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A cost of illness study of allergic rhinitis in the United States

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Abstract

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Background: Allergic rhinitis is a common condition, but the burden of this condition on the national economy is not well understood.

Objective: The purpose of this study was to estimate the national direct and indirect costs of allergic rhinitis.

Methods: Data from the National Medical Expenditure Survey were used to provide estimates of resource utilization, medical expenditures, and lost productivity. With the complex survey design, variance estimates were used to construct confidence intervals for cost estimates of resource utilization and lost productivity.

Results: It is estimated that approximately 39 million persons in the United States experienced allergic rhinitis in 1987. However, only 12.3% (4.8 million) sought medical treatment for allergic rhinitis. The total estimated cost of the condition, in 1994 dollars, was \$1.23 billion (95% confidence interval, \$846 million to \$1.62 billion). Direct medical expenses accounted for 94% of total costs. Allergic rhinitis resulted in approximately 811,000 missed workdays, 824,000 missed school days, and 4,230,000 reduced activity days.

Conclusion: Allergic rhinitis clearly creates a burden in terms of the number of persons affected, total expenditures, and lost productivity. It also appears that a relatively large proportion of persons with allergic rhinitis were not seeking medical treatment. (J Allergy Clin Immunol 1997;99:22-7.)

CI Confidence interval

NMES National Medical Expenditure Survey

OTC Over-the-counter

(Click on a term to search this journal for other articles containing that term.)

Key Words: [Allergic rhinitis](#), [hay fever](#), [cost of illness](#), [cost and cost analysis](#), [National Medical Expenditure Survey](#)

Allergic rhinitis is a common condition for which many persons never seek medical care.¹ There is concern that the incidence of allergic rhinitis may be increasing because of changes in environmental factors.²⁻⁴ An important component of the morbidity of allergic rhinitis is the economic consequences of this condition. The treatment of the symptoms and complications includes a variety of medical and nonmedical products and services with costs that are believed to be substantial. In addition, there are indirect costs associated with this condition. Symptoms may be severe enough to warrant cessation of activities, including school- or work-related activities.

This current cost of illness study seeks to address the limitations of the previous work⁵ in estimating the direct and indirect costs of allergic rhinitis as a measure of its impact on the U.S. economy.

Methods

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Data for this study are from the 1987 National Medical Expenditure Survey (NMES) of approximately 14,000 households, representing 36,259 civilian noninstitutionalized individuals in the United States. A principal advantage of NMES over other national medical surveys is the

incorporation of medical expenditures. The reported expenditures for medications and ambulatory visits reflect total payments, including consumer out-of-pocket and third party payer expenditures. In situations in which no costs were reported (e.g., charity care), logical edits and imputations were conducted by the Agency for Health Care Policy and Research to approximate the market value for those services and products.

Records of interest were identified by using the *International Classification of Diseases (ninth edition) Clinical Modification* (ICD-9-CM) codes. Allergic rhinitis was defined as in ICD-9-CM code 477 and 477 subcategories. In addition to point estimates for the various cost types, sampling weights in the NMES survey were used to construct 95% confidence intervals (CIs) with SUDAAN software (Research Triangle Institute).⁷ Cost estimates are reported in both 1987 and 1994 dollars. Dollars were inflated by using the consumer price indexes for each component of medical care spending.⁸ Estimates for work or school loss and restricted activity days were inflated to 1994 dollars by using the annual percent change in earnings and compensation from 1988 to 1994.⁸

Prevalence

Prevalence of allergic rhinitis in 1987 was determined by examining health status questionnaire data, which contained information regarding whether respondents had an episode of hay fever during the year. We used person-level weights to estimate the number of persons who sought medical care, missed work or school, or were otherwise limited by allergic rhinitis.

Direct medical costs

Medical care resource utilization and costs associated with the diagnosis and treatment of allergic rhinitis were identified from various NMES tapes containing information about prescribed medicines and ambulatory medical visits.

Medications

The prescribed medicines tape contains respondent-reported medications that were prescribed by a licensed practitioner. Prescribed medications included both prescription and over-the-counter (OTC) pharmaceuticals. OTC medications obtained for self-treatment were not captured by the survey. Each medication was linked to a specific condition identified by the respondent and then translated to ICD-9-CM codes by trained medical coders. The design of the survey allowed up to four ICD-9-CM codes for each reported medication. Of the medication records associated with allergic rhinitis, 96% contained only ICD-9-CM codes for allergic rhinitis. The remaining 4% had two ICD-9-CM codes (one of which was for allergic rhinitis). Furthermore, to eliminate those medications that are not used to treat allergic rhinitis, three investigators independently classified the medications into three groups: (1) most likely used for allergic rhinitis, (2) possibly used for allergic rhinitis, and (3) definitely not used for allergic rhinitis. Ratings were tallied, and disagreements were then discussed to reach a consensus. The primary analysis includes medications from groups 1 and 2.

Medical visits

Information about ambulatory medical provider visits was obtained from the ambulatory medical

provider tape. This tape includes medical provider visits (e.g., office and clinic), emergency department visits, and hospital outpatient visits. We examined the range of expenses for each type of clinical setting for face validity and reduced obvious outliers to next highest expense. Expenditures for emergency department and hospital outpatient visits reflect both facility and provider expenses.

Lost productivity

The human capital approach was taken to value lost productivity.⁹ Adopting a societal view of the cost of allergic rhinitis, we valued lost productivity by using a person's daily personal wage rate. NMES data provided estimates of the number of work or school days missed or the number of restricted activity days attributable to allergic rhinitis. For adults, defined as those individuals 18 years of age or older, the daily wage rate was calculated by dividing the person's income from salary and tips by the number of days worked during the year. This figure was multiplied by the number of missed days to obtain a measure of the lost productivity.

School absenteeism represents another economic cost to society; however, valuing lost learning opportunity is fraught with assumptions. Therefore for those children under 12 years of age, the lost productivity was attributed to a parent or guardian missing work to take care of the child. In cases in which two persons were linked to the child, the lowest income was used to estimate lost productivity. If one parent or guardian did not appear to work, no economic value was assigned to the observation. Lost productivity was not included for those children 13 to 17 years of age, under the assumptions that they were not working and that it would not be necessary for their parents or guardians to miss work to care for them.

Restricted activity days represent a third type of indirect cost and were defined by NMES as times when the respondent was unable to engage in normal activities for at least half a day. Because restricted activity days were not differentiated into work or leisure time, each restricted activity day was counted as 5/7, assuming that each day of the week had an equal chance of being a restricted activity day and that individuals had 2 days off per week. Restricted activity days were valued at a conservative wage rate equal to 25% of the person's daily salary. This assumption was varied in the sensitivity analysis with values of 10% and 50%. Not included were restricted activity day costs for individuals younger than 18 years of age.

Results

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Prevalence

The number of adult persons in the U.S. population who self-reported having allergic rhinitis during the 1987 calendar year was approximately 26.7 million. The number of children with allergic rhinitis was approximately 12.3 million. Thus approximately 38.9 million persons in the United States experienced allergic rhinitis in 1987 (Table I).

Table I. NMES weighted estimates for persons with allergic rhinitis in the United States: 1987

Category	Persons experiencing allergic rhinitis		Persons who received medical treatment*	
	No.	%	No.	%
Gender				
Male	17,628,049	45	2,128,486	45
Female	21,367,715	55	2,630,465	55
Age (yr)				
0 to 17	12,317,664	32	1,242,489	26
18 to 44	16,696,629	43	1,936,824	41
45 to 64	6,707,358	17	1,096,788	23
65 and older	3,274,113	8	482,850	10
Race				
Native American	328,921	1	97,273	2
Asian/Pacific	606,762	1	93,167	2
Black	4,215,059	11	271,851	6
White	32,728,023	84	4,225,982	89
Other	1,116,999	3	70,678	1
Total persons	38,995,764	100	4,758,951	100

*Medical treatment is defined as an ambulatory visit to a medical provider or taking a prescribed medicine.

The condition is distributed fairly evenly between male and female individuals and appears to mainly affect persons under age 45. Blacks represent approximately 11% of affected persons but only 6% of those who received medical treatment. The total number who sought medical treatment was approximately 4.7 million persons, and 1.3 million missed school or work because of allergic rhinitis (not shown).

Direct costs

Prescribed medicines

The number of new and refill medications ordered by a licensed practitioner was estimated to be 11.5 million prescriptions. The medications mentioned most often were products containing two or more active ingredients (28.3%) and terfenadine (13.9%). Expenditures for medications were \$184 million (95% CI, \$150 million to \$218 million) in 1987 dollars. Because of the NMES survey design, we were unable to estimate the cost and number of persons who self-treat with OTC products.

