The Cost of Productivity Losses Associated With Allergic Rhinitis

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Abstract

Objective: **To measure the cost of absenteeism and reduced productivity associated with allergic rhinitis.**

Methods: **The National Health Interview Survey (NHIS) was used to obtain information on days lost from work and lost productivity due to allergic rhinitis. Wage estimates for occupations obtained from the Bureau of Labor Statistics (BLS) were used to calculate the costs.**

Results: **Productivity losses associated with a diagnosis of allergic rhinitis in the 1995 NHIS were estimated to be $601 million. When additional survey information on the use of sedating over-the-counter (OTC) allergy medications, as well as workers' self-assessments of their reduction in at-work productivity due to allergic rhinitis, were considered, the estimated productivity loss increased dramatically. At-work productivity losses were estimated to range from $2.4 billion to $4.6 billion.**

Conclusion: **Despite the inherent difficulty of measuring productivity losses, our lowest estimate is several times higher than previous estimates of the indirect medical costs associated with allergic rhinitis treatment. The most significant productivity losses resulted not from absenteeism but from reduced at-work productivity associated with the use of sedating OTC antihistamines.**

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Allergic rhinitis is characterized by inflammation of the nasal lining with resulting symptoms of rhinorrhea, congestion, and sneezing. The condition can be seasonal or chronic and originates from airborne agents such as pollens, mold spores, and dust-borne mites.

Generally, employers do not consider the potential for productivity losses due to allergic rhinitis to be a major concern. These productivity losses and associated costs may be substantial, however. Allergic rhinitis is fairly prevalent; 1 in 10 workers suffer from the condition.[1] Data from the National Center for Health Statistics indicate that allergic rhinitis was the fifth most prevalent chronic health condition in the United States during the 1990s.[2,3] This high incidence, combined with the cold- and flu-like symptoms associated with allergic rhinitis, may cause absenteeism or reduced productivity while at work when the condition is untreated. As many as 75% of workers with allergies are either absent from work or have reduced productivity at work for 2 or more weeks per year.[1] Further, many over-the-counter (OTC) treatments for allergic rhinitis have sedative side effects associated with reduc-

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tions in productivity.[4] Numerous studies have demonstrated a relationship between antihistamine use and subsequent effects on sedation, psychomotor performance, and cognition.[5-8]]

Like most chronic conditions, allergies have direct and indirect costs. The direct healthcare costs of allergic rhinitis are easier to track and can be estimated from public data sources. One such estimation based on the 1987 National Health Interview Survey (NHIS) and 1988 National Ambulatory Care Survey data showed that the direct healthcare costs of allergic rhinitis were approximately $1.16 billion valued in 1990 dollars,[9] or $1.51 billion in 1994 dollars. A similar study based on data from the 1987 National Medical Expenditure Survey provided an estimate of $1.15 billion in 1994 dollars.[10] Although the 2 estimates vary, they are remarkably consistent when one considers the different data sources.

These same researchers[9,10] also estimated the indirect costs of allergies in 2 separate studies, and both studies concluded that the indirect costs were minor relative to the direct medical costs. The estimated costs of productivity losses were $639 million (1990 dollars)[9] and $86 million (1994 dollars).[10] These 2 estimates differ widely partly because measuring at-work productivity losses is difficult. In this study, we attempted to overcome these challenges and measure at-work productivity losses using a series of conservative assumptions and more than one data source.

···METHODS···

The core analysis relies on a series of assumptions that result in a conservative estimate of the indirect costs associated with allergic rhinitis. We began by estimating the number of days of work lost (work-loss days) and days of reduced productivity (cut-down days) experienced by workers who reported they had allergic rhinitis. Next, we incorporated information from other studies on sedating OTC allergy medications and workers' self-assessments of their reduction in at-work productivity due to allergic rhinitis. Incorporating this latter information resulted in significantly higher, and probably more realistic, estimates of the productivity costs associated with allergic rhinitis.

Data Sources

We obtained information on indirect costs, including days lost from work and lost productivity due to allergic rhinitis, from the NHIS. We also used wage estimates for occupational categories from the Bureau of Labor Statistics (BLS) to calculate the costs associated with these losses.

