States had allergic rhinitis in 1996 (Table I). Of patients who reported having allergic rhinitis in the Medical Conditions file, 66% had a provider visit, filled a prescription for allergic rhinitis, or both in 1996.

Persons in the United States made approximately 36.5 million ambulatory care visits (95% CI, 32.7-40.4 million) and filled over 39.5 million drug prescriptions (95% CI, 37.1-41.8 million) for allergic rhinitis. Among all

Asthma, rhinitis,
other respiratory
diseases

TABLE I. Weighted estimates of the prevalence of allergic rhinitis in the United States, 1996*

	Persons with allergic rhinitis (millions)†	Persons who sought treatment (millions)‡
Total, n	20.9	13.8
Men	8.7 (41.6)	5.3 (38.5)
Women	12.2 (58.4)	8.5 (61.5)
Age		
0-12 y	2.9 (14.0)	1.9 (14.1)
13-17 y	1.6 (7.6)	0.8 (5.8)
18-44 y	9.0 (43.1)	5.6 (40.8)
45-64 y	5.0 (23.9)	3.6 (26.1)
≥65 y	2.4 (11.4)	1.8 (13.2)
Race-ethnicity		
White	18.0 (86.3)	11.9 (86.4)
Black	1.8 (8.5)	1.2 (8.9)
Other	1.1 (5.2)	0.7 (4.7)

*Values are expressed as numbers (percentage) unless otherwise indicated.

†Values are based on self-reported medical conditions and treatment received for allergic rhinitis.

‡Medical treatment was defined as a visit to a health care provider for allergic rhinitis or receipt of a prescription drug for allergic rhinitis.

TABLE II. Estimates of the costs of allergic rhinitis in the United States, 1996

	Cost (95% CI), \$ millions
Direct costs	3390 (2800-3980)
Emergency department visits	50 (15-84)
Outpatient visits	1760 (1310-2210)
Immunotherapy	691 (567-816)
Nonimmunotherapy	1070 (897-1250)
Prescription medications	1580 (1350-1820)

ambulatory care visits made by patients who sought treatment, allergic rhinitis was recorded as the primary medical condition in approximately 93% of cases ($n = 34.1$ million; 95% CI, 31.3-37.0 million) and as the secondary medical condition in approximately 7% of cases ($n = 2.4$ million; 95% CI, 2.3-2.5 million). Among all prescriptions filled by patients who sought treatment, allergic rhinitis was recorded as the primary medical condition in 95% of cases ($n = 37.6$ million; 95% CI, 35.5-39.8 million) and as the secondary medical condition in 5% of cases ($n = 1.84$ million; 95% CI, 1.79-1.89 million).

Direct medical costs

The total direct medical cost of allergic rhinitis was \$3.4 billion (Table II). Prescription medication costs comprised 46.6% and outpatient visits (including outpatient clinic and office-based provider visits) comprised 51.9% of the total direct cost. Adults spent a larger portion of their total costs on prescription medications (36% for patients aged <18 years vs 48% for patients aged ≥18 years). On the other hand, children and adolescents spent a larger portion on outpatient visits (61% for patients aged <18 years vs 50% for patients aged ≥18 years).

Fifty-eight percent of patients with allergic rhinitis received 1 or more prescription drugs for its treatment, and 75% of these patients had some type of prescription drug insurance at some time during the study year (overall and among the working population aged 18-64 years). Each person receiving prescription medications filled an average of 3 drug prescriptions for allergic rhinitis per year; 51% of the expenditures for prescription medications were for second-generation antihistamines, 25% were for intranasal corticosteroids, and 5% were for first-generation antihistamines.

Prescription medication costs by prescription drug insurance category

Among persons who received prescription medication for allergic rhinitis, the mean annual expenditure for prescription medications was \$131, of which \$50 were paid out-of-pocket by the patient (Table III). The mean annual expenditure for prescription medications per person was \$103 for subjects with Medicaid, \$155 for those with private insurance, \$213 for those with other types of insurance, and \$69 for individuals who did not have prescription drug insurance at any time during the year. The mean out-of-pocket expenditure per prescription was \$1 for subjects with Medicaid, \$10 for those with private insurance, \$14 for those with other insurance, and \$30 for individuals with no prescription drug insurance.

Direct costs related to allergen immunotherapy

Greater than 50% of outpatient visits for allergic rhinitis ($n = 19.5$ million; 95% CI, 16.7-22.4 million) were associated with administering immunotherapy to an estimated 1.8 million persons (95% CI, 1.7-2.0 million) in 1996. Of these visits, 95% were coded with allergic rhinitis as the primary condition.