Ambulatory care

There were approximately 16.7 million visits to medical providers for the treatment of allergic

rhinitis, with the vast majority (95%) occurring in medical offices or clinics. Care was delivered by a variety of health care providers, including nurses (23.8%), allergists (16.5%), and pediatricians (8.9%) (Table II).

Table II. Distribution of self-reported allergic rhinitis–related medical office and clinic visits by provider type*

Provider type	Weighted visits	Percent
Not certain	2,822,062	17.8
Allergist	2,628,140	16.5
Otolaryngologist	618,792	3.9
General or family practitioner	998,098	6.3
Internist	453,672	2.9
Pediatrician	1,413,875	8.9
Nurse	3,780,540	23.8
Other	3,113,897	19.6
Total	15,894,428	100

*Approximately 0.8 million visits occurred in other settings (e.g., emergency departments) for a total of 16.7 million visits.

A large proportion (17.8%) of provider types are unknown because the data was self-reported. The 1987 cost of medical office and clinic visits associated with allergic rhinitis was \$418 million (95% CI, \$319 million to \$517 million).

Non-office– or non-clinic–based ambulatory visits were represented by outpatient hospital visits and emergency department visits. There were approximately 734,000 and 101,000 hospital outpatient and emergency department visits, respectively. Hospital outpatient expenditures associated with allergic rhinitis were \$96.3 million (95% CI, \$38 million to \$155 million). Emergency department expenditures were \$10 million (95% CI, \$3 million to \$16 million). The relatively large variance in these numbers is due to the small number of observations and wide range of reported expenditures. Combined, they account for approximately \$106 million and may represent those individuals who use the hospital or hospital clinics as a primary source of care.

Indirect costs

Lost work productivity

It was estimated that a total of 811,000 days of missed work were directly attributable to allergic rhinitis in 1987. This represents a potential economic burden of approximately \$37 million (95% CI, \$20 million to \$53 million).

School absenteeism

Approximately 824,000 days of school absenteeism were attributable to allergic rhinitis in 1987. The value of this lost productivity for parental or guardian caretakers was \$13 million (95% CI, -\$0.2 million to \$26 million).

Restricted activity days

In many instances the symptoms of allergic rhinitis are not severe enough to warrant missing an entire day of work. However, it is often difficult to function at full productivity when attention and concentration are diverted toward managing symptoms of allergic rhinitis. Approximately 4,230,000 days of reduced functioning were attributable to allergic rhinitis. In the primary analysis the value of the lost productivity was designated to be 25% of a full day's wages. Under this premise, the estimated value was \$17 million (95% CI, \$3 million to \$31 million). This assumption was varied in the sensitivity analysis (see below).

Total costs

The sum of both direct and indirect costs for allergic rhinitis in 1987 was \$775 million with a 95% CI of \$533 million to \$1.02 billion. In 1994 dollars this represents \$1.23 billion (95% CI, \$846 million to \$1.62 billion) (Table III).

Table III. Direct and indirect cost estimates for allergic rhinitis in 1987 and 1994 dollars

Cost component	1987 Dollars		1994 Dollars	
	Cost estimate	Standard error	Cost estimate	95% CI
Direct costs				
Prescribed medicines	\$184,021,092	\$17,372,206	\$301,371,342	\$245,608,436 to \$357,134,248
Ambulatory visits	\$417,961,203	\$50,352,639	\$648,341,417	\$495,251,669 to \$801,431,165
Office and clinic				
Hospital outpatient	\$96,348,389	\$29,768,375	\$179,814,998	\$70,923,830 to \$288,706,167
Emergency department	\$9,500,551	\$3,387,452	\$17,730,879	\$5,339,755 to \$30,122,003
Total direct costs	\$707,831,235	N/A	\$1,147,258,636	\$817,123,690 to \$1,477,393,583
Indirect costs				
Work-associated productivity loss	\$36,961,823	\$8,610,816	\$46,793,667	\$25,427,134 to \$68,160,201
School-associated productivity loss	\$13,156,948	\$6,797,143	\$16,656,697	-\$209,461 to \$33,522,855

Restricted activity– associated productivity loss	\$17,045,020	\$7,315,664	\$22,959,642	\$3,645,410 to \$42,273,874
Total indirect costs	\$67,163,791	N/A	\$86,410,006	\$28,863,083 to \$143,956,930
Total costs	\$774,995,026		\$1,233,668,643	\$845,986,774 to \$1,621,350,513

N/A, Not applicable.

Direct medical care costs represent 94% of total costs associated with allergic rhinitis. The largest component was medical provider visits (68%). Prescribed medicines account for approximately 26% of total costs.

Although the cost of allergic rhinitis is approximately \$1.23 billion, this is relatively low when compared with other medical conditions (Table IV).

Table IV. Medical expenditures by disease group*

Diagnostic category	Medical expenditures(billions)	Percent of total costs
Cardiovascular	79.6	13.9
Injury and long-term effects	69.1	12.1
Neoplasm	49.6	8.7
Genitourinary	49.3	8.7
Pregnancy/birth-related	39.7	6.9
Respiratory	38.3	6.7
Allergic rhinitis†	1.2	0.2
Digestive	35.9	6.3
Musculoskeletal	27.7	4.8
Other circulatory diagnosis	20.2	3.5
Mental health	19.3	3.4
Well care	17.4	3.0
Congenital anomalies	8.7	1.5
Medical misadventure	6.9	1.2
Miscellaneous	110.6	19.3
Total	572.3	100.0

*Source (except for allergic rhinitis): Miller TR, Lestina DC, Galbraith MS, et al. Medical care spending-United States. MMWR 1994;43:583.

†Allergic rhinitis is a subcategory of respiratory.

For example, cardiovascular diseases consumed approximately \$80 billion in 1993 dollars; and the cost for the entire category of respiratory diseases, including allergic rhinitis, was \$38.3 billion.¹¹ Overall, costs associated with allergic rhinitis represent 0.2% of national health care expenditures.

Sensitivity analyses

Consistent with accepted economic methods, sensitivity analyses were conducted to examine the robustness of the cost estimates when key assumptions were modified. First, when the medications listed with an ICD-9-CM for allergic rhinitis were examined, it was clear that some medications were not used for allergic rhinitis (e.g., captopril). Consequently, medications were classified into three categories (see Methods section), and the primary analysis included those medications that were most likely used and possibly used for allergic rhinitis. When this assumption is varied to only include those medications classified as most likely used for allergic rhinitis, the estimated overall cost of allergic rhinitis is reduced by approximately \$55 million in 1987 dollars.

Another assumption in the primary analysis was the valuation of a restricted activity day at 25% of a full day's wages, even though the NMES defined a restricted activity day as one in which persons were kept from performing activities for at least a half a day. A sensitivity analysis was conducted by valuing a restricted activity day at 10% and 50% of daily wages. A 10% valuation reduced the restricted activity day value from \$17 million to \$7 million, approximately 1.3% of total costs. Assigning a value of 50% increases the economic cost to \$34 million.

Discussion

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Approximately 38.9 million persons in the United States experienced allergic rhinitis in 1987 (representing a prevalence rate of 16.0% of the population¹²); however, only approximately 4.8 million persons with allergic rhinitis (12.3% of those who experienced symptoms) sought medical treatment for allergic rhinitis. The estimated direct costs for allergic rhinitis in the United States for 1987 were \$708 million (\$1.15 billion in 1994 dollars) and the estimated indirect costs were \$67 million (\$86 million in 1994 dollars). The estimated total of direct and indirect costs in 1987 was \$775 million (\$1.23 billion in 1994 dollars). In addition, allergic rhinitis resulted in approximately 811,000 missed workdays, 824,000 missed school days, and 4,230,000 days of reduced functioning. Although most persons who have allergic rhinitis do not seek treatment from a physician, allergic rhinitis clearly creates a burden in terms of the number of persons affected, total expenditures for the condition, and lost productivity.

Although a relatively small proportion of persons with allergic rhinitis sought treatment from a physician for their condition, ambulatory visits accounted for 68% of total costs. This may reflect those individuals who experience severe allergic rhinitis. The relatively large proportion of persons with allergic rhinitis not seeking treatment from a physician has several implications. These persons most likely engage in self-treatment with readily available OTC decongestants and antihistamines.

The NMES study design does not allow estimates to be made of the cost and number of persons who self-treat by using OTC medications. However, it is estimated that retail sales of OTC allergy relief products exceed \$140 million a year.¹³ This figure is less than half the estimated amount spent on medications obtained by prescription (\$301 million in 1994 dollars). In addition, given the relatively large proportion of persons with allergic rhinitis who appear to self-treat, it is likely that many of them are not receiving the full benefits of available prescription drug therapies. They may not be achieving the best possible control of their condition, or they may be experiencing unwanted side effects of medications.

In the only previously published study on the costs associated with allergic rhinitis, McMenamin⁵ estimated that the total annual cost of hay fever was \$1.8 to \$1.9 billion in 1990. However, there are severe limitations and questionable assumptions made by this study. First, different data sources were used for estimates of prevalence, health care resource utilization, productivity losses, and associated costs. Second, drug costs (both prescription and OTC) were estimated by assuming that medication costs are a fixed percentage (37.93%) of total physician costs, an unrefined measure of medication costs. Third, McMenamin⁵ purposefully left out parental work loss caused by the illness of the child. This study overcomes these substantial issues in an attempt to more accurately assess the economic burden of allergic rhinitis.

This study is not without its own limitations, which must be considered when interpreting the results. First, the NMES data are subject to certain limitations, which have been described elsewhere.¹⁴ Second, treatment patterns have probably changed since the NMES data were collected in 1987. At that time, terfenadine was the only nonsedating antihistamine available in the United States. Two other nonsedating antihistamines (astemizole and loratadine) have entered the marketplace since 1987. In addition, intranasal use of corticosteroids and ipratropium has increased in recent years. Furthermore, several medications used to treat allergic rhinitis have been switched from prescription-only to OTC status since 1987. All of these factors contribute to changes in treatment patterns that might affect direct and indirect costs. Finally, although 1987 dollars were adjusted to 1994 dollars, this study probably underestimates the current utilization of health care services and costs because the population increase since 1987 was not included in the estimation process.

Other limitations of this study are more theoretic in nature. According to economic principles, the cost of a disease should reflect the marginal cost associated with treating the condition. If excess capacity exists (e.g., no additional physicians or facilities are needed to treat patients with allergic rhinitis), then the marginal cost is zero. This study examines total costs and not marginal costs because of practical difficulties in determining marginal costs. Another limitation is valuing lost productivity by using workers' salaries. This assumption has two implications. First, it assumes that the missed work will not be performed by the affected individual at a later time or by another worker. Second, it assumes that this lost time is translated into a decrease in productivity. A decrease in productivity may not occur if the worker is able to make up the lost productivity or if there is high unemployment and a replacement worker can be easily found. Also, the value of the lost productivity may or may not be equal to the worker's wage. Finally, this study includes net profit for goods and services, which may overstate the true burden on the economy to the extent that net profit represents transfer payments from consumers or insurers to stockholders.

Although allergic rhinitis may not be thought of as a serious condition, the results of this study show that it is important in terms of the number of persons affected, total expenditures for the condition,

and lost productivity. A large number of persons have allergic rhinitis, but only 14% account for the majority of expenditures.

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References

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1. International Rhinitis Management Working Group. International Consensus Report on the Diagnosis and Management of Allergic Rhinitis. *Allergy* 1994;49:5-34.
2. Barbee R, Kaltenborn W, Lebowitz W, Burrows B. Longitudinal changes in allergic skin test reactivity in a community population sample. *J Allergy Clin Immunol* 1987;79:16-24.

MEDLINE

3. Weeke ER. Epidemiology of allergic diseases in children [review]. *Rhinology* 1992;13 (suppl):5-12.
4. Hopper JL, Jenkins MA, Carlin JB, Giles GG. Increase in the self-reported prevalence of asthma and hay fever in adults over the last generation: a matched parent-off spring study. *Aust J Public Health* 1995;19:120-4.

MEDLINE

5. McMenamin P. Costs of hay fever in the United States in 1990. *Ann Allergy Asthma Immunol* 1994;73:35-9.
6. Edwards WS, Berlin M. Questionnaires and data collection methods for the household survey and survey of American Indians and Alaska natives. National Medical Expenditure Survey Methods 2, National Center for Health Services Research and Health Care Technology Assessment. Rockville (MD): Public Health Service, 1989. DHHS Publication No. (PHS) 89-3450.
7. Shah B, Barnwell B, Beiler G. SUDAAN user's manual: software for analysis of correlated data, release 6.40. Research Triangle Park (NC): Research Triangle Institute, 1995.
8. U.S. Bureau of the Census. Statistical Abstract of the United States: 1995. 115th ed. Washington (DC): U.S. Government Printing Office, 1995:431,494.
9. Hodgson TA. The state of the art of cost-of-illness estimates. *Adv Health Econ Health Serv Res* 1983;4:129-64.

MEDLINE

10. Agency for Health Policy and Research. 1987 Medical expenditure survey: public use tape 29 household survey disability days and medical conditions, calendar year 1987 file documentation. Springfield (VA): U.S. Department of Commerce NTIS, 1994.

11. Miller TR, Lestina DC, Galbraith MS, et al. Medical care spending-United States. MMWR 1994;43:581-6.
12. U.S. Bureau of the Census. Statistical Abstract of the United States: 1994. 114th ed. Washington (DC): U.S. Government Printing Office, 1994:8.
13. Waldrop J. Spring sneezes. Am Demographics 1993;15:4.
14. Berk ML, Schur CL, Mohr P. Using survey data to estimate prescription drug costs. Health Aff (Millwood) 1990;9:146-56.

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Publishing and Reprint Information

TOP

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Articles with References to this Article

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This article is referenced by these articles:

Preface to outcome measures in allergic rhinitis

Journal of Allergy and Clinical Immunology, The
March 2005, Supplement • Volume 115 • Number 3
Peter H. Howarth, Niels Mygind, Philip E. Silkoff, Alkis Togias

FULL TEXT

Fexofenadine is efficacious and safe in children (aged 6-11 years) with seasonal allergic rhinitis

Journal of Allergy and Clinical Immunology, The
April 2003 • Volume 111 • Number 4

Ulrich Wahn, MD^{a†‡}, Eli O. Meltzer, MD^{b*‡}, Albert F. Finn, Jr, MD^{c*‡}, Marek L. Kowalski, MD, PhD^{d‡}, Paola Decosta, MD^e, Gunilla Hedlin, MD^{f*}, Pierre Scheinmann, MD^{g*}, Claus Bachert, MD, PhD^{h*}, Jose E. Rosado Pinto, MD^{i*}, Carlos Baena-Cagnani, MD^{j‡}, Paul Potter, MD^{k‡}, F. Estelle R. Simons, MD^{l*}, Erik Ruuth, MD, PhD^e

ABSTRACT

FULL TEXT

Direct costs of allergic rhinitis in the united states: Estimates from the 1996 medical

expenditure panel survey

Journal of Allergy and Clinical Immunology, The

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Amy W. Law, PharmD^a, Shelby D. Reed, PhD^a, John S. Sundry, MD, PhD^b, Kevin A. Schulman, MD^a

[ABSTRACT](#)

[FULL TEXT](#)

Allergic rhinitis: Broader disease effects and implications for management

Otolaryngology - Head and Neck Surgery

May 2003 • Volume 128 • Number 5

Fuad M. Baroody, MD^{a*}

[ABSTRACT](#)

[FULL TEXT](#)

Allergic Rhinitis and Its Impact on Asthma

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Jean Bousquet, MD, PhD, Paul van Cauwenberge, MD, PhD, Nikolai Khaltaev, MDIn collaboration with the World Health Organization

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The health economics of asthma and rhinitis. I. Assessing the economic impact

Journal of Allergy and Clinical Immunology, The

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Kevin B. Weiss, MD, Sean D. Sullivan, PhD

[ABSTRACT](#)

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Effect of allergist intervention on patient-centered and societal outcomes: Allergists as leaders, innovators, and educators

Journal of Allergy and Clinical Immunology, The

December 2000 • Volume 106 • Number 6

Robert S. Zeiger, MD, PhD, Michael Schatz, MD

[ABSTRACT](#)

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Allergic rhinitis in Rochester, Minnesota residents with asthma: Frequency and impact on health care charges

Journal of Allergy and Clinical Immunology, The

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Barbara P. Yawn, MD, MSc^a, John W. Yunginger, MD^b, Peter C. Wollan, PhD^c, Charles E. Reed, MD^d, Marc D. Silverstein, MD, MS^e, Alan G. Harris, MD^f

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