The NHIS is an annual, nationwide household survey of healthcare utilization by the US civilian noninstitutionalized population. Over the telephone, subjects provide information about the number of restricted-activity days, as well as work- or school-loss days, during a prior 2-week period. Data are also obtained on the acute and chronic conditions responsible for these productivity losses. Additionally, respondents are asked about long-term limitations in certain types of activities and the chronic conditions responsible for these disabilities. Using the limited diagnostic detail available from respondents, all conditions are then coded using *International Classification of Diseases,* 9th Edition, Clinical Modification (ICD-9-CM) diagnostic codes.

Analyses

Prevalence of Allergic Rhinitis. We estimated the prevalence of allergic rhinitis in the United States from the 1995 NHIS database. Individuals who reported having allergic rhinitis were identified using appropriate diagnostic codes (ICD-9-CM code 477). Prevalence was calculated by age and gender groups and compared to the entire 1995 US population as indicated by the complete, weighted NHIS person file.

We also estimated the prevalence of allergic rhinitis in the employed population. Employed individuals were identified by using a subset of the 1995 NHIS condition records for persons with allergic rhinitis who indicated that they were currently employed and either working, able to work, or seeking new employment.

Work Loss. The NHIS defines work loss as more than half of any scheduled working day missed due to illness or injury. Work loss attributable to allergic rhinitis was calculated for all persons ≥18 years of age. In estimating costs, we assumed that reported work-loss days represented a full day absent from work.

The total number of work-loss days calculated for employed persons was categorized by occupational categories. The number of people with a diagnosis of allergic rhinitis in each occupational category was multiplied by the average number of work-loss days per person. Work-loss costs were estimated by multiplying the number of work-loss days by the average daily wage for a given occupational category.

Productivity Loss. The NHIS defines productivity loss as the number of days respondents report cutting down on their usual activities by more than half of the day. To estimate at-work productivity costs associated with allergic rhinitis, we limited the analysis to the employed population and assumed a 5-day work week. The number of cut-down days were calculated for each occupational category by multiplying the number of employed individuals with allergic rhinitis by the average number of cut-down days per person. Based on a prior study,[9] we assumed a 25% reduction in productivity for each reported cut-down day and used 25% of the average daily salary to calculate the costs associated with this productivity loss.

···RESULTS···

Based on NHIS estimates, 9.8% of the US population suffered from allergic rhinitis in 1995. As shown in Table 1, there were more than 25 million persons with allergic rhinitis, nearly 15 million of whom were employed. The rate of allergic rhinitis was highest for persons of working age, ie, those 18 to 64 years of age. Women ≥18 years old had higher rates of allergic rhinitis than men in the same age group.

Employed persons missed an average of 0.24 days per year due to allergic rhinitis. From these data, we estimated that approximately 1 of every 4 people with allergic rhinitis missed 1 day of work per year due to the illness. We then assumed that employees across all occupational categories missed the same number of days per year due to allergic rhinitis. Work losses totaled nearly 3.6 million days due to allergies (Table 2), and these work-loss days cost employers $445.3 million in 1995.

Employees with allergic rhinitis also reported cutting down on their usual workload for nearly 3 million days. This on-the-job loss of productivity cost employers an additional estimated $92.8 million per year (Table 2).

Thus, using the NHIS data, we estimated that the total indirect costs of allergic rhinitis were $538 million per year in 1995 (Table 2). This was equivalent to $601.2 million in 1998 dollars (adjusted for the change in the medical consumer price index between 1995 and 1998) (Table 3), with $103.7 million due to productivity losses and $497.5 million due to time lost from work.

Effect of Sedating Antihistamines on Productivity

These estimates are likely to substantially underestimate the full costs of allergic rhinitis because they do not consider the effect of sedating antihistamines on productivity loss. The data sources used in this study did not provide information on the use of sedating antihistamines, most of which are sold as OTC medications. Estimates from unpublished survey data (Susan Decandia, MBA, Shering Plough, Kenilworth, NJ, September 1998) estimate that 82% of allergy sufferers use some sort of treatment for their allergies, and that 57% of those who treat their

Table 1. Prevalence of Allergic Rhinitis for the Entire US Population and the Employed Population by Age Group and Gender