The total cost attributable to immunotherapy was approximately \$691 million (20% of the total direct costs for allergic rhinitis). When including the cost of prescription drugs for patients receiving immunotherapy, the 8.6% of patients receiving immunotherapy accounted for 35.9% (\$1.22 billion) of the total direct cost attributed to allergic rhinitis. Annual direct costs were 5.8-fold higher for patients with allergic rhinitis receiving immunotherapy (\$661 vs \$114). Costs for outpatient physician visits for patients receiving immunotherapy were \$524 per year compared with \$42 per year for patients not receiving immunotherapy.

Average annual medication costs were 23% higher for patients receiving immunotherapy (\$135 vs \$70). The proportion of patients receiving immunotherapy with various categories of allergic rhinitis medications was not significantly different than the proportion of patients not receiving immunotherapy. Patients with private health insurance were overrepresented in the group of patients receiving immunotherapy (81% vs 63%). Patients with Medicaid were least likely to receive immunotherapy (0.9% vs 6%).

TABLE III. Mean prescription drug expenditures by insurance category, 1996

Insurance category	No. of persons (95% CI)	Expenditure per person (95% CI), \$		Expenditure per prescription (95% CI), \$	
		Total	Out of pocket	Total	Out of pocket
All categories	12,055 (11,433-12,677)	130.6 (119.2-142.0)	49.5 (42.9-56.2)	38.3 (36.8-39.9)	14.6 (13.5-15.6)
No coverage*	3056 (2900-3212)	68.8 (57.4-80.1)	66.5 (55.0-78.1)	30.6 (28.3-32.9)	29.7 (27.3-32.1)
Medicaid	874 (836-913)	102.6 (69.8-135.5)	5.9 (3.8-8.0)	28.2 (23.0-33.3)	1.3 (0.5-2.1)
Private insurance	7829 (7509-8149)	154.8 (140.2-169.4)	46.2 (39.5-52.8)	42.3 (40.3-44.4)	10.2 (9.4-11.0)
Other insurance	295 (281-310)	212.5 (0-520.8)	92.4 (0-208.6)	42.2 (41.1-43.4)	14.0 (5.4-22.7)

*Medicare-only patients were grouped into the "no drug coverage" group and account for the small differential between out-of-pocket expenditures and total expenditures.

TABLE IV. Direct costs of allergic rhinitis reported in the published literature

Study	Subjects with allergic rhinitis (millions)	Year(s) of data source(s)	Year of cost estimate	Direct costs (billions US\$)	Direct costs adjusted to 1996 dollars (billions US\$)*
McMenamin, 1994 ³	22.4	1985-1990	1990	1.16	1.63
Storms et al, 1997 ⁵	35.9	1993	1993†	3.4	3.8
Malone et al, 1997 ⁴	38.9	1987	1994	1.15	1.24
Mackowiak et al, 1997 ²⁰	11.7	Various	NR	4.5	—
Current study	20.9	1996	1996	3.4	3.4

NR, Not reported.

*Costs were updated by using the Bureau of Labor Statistics Consumer Price Index for Medical Care.

†Year of cost estimates were not reported but assumed to be valued in the same year as the survey.

DISCUSSION

Approximately 20.9 million persons in the United States have allergic rhinitis, representing nearly 8% of the population, of whom 66% sought care from a health care provider or filled a drug prescription for allergic rhinitis. The total direct medical cost of allergic rhinitis was approximately \$3.4 billion, with the majority of the cost attributed to prescription medications and outpatient visits. Persons with no prescription drug insurance had lower mean annual expenditures for prescription medications to treat allergic rhinitis compared with persons with Medicaid private insurance or other types of prescription drug coverage (Table III). However, out-of-pocket costs per prescription for persons without prescription drug insurance were higher than for those with some type of coverage.

Whereas previous studies have reported 1-year prevalence rates as high as 16%,^{3-5,12,13} our estimate of 7.7% is comparatively lower. This might be due, in part, to the design of MEPS, which asked respondents to freely report their medical conditions. Previous studies prompted subjects to respond to specific questions about whether they had hay fever or allergic rhinitis.⁴ However, we believe we have captured data on the patients who accounted for the large majority of costs for allergic rhinitis because we included patients receiving medical treatment for the disease regardless of whether they reported the condition. Persons with milder cases might have been more likely to have forgone treatment, to have self-treated with over-the-counter allergy medications, or to have experienced a nonallergic condition, such as an upper respiratory tract infection.^{3,5}

