

# COST OF ILLNESS FOR INSOMNIA: MEDICAL, PHARMACY, AND WORK ABSENCE COSTS IN EMPLOYEES WITH OR WITHOUT INSOMNIA

RICHARD A. BROOK, MS, MBA<sup>1</sup>; NATHAN L. KLEINMAN, PHD<sup>2</sup>; ARTHUR K. MELKONIAN, MD<sup>3</sup>; JUSTIN F. DOAN, MPH<sup>4</sup>; ROBERT W. BARAN, PHARM<sup>4</sup>

<sup>1</sup>THE JESTARX GROUP, NEWFOUNDLAND, NJ, USA; <sup>2</sup>HUMAN CAPITAL MANAGEMENT SERVICES, CHEYENNE, WY, USA;

<sup>3</sup>HUMAN CAPITAL MANAGEMENT SERVICES, YEREVEN, ARMENIA; <sup>4</sup>TAKEDA GLOBAL RESEARCH AND DEVELOPMENT, DEERFIELD, IL, USA

#242

## INTRODUCTION

Insomnia can negatively impact the function of employees, which may potentially cause financial burden to employers. Employers contribute significantly to health-benefit costs of their employees, including health plan enrollment, medical coverage, prescription drug coverage, sick leave, short- and long-term disability coverage, and workers' compensation. This financial burden is a major component of the cost of illness calculations for insomnia. Previous studies on the cost of illness for insomnia have used subjective information gathered from patient surveys,<sup>1-4</sup> included benzodiazepines and antidepressants in their inclusion criteria,<sup>5</sup> and have reported total costs without taking into account incremental costs.<sup>6</sup> Few studies have focused on the direct medical and prescription drug costs of insomnia and no recent published studies have reported on total absenteeism costs for a United States population. The goal of the current analysis was to examine the impact of insomnia in an employed population, quantifying the annual cost of illness to the employer by examining annual health benefit costs per employee, including medical and prescription drug claims (direct costs), sick leave, short- and long-term disability, and workers' compensation claims (indirect costs). The study findings were projected for a US national perspective using the civilian labor force and database of persons insured by their employer.

## METHODS

- A retrospective analysis was performed on data (2001 to 2006) from the Human Capital Management Services (HCMS) Research Reference Database consisting of the medical records for approximately 510,000 employees representing the retail, service, manufacturing, and financial industries. Anonymity of person-level data was maintained according to the Health Insurance Portability and Accountability Act guidelines.

- Employees with insomnia were identified using *International Classification of Diseases-9*<sup>th</sup> Revision (ICD-9) codes or prescriptions for hypnotic agents.

- ICD-9 codes used to identify employees with primary, secondary, or tertiary diagnoses included 307.41 (transient disorder of initiating or maintaining sleep), 307.42 (persistent disorder of initiating or maintaining sleep), 307.49 (subjective insomnia), and 780.52 (insomnia).

- Prescriptions for hypnotic agents included ramelteon, zaleplon, zolpidem, and eszopiclone.

- Employees without insomnia (no record of insomnia-related diagnoses and no prescriptions for hypnotic agents) were defined as the control group.

- The index date for each employee in the insomnia group was defined as the date of first service associated with insomnia or date of the first prescription, whichever was earlier.

- For the control group, the index date was the average index date of employees with insomnia.

- Employees in both the insomnia and control groups were required to be continuously employed and eligible for health benefits for at least 1 year after their index date.

- Outcome measures included prevalence of insomnia in the employed population, medical and prescription costs, as well as payments for absences (sick leave, short- and long-term disability, and workers' compensation).

- Costs were inflation-adjusted to 2006 US dollars.

- For projections representative of public health concerns, the study findings were applied to both estimates of the US civilian labor force<sup>7</sup> and the US population insured by employers.<sup>8</sup>

### Statistical Analysis

- Differences in descriptive statistics were compared using *t* tests for continuous variables and chi-square ( $\chi^2$ ) tests for binary variables.

- Two-part regression analysis was used to model the cost differences between the insomnia and control groups using separate regression models for direct medical costs (medical and prescription drugs), absence (indirect) costs, and absence days.

- The models controlled for population 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,<sup>9</sup> 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 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 294,042 eligible employees, of which 12,308 (4.19%) were included in the insomnia group. The demographics for both the insomnia and control groups are detailed in Table 1.

- Comparison of annual health benefit costs showed highly significant differences in costs between employees with and without insomnia for all categories (Table 2).

- Insomnia was associated with an annual mean incremental cost of \$3,225 per employee, of which direct medical costs accounted for 48.3%, prescription drug costs for 24.7%, and indirect costs (sick leave, short- and long-term disability, and workers' compensation) for 27.0% (Figure 1).

- Results of the current study were used to estimate the impact on the US population (Table 3).

**Table 1. Demographic Differences Between Employees With and Without Insomnia**

Category	Employees With Insomnia		Employees Without Insomnia		Difference	
	N	Mean	N	Mean		P Value
Mean age (at index date), years, [SE]	12,306	42.59* [0.08]	281,718	40.16 [0.02]	2.43	<.0001
Mean tenure (at index date), years, [SE]	12,308	9.38 [0.07]	281,734	9.28 [0.02]	0.10	0.1971
Mean annual salary, \$US, [SE]	12,256	\$61,365 [\$551]	278,349	\$49,509 [\$167]	\$11,856	<.0001
Female, %	12,308	57.0*	281,734	41.2	15.8%	<.0001
Married, %	11,720	56.2	257,156	56.2	0.0%	0.9615
Race (N)	10,372		207,655			
White, %		74.8		60.6	14.3%	<.0001
Black, %		7.5*		18.0	-10.5%	<.0001
Hispanic, %		8.7		9.6	-0.8%	0.0040
Exempt, %	12,308	44.2	281,726	28.0	16.2%	<.0001
Full Time, %	12,308	94.8	281,734	88.4	6.4%	<.0001

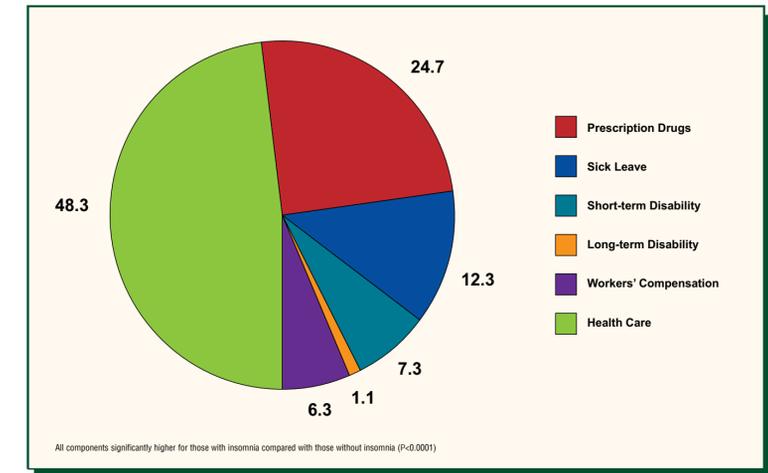
Abbreviations: SE = Standard Error  
\* Demographic data corrected from abstract

**Table 2. Annual Health Benefit Costs**

Cost Category	Employees With Insomnia		Employees Without Insomnia		Difference
	N	Adjusted Mean Cost	N	Adjusted Mean Cost	
Health Care	12,308	\$3,306	281,734	\$1,749	\$1,557
Prescription Drug	12,308	\$1,220	281,734	\$422	\$798
Sick Leave	5,582	\$720	136,661	\$325	\$395
Short-term Disability	6,774	\$465	130,792	\$229	\$236
Long-term Disability	10,107	\$46	195,323	\$10	\$35
Workers' Compensation	11,669	\$483	258,274	\$280	\$203
Totals		\$6,240		\$3,015	\$3,225

All categories  $P < 0.0001$   
All costs were rounded to the nearest dollar

**Figure 1. Percentage of Utilization for Incremental Costs of Insomnia**



**Table 3. Projections of the Impact of Insomnia to the US Civilian and Employer-Insured Labor Forces (in 2005)**

Projections	US Civilian Labor Force (2005)	Population Insured by Employer (2005)
Study Prevalence Rate	4.19%	
Persons (millions of persons)	150.1	126.7
<b>Estimated:</b>		
Prevalence of Insomnia (millions of persons)	6.283	5.303
Incremental Annual Direct Health Care Costs (medical+Rx) (\$ millions)	\$14,799.1	\$12,492.0
Incremental Annual Indirect Costs (SL, STD, LTD, WC) (\$ millions)	\$5,463.1	\$4,611.4
Total Incremental Annual Costs (\$ millions)	\$20,262.2	\$17,103.4

SL = sick leave  
STD = short-term disability  
LTD = long-term disability  
WC = workers' compensation

## CONCLUSIONS

- Insomnia is associated with a substantial cost of illness, which can be a large financial liability to employers.
- Direct medical costs (excluding prescription medications) contributed almost half (48.3%) of the total incremental costs, while indirect costs (sick leave, short- and long-term disability) represented 27.0% of the total incremental costs.
- The insomnia prevalence rate in this study (4.19%) reflected only employees seeking medical care for their insomnia, and may underestimate the true prevalence in the population.
- These results indicate an opportunity for improved management of patients with insomnia that may reduce costs from an employer and a societal perspective.

## REFERENCES

- Leger D, Guilleminault C, Bader G, Levy E, Paillard M. Medical and socio-professional impact of insomnia. *Sleep* 2002;25(6):625-629.
- Ohayon M, Roth T. Place of chronic insomnia in the course of depressive and anxiety disorders. *J Psychiatr Res* 2003;37(1):9-15.
- Hatoum HT, Kong SX, Kania CM, Wong JM, Mendelson WB. Insomnia, health-related quality of life and healthcare resource consumption. A study of managed-care organisation enrollees. *Pharmacoeconomics* 1998;14(6):629-637.
- Sivertsen B, