

PEDIATRIC ASTHMA: AN EMPLOYER PERSPECTIVE ON ANNUAL EMPLOYEE AND DEPENDENT COSTS FOR MEDICAL CARE AND PRESCRIPTION DRUGS

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INTRODUCTION

- Asthma is the most common chronic disorder in childhood, currently affecting an estimated 6.8 million children under 18 years, of which 4.1 million suffered from an asthma attack or episode in 2006.¹
- Management of pediatric asthma is known to be very costly; however, little is known about the costs to the parent.
 - The annual direct health care cost of asthma is approximately \$14.7 billion; indirect costs (e.g. lost productivity) add another \$5 billion, for a total of \$19.7 billion dollars. Prescription drugs represented the largest single direct cost, at \$6.2 billion.²
- Asthma is one of the leading causes of school absenteeism;³ in 2003, asthma accounted for an estimated 12.8 million lost school days in children who had an asthma attack in 2002.⁴
- Many of the asthma caregiver studies utilize survey-based instruments such as the Pediatric Asthma Caregiver's Quality of Life Questionnaire⁵ and focus on the Caregiver's Quality of Life^{6,7}
- A Medline search conducted in February 2008 with asthma and caregiver in the title identified 9 articles, none of which examined the parent's health care costs.

OBJECTIVE

- We aimed to objectively assess employee and dependent costs for employees with children with asthma (EWCWA) compared with employees with children without asthma (EWCWOA).

METHODS

- A retrospective analysis was performed on data (January 2001 to March 2007) from the Human Capital Management Services Research Reference Database consisting of approximately 510,000 employees representing the retail, service, manufacturing, and financial industries.
- Data included medical claims, pharmacy claims, payroll, work absence, and demographics.
- Persons with pediatric asthma were required to be less than 12 years old and were identified based on the presence of *International Classification of Diseases*, 9th Revision (ICD-9) diagnostic codes of 493.xx or pharmacy claims for an asthma controller medication.
 - Controller medications included: bronchodilator combinations, inhaled corticosteroids (ICSs), leukotriene modifiers (other than Singulair), and inhaled long-acting β_2 agonists.
- Employees in the EWCWOA cohort were identified based on dependent age, lack of an asthma diagnosis (ICD-9 code), and lack of a pharmacy claim for a controller medication.
- The index date in the EWCWA cohort was defined as the date of first asthma diagnosis during 2001 or later; the first pediatric medical or pharmacy claim date was used in the EWCWOA cohort.
- Employees included in the analysis were required to be continuously employed and eligible for health benefits for at least 12 months after their index date.

- Eligible subjects were analyzed overall (those with dependents age 0 to 11) and further analyzed based on the following subgroups (age at index date):
 - Less than 4 years old
 - At least 4 to 7 years old
 - At least 8 to 11 years old
- Comparisons were made between 2 cohorts (EWCWA and EWCWOA), for all 4 age groupings.
- Outcomes for both cohorts were compared over the 12 months following the index date and included:
 - Employee Health Benefit Costs, which comprised direct healthcare and prescription costs, as well as indirect costs associated with payments for absences (sick leave, short- and long-term disability, and workers' compensation)
 - Dependent Direct costs (healthcare costs and prescription drug costs)
 - Among the EWCWA, the percentage of employees with dependents taking short-acting β_2 agonists (SABAs) or ICSs
- All costs were inflation-adjusted to 2007 US dollars.

Statistical Analysis:

- Two-part regression analysis was used to model the cost differences between the EWCWA and EWCWOA cohorts using separate regression models for each cost variable and each age group.
 - The models controlled for employee differences in age, tenure (years with current employer), sex, marital status, race, exempt/non-exempt status (exempt employees are not paid on an hourly basis and are not paid for overtime work), full-time/part-time status, salary, Charlson Comorbidity Index,⁸ and geography (defined by the first digit of the employee's postal zip code).
 - Only employees eligible for each specific benefit were included in the regression models for that benefit.
 - Indirect costs were summed over all absence claims begun at some point during the year following the index date.
- Differences were considered significant if $P < 0.05$.