There has been a substantial increase in the proportion of patients with allergic rhinitis who seek treatment, from 12% in 1987 to 66% in 1996.⁴ Our cost estimates indicate a substantial increase in the costs of allergic rhinitis compared with figures reported in the 1990s (Table IV). When inflated to 1996 dollars using the US Consumer Price Index for Medical Care (available at <http://www.bls.gov/>), the estimates reported by Malone et al⁴ and McMenamin³ were 3 times less than those estimated in our analysis. Estimates by Storms et al⁵ from a 1993 survey, when adjusted to 1996 dollars, reported both prescription and over-the-counter medication costs (both estimated at \$63 per year per patient) that were closest to our findings (\$1.03 vs \$1.58 billion for prescription medications), and their estimates of physician costs were approximately 75% of our estimates (\$1.28 vs \$1.76 billion for outpatient visits).

To our knowledge, this is the first study to report national estimates regarding the resource use and costs of immunotherapy. Although the number of visits for immunotherapy account for approximately half of all outpatient visits for allergic rhinitis, patients receiving immunotherapy represent just 8.6% of all patients reporting to have allergic rhinitis. The majority of visits were made by children and younger adults (19% aged <18 years, 44% aged 18-44 years, 28% aged 45-64 years; and 8% aged ≥65 years). Direct medical costs attributable to allergic rhinitis were 5.8-fold higher in patients receiving immunotherapy. Most of the additional costs were related to office visits to receive therapy. Thus emerging therapies that might reduce the need for immunotherapy or that might allow for self-administration of immunotherapy could have a substantial effect on treatment patterns

for patients treated by allergy specialists. In addition, differences in the use of immunotherapy on the basis of the type of insurance were also observed. This finding might indicate differences in access to specialty care for patients covered by Medicaid programs.

On the basis of moral hazard theory,^{14,15} we would expect individuals in the no insurance category to have lower total costs. Indeed, for subjects without prescription drug coverage for all 12 months who were captured by the survey, the mean prescription expenditure per person was only \$69 (95% CI, \$57-\$80) compared with \$152 (95% CI, \$137-\$166) for subjects with some type of insurance coverage. Persons without prescription drug insurance might have either limited the quantity of medication filled with each prescription or filled medications that were less costly. The total cost per prescription averaged \$31 (95% CI, \$28-\$33) for persons without prescription drug insurance for the entire year compared with \$41 (95% CI, \$39-\$43) for persons with some type of prescription drug insurance.

Our analysis had a few limitations. First, although the prescription medication data were validated on the basis of pharmacy records, there remains the potential for underreporting and recall bias in the data obtained from MEPS because subjects might have forgotten to report some pharmacies where they filled their medications. Second, the database contained no objective measures of disease severity. Such data could have enhanced our ability to stratify and quantify the effects of allergic rhinitis on costs and to describe drug-prescribing patterns. It would also have been possible to determine whether patients receiving immunotherapy had more severe disease and would have been expected to incur greater medication costs in the absence of immunotherapy. We might also have underestimated costs because of potential underreporting of all medical conditions in the MEPS data set. In cases in which only a primary diagnosis was provided, coexisting conditions, such as asthma, might have been more likely to have been reported than allergic rhinitis. Finally, MEPS did not routinely collect information about over-the-counter medications. In the study by Storms et al,⁵ the annual amount reportedly spent on prescription drugs was equal to the amount spent on over-the-counter medications. However, the medication costs in that analysis were based on patient-reported expenditures. Therefore it is unclear whether the estimates reported by Storms et al reflect out-of-pocket spending or total cost of medications, which often are not known by patients because of insurance cost-sharing arrangements.

Despite a substantial increase over the 1987 and 1990 estimates, there are reasons to believe that our data continue to underestimate today's costs of treatment. When projecting our estimate to 2001 dollars, the total direct medical cost of allergic rhinitis is \$4.6 billion. However, sales for 3 second-generation antihistamines (ie, cetirizine, fexofenadine, and loratadine) alone reached over

\$4.5 billion in 2000.¹⁶⁻¹⁸ At the same time, however, our estimates might overestimate the future costs of treatment. A Food and Drug Administration advisory committee has considered switching these medications to non-prescription status.¹⁹ Such an action would inevitably affect resource use and expenditures associated with allergic rhinitis. Because most insurance plans do not cover the costs of over-the-counter medications, patients without prescription drug insurance in our study might best represent the behavior of the majority of patients with allergic rhinitis, who would be faced with the burden of paying the full cost of second-generation antihistamines.

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