		Under 18 Years		18-64 Years		65+ Years		Total	
Population	Gender	No. of Cases	Rate per 1000	No. of Cases	Rate per 1000	No. of Cases	Rate per 1000	No. of Cases	Rate per 1000
Entire US	Male	2,509,466	69.4	8,489,385	108.5	928,874	70.7	11,927,725	93.5
	Female	2,172,513	63.0	10,266,243	126.0	1,363,713	74.4	13,802,469	102.8
	Total	4,681,979	66.2	18,755,627	117.4	2,292,587	72.9	25,730,193	98.2
Employed	Male	0.0	0.0	7,213,578	110.6	168,534	71.9	7,382,112	109.0
	Female	0.0	0.0	7,335,912	131.7	160,854	97.3	7,496,766	131.0
	Total	0.0	0.0	14,549,490	120.3	329,388	82.4	14,878,878	119.1

Analysis done using *1995 National Health Interview Survey Raw Data File*.[11]

allergies use OTC sedating antihistamines. When we applied these figures to the labor force estimates presented in this paper, we calculated that approximately 8.4 million workers in the United States use sedating antihistamines.

Workers using sedating antihistamines report that their productivity is diminished by an average of 25% for 14 workdays per year.[12] These data, considered with our estimated size of the labor force suffering from allergic rhinitis, imply that there are more than 125 million days of reduced productivity due to allergic rhinitis. As Table 3 demonstrates, this translates into an estimated productivity loss due to sedating antihistamines of approximately $4.6 billion (in 1998 dollars). This brings the total indirect cost estimate to about $5.2 billion.

When indirect costs are calculated based on the prevalence of reported diagnoses for allergic rhinitis, approximately 17% of costs are attributable to at-work productivity loss and over 80% are attributable to time lost from work (Figure). However, when the effects of sedating antihistamines on indirect costs are considered, the proportion of costs attributable to at-work productivity loss increases substantially—to 88% (Figure).

Table 2. Indirect Costs by Occupational Categories, Work Loss, and Productivity Loss (1995 Dollars)

Work Loss and Associated Costs			
Occupation	**Work-Loss Days**	**Average Daily Salary ($)**	**Total Cost ($)**
Managerial and Professional Specialty	1,324,404	169	223,824,276
Technical, Sales, Administrative Support	1,106,818	105	116,215,890
Service Occupations	348,585	74	25,795,290
Farming, Forestry, and Fishing	36,987	67	2,478,129
Precision, Production, Craft, and Repair	311,646	115	35,839,290
Operators, Fabricators, and Laborers	368,643	88	32,440,584
Unknown Industry	73,847	118	8,713,946
Subtotal	**3,570,930**		**445,307,405**
Productivity Loss and Associated Costs			
Occupation	**Cut-Down Days**	**25% of Average Daily Salary ($)**	**Total Cost ($)**
Managerial and Professional Specialty	1,103,670	42	46,630,058
Technical, Sales, Administrative Support	922,348	26	24,211,635
Service Occupations	290,487	19	5,374,010
Farming, Forestry, and Fishing	30,823	17	516,285
Precision, Production, Craft, and Repair	259,705	29	7,466,519
Operators, Fabricators, and Laborers	307,203	22	6,758,466
Unknown Industry	61,539	30	1,815,401
Subtotal	**2,975,775**		**92,772,374**
Total Indirect Costs			**538,079,779**

Analysis done using *1995 National Health Interview Survey Raw Data File*.[11]

···DISCUSSION···

Employers generally focus on direct treatment when considering the costs of health conditions. Since the direct treatment costs associated with allergic rhinitis are modest compared with other conditions such as heart disease or cancer, allergies have not been a major concern of employers. However, we have shown that productivity costs associated with allergic rhinitis—especially those associated with at-work productivity losses due to the sedative effects of OTC allergy medications—are substantial.

It should be noted that the estimates provided in this paper are based on multiple assumptions and therefore may not be definitive. Several variables could raise or lower our estimates. For example, we did not consider work losses of parents caring for children who miss school due to allergies. Further, studies suggest that allergic rhinitis tends to coexist with and may exacerbate certain other medical conditions. An exten-

sive body of literature demonstrates that allergic rhinitis and asthma frequently coexist.[13-15] Although the prevalence of asthma in the general population is 3% to 5%, asthma affects approximately 38% of patients diagnosed with allergies.[14] Conversely, of those patients diagnosed with asthma, 60% to 78% have allergic rhinitis.[15] It has been postulated that allergic rhinitis may be related to increased asthma severity, and asthma patients with symptomatic rhinitis may use more asthma medications.[14] Similarly, investigators have noted links between allergies and sinusitis[16,17] as well as otitis media.[18] In addition, our productivity loss estimates may be low because we did not consider the enormous safety consequences for those using sedating antihistamines, especially employees who perform hazardous work (eg, transportation industry workers, operators of heavy machinery). In one study, researchers found that health plan members experienced a 50% increase in on-the-job accidents when they were prescribed a sedating antihistamine within the 30 days before their accident.[19]