RESULTS

- Data were available for the 11,794 Employees with Children with Asthma (<12 yr) and 64,812 Employees with Children without Asthma (<12 yr), and descriptive statistics are presented based on age groupings. (Tables 1)
- The annual direct costs (for employees and dependents) and indirect costs (for employees) are shown in the following tables:
 - Dependents <4 years old: **Table 2A**
 - Dependents at least 4 to 7 years old: **Table 2B**
 - Dependents at least 8 to 11 years old: **Table 2C**
 - Dependents <12 years old: **Table 2D**
- The percentages of employees with dependents using SABAs and ICSs by age group are presented in **Figure 1**

LIMITATIONS

- While the database has identifiers of employees' dependents and direct medical and prescription drug claims for the dependents, there is no measure of additional "caregiver support" available.
- While the incremental impact of asthma in the very young population (<4) appears to be lower than that of the other populations (4 to 7, and 8 to 11), this may be due to complications experienced by newborns without asthma that raised the costs for the control cohort. Additionally, the difficulty in diagnosing asthma at so young an age may have led to smaller cost differences between the two <4 year cohorts.

Table 1: Table 1: Sample Sizes for different Age Cohorts

Cost Category	Employees with Children with Asthma		Employees with Children (None with Asthma)	
	N	Adjusted Mean Cost	N	Adjusted Mean Cost
Children < 4 Years-old ¹	4,577		32,558	
Children 4-7 Years Old ¹	4,343		28,017	
Children 8-11 Years Old ¹	3,954		27,863	
Children 0-11 Years-old ¹	11,794		64,812	

¹ Age as of the index date. For EWCWA, the index date is the date of the 1st asthma diagnosis or 1st controller medication prescription in the study period. For EWCWOA, the index date is the date of a child's first medical or drug claim in the data.

Table 2A: Comparison of Annual Health Benefit Costs per Employee Caregiver of Children < 4 Years Old¹ with and without Asthma (during the year following each person's index date)²

Cost Category	Employees with Children with Asthma		Employees with Children (None with Asthma)	
	N	Adjusted Mean Cost	N	Adjusted Mean Cost
Employee Health Care	4,577	\$1,738	32,558	\$1,793
Employee Prescription Drug*	4,577	\$395	32,558	\$322
Employee Sick Leave	2,306	\$539	15,347	\$558
Employee Short-term Disability*	2,737	\$248	17,781	\$312
Employee Long-term Disability	3,933	\$11	25,483	\$2
Employee Workers' Compensation*	4,227	\$243	29,286	\$152
Dependent Health Care (any child) ³	4,577	\$3,951	32,558	\$3,288
Dependent Prescription Drug (any child)*	4,577	\$741	32,558	\$173

¹ Children were born before the index date but did not turn 4 until after.
² For EWCWA, the date of the 1st asthma diagnosis or 1st controller medication prescription in the study period.
³ For EWCWOA, the index date is the date of a child's first medical or drug claim in the data.
 * $P \leq 0.01$

Table 2B: Comparison of Annual Health Benefit Costs per Employee Caregiver of Children 4-7 Years Old¹ with and without Asthma (during the year following each person's index date)²

Cost Category	Employees with Children with Asthma		Employees with Children (None with Asthma)	
	N	Adjusted Mean Cost	N	Adjusted Mean Cost
Employee Health Care*	4,343	\$1,776	28,017	\$1,578
Employee Prescription Drug*	4,343	\$481	28,017	\$371
Employee Sick Leave*	2,109	\$445	13,679	\$505
Employee Short-term Disability	2,561	\$180	14,821	\$187
Employee Long-term Disability	3,645	\$2	21,921	\$4
Employee Workers' Compensation*	3,977	\$154	25,251	\$212
Dependent Health Care (any child) ³	4,343	\$2,818	28,017	\$1,914
Dependent Prescription Drug (any child)*	4,343	\$809	28,017	\$254

¹ Children turned 4 years old before the index date but did not turn 8 until after.
² For EWCWA, the date of the 1st asthma diagnosis or 1st controller medication prescription in the study period.
³ For EWCWOA, the index date is the date of a child's first medical or drug claim in the data.
 * $P \leq 0.01$

References

- Centers for Disease Control and Prevention. National Center for Health Statistics. National Health Interview Survey Raw Data, 2006. Analysis by the American Lung Association Research and Program Services Division using SPSS and SUDAAN software.
- National Heart, Lung and Blood Institute. Chartbook. U.S. Department of Health and Human Services, National Institute of Health, 2007.
- Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion. Healthy Youth! Health Topics: Asthma. December 7, 2007. Available at <http://www.cdc.gov/healthyyouth/asthma/index.htm>. Accessed on December 20, 2007.
- Centers for Disease Control and Prevention. National Center for Health Statistics. Asthma Prevalence, Health Care Use and Mortality: United States, 2003-05. January 2007. Available at <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma03-05/asthma03-05.htm>. Accessed on October 5, 2007.

SUMMARY AND CONCLUSIONS

- Pediatric asthma results in significant additional costs for both employees and dependents.
- This study suggests that:
 - Follow-up studies should seek to quantify the availability of other caregivers for the asthmatic children.
 - Linkages between dependent healthcare conditions and parental costs are difficult to quantify.

Table 2C: Comparison of Annual Health Benefit Costs per Employee Caregiver of Children 8-11 Years Old¹ with and without Asthma (during the year following each person's index date)²

Cost Category	Employees with Children with Asthma		Employees with Children (None with Asthma)	
	N	Adjusted Mean Cost	N	Adjusted Mean Cost
Employee Health Care*	3,954	\$2,031	27,863	\$1,667
Employee Prescription Drug*	3,954	\$540	27,863	\$424
Employee Sick Leave*	1,911	\$475	13,331	\$533
Employee Short-term Disability	2,277	\$226	14,057	\$229
Employee Long-term Disability	3,243	\$4	21,568	\$4
Employee Workers' Compensation*	3,650	\$197	25,243	\$239
Dependent Health Care (any child) ³	3,954	\$2,922	27,863	\$1,840
Dependent Prescription Drug (any child)*	3,954	\$919	27,863	\$333

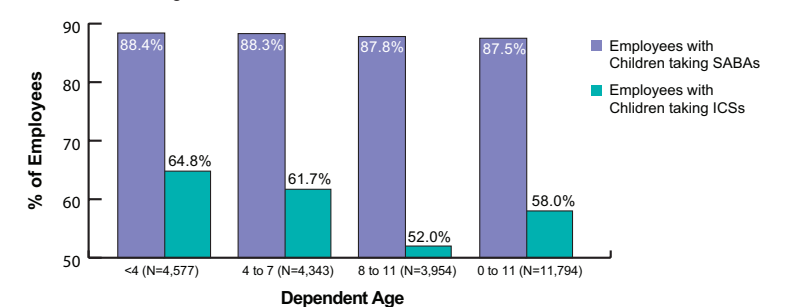
¹ Children turned 8 years old before the index date but did not turn 12 until after.
² For EWCWA, the date of the 1st asthma diagnosis or 1st controller medication prescription in the study period.
³ For EWCWOA, the index date is the date of a child's first medical or drug claim in the data.
 * $P \leq 0.01$; [†] $P = 0.0501$

Table 2D: Comparison of Annual Health Benefit Costs per Employee Caregiver of Children 0 to 11 Years Old¹ with and without Asthma (during the year following each person's index date)²

Cost Category	Employees with Children with Asthma		Employees with Children (None with Asthma)	
	N	Adjusted Mean Cost	N	Adjusted Mean Cost
Employee Health Care*	11,794	\$1,890	64,812	\$1,736
Employee Prescription Drug*	11,794	\$460	64,812	\$364
Employee Sick Leave*	5,782	\$481	30,514	\$522
Employee Short-term Disability*	6,856	\$250	33,572	\$291
Employee Long-term Disability	9,863	\$7	49,679	\$5
Employee Workers' Compensation	10,833	\$223	58,317	\$207
Dependent Health Care (any child) ³	11,794	\$3,208	64,812	\$2,345
Dependent Prescription Drug (any child)*	11,794	\$767	64,812	\$233

¹ Children were born before the index date but did not turn 12 until after.
² For EWCWA, the date of the 1st asthma diagnosis or 1st controller medication prescription in the study period.
³ For EWCWOA, the index date is the date of a child's first medical or drug claim in the data.
 * $P \leq 0.01$

Figure 1: Percentages of Employees with Dependents using Short-acting Beta Agonists or Inhaled Corticosteroids Caregiver of Children



- Juniper EF, et al. Measuring quality of life in the parents of children with asthma. *Qual Life Res.* 1996 Feb;5(1):27-34.
 - Murphy KR, et al. Effects of budesonide inhalation suspension compared with cromolyn sodium nebulizer solution on health status and caregiver quality of life in childhood asthma. *Pediatrics.* 2003 Sep;112(3 Pt 1):e212-9.
 - Halterman JS, et al. The impact of childhood asthma on parental quality of life. *J Asthma.* Sep 2004;41(6):645-653.
 - Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987;40:373-83.
- Presented at the 13th Annual International Meeting of the International Society for Pharmacoeconomics and Outcomes Research May 3-7, 2008, Sheraton Centre Toronto, Toronto, Ontario, Canada
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