Conversely, several other factors involving the interpersonal dynamics of the workplace could suggest that our productivity estimate is too high. For example, in team environments, coworkers may compensate for absent or less productive members. Similarly, individuals who are absent from or are less productive at work due to allergies or allergy treatment may compensate by working overtime or working harder on subsequent days.

Undoubtedly, the biggest variable in our productivity cost estimates is the use of sedating OTC antihistamines, which was based on self-reports. One study that objectively measured the output of insurance claims processors, however, showed that the productivity of workers who treated their allergies with sedating antihistamines was 13% lower than that of workers using nonsedating antihistamines.[20] This productivity decline is about half that assumed in our calculations. If we were to apply this 13% rate to our data, our estimate of at-work productivity loss would be $2.4 billion.

Despite the inherent imprecision in any productivity loss estimate, our lowest estimate is several times higher than previous estimates of the direct medical costs associated with allergic rhinitis treatment.[9,10] When at-work productivity losses due to sedating OTC medications are considered, the cost to employers is substantial and may be large enough to warrant considering health plan coverage of nonsedating antihistamines.

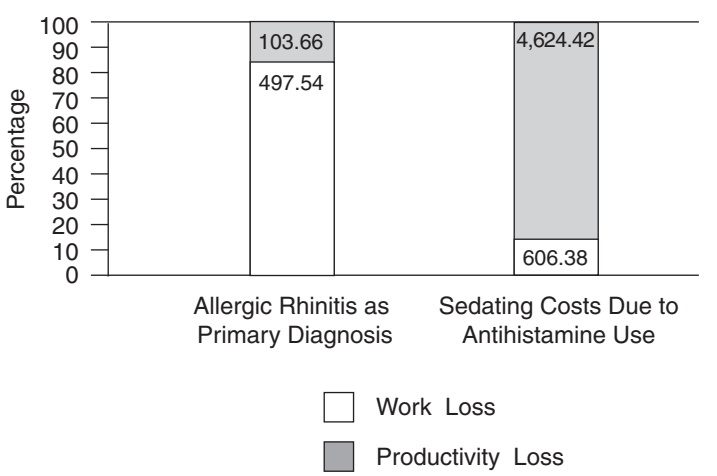
Importantly, however, the productivity losses will vary considerably by employer. As indicated in Table 1, the prevalence of allergic rhinitis varies significantly by age and gender. In addition, while this analysis assumed that employees across all occupational categories missed the same number of days

Table 3. Additional Cost Estimates (Millions of 1998 Dollars)

	Primary Diagnosis ($)	Sedating Antihistamine Use ($)
Work Loss	497.54	606.38
Productivity Loss	103.66	4,624.42
Total Costs	**601.20**	**5,230.81**

Adapted from references 11 and 13.

Figure. Productivity Loss and Work-Loss Costs (in Millions) as a Percentage of Total Indirect Costs of Allergic Rhinitis in the Workplace



per year due to allergies, there may be substantial differences in employee response to allergic rhinitis in different occupations. For example, laborers who are suffering from allergies or sedation from allergy medications may be more likely to miss work due to safety issues than employees in managerial or professional occupations. The value of productivity losses is also a function of the skill mix of the labor force. It serves to reason that companies employing relatively large numbers of highly compensated workers will, all else being equal, experience greater financial losses from productivity reductions. Finally, regional variations in the cost of living will also influence the valuation of productivity losses.

In sum, this analysis demonstrates that it is often inappropriate to rely on a component-based approach when measuring the costs of a given condition and its treatment. It may be short-sighted to make coverage decisions based on pharmaceutical costs alone. This study underscores the value of considering the societal costs of certain common medical conditions. One study of productivity losses associated with other conditions demonstrated that appropriate prescribing can substantially reduce employer costs.[21] In this study, researchers used the 1987 National Medical Expenditure Survey to estimate the effects of prescription medicines on days lost from work and associated costs for hypertension, heart disease, noninsulin-dependent diabetes, and depression. They found that the *per-employee* savings from reduced absenteeism due to the use of prescription medications were $286 for those with hypertension, $633 for those with heart disease, $822 for those with depression, and $1475 for those with diabetes.[21]

Unless they are involved in occupational health, primary care physicians and those specializing in respiratory illness are often poorly informed of these issues. While physicians often inform patients of the sedating side effects of most medications used for allergic rhinitis, they may not consider the impact of the illness and any treatment side effects on the patient's employment. This is partly due to the lack of cost and productivity impact information fed back to physicians, patients, and managed care organizations. It is hoped that the results of our study will improve healthcare providers' understanding of the full impact of their prescribing and treatment patterns.

···REFERENCES ···

1. Collis L, Pellegrini K. Uncovering the hidden costs of allergies. *Business Health* 1997:47-48.

2. Adams PF, Marano MA. Current estimates from the National Health Interview Survey, 1994. National Center for Health Statistics. *Vital Health Stat* 1995;10(193):81-93.

3. Collins JG. Prevalence of selected chronic conditions: United States, 1990–1992. National Center for Health Statistics. *Vital Health Stat* 1997;10(194):28-31.

4. Meltzer E. Productivity costs of antihistamines in the workplace. *Occup Health Safety* 1996;65:46-50.

5. Kay GG, Berman B, Mockoviak SH, et al. Initial and steady-state effects of diphenhydramine and loratadine on sedation, cognition, mood, and psychomotor performance. *Arch Intern Med* 1997;157:2350-2356.

6. Adelsberg B. Sedation and performance issues in the treatment of allergic conditions. *Arch Intern Med* 1997;157:494-500.

7. Fireman P. Treatment of allergic rhinitis: Effect on occupation productivity and work force costs. *Allergy Asthma Proc* 1997;18:63-67.

8. Philpot E, Brooker A, Biegalski C. Effects of sedating and nonsedating antihistamines on flying performance. *Military Med* 1993;158:654-660.

9. McMenamin P. Costs of hay fever in the United States in 1990. *Ann Allergy* 1994;73:35-39.

10. Malone DC, Lawson KA, Smith DH, et al. A cost of illness study of allergic rhinitis in the United States. *J Allergy Clin Immunol* 1997;99(1 Pt 1):22-27.

11. Department of Health and Human Services, National Center for Health Statistics (NCHS). *1995 National Health Interview Survey Raw Data File.* National Technical Information Service, Springfield, VA: 1998. Publication PB98-500432INC.

12. The Gallup Organization, Inc. *Survey of Attitudes and Experiences of Allergy Sufferers.* Princeton, NJ; The Gallup Organization, Inc: December 1989.

13. Spector S. Overview of comorbid associations of allergic rhinitis. *J Allergy Clin Immunol* 1997;99:S773-S780.

14. Corren J. The impact of allergic rhinitis on bronchial asthma. *J Allergy Clin Immunol* 1998;101:S352-S356.

15. Grossman J. One airway, one disease. *Chest* 1997;111:11S-16S.

16. Moss A, Parsons V. Current estimates from the National Health Interview Survey, United States, 1985. National Center for Health Statistics. *Vital Health Stat* 1986;10(160):1-82.

17. Savolainen S. Allergy in patients with acute maxillary sinusitis. *Allergy* 1989;44:116-122.

18. Bernstein J, Lee J, Conboy K, et al. Further observations on the role of IgE-mediated hypersensitivity in recurrent otitis media with effusion. *Otolaryngol Head Neck Surg* 1985;93:611-615.

19. Gilmore T, Alexander B, Mueller B, Rivera F. Occupational injuries and medication use. *Am J Ind Med* 1996;30:234-239.

20. Cockburn I, Bailit H, Berndt E, Finkelstein S. *Loss of Work Productivity Due to Illness and Medical Treatment.* Cambridge, MA: MIT Sloan School of Management; 1998.

21. Rizzo J, Abbott T, Pashko S. Labour productivity effects of prescribed medicines for chronically ill workers. *Health Economics* 1996;5:249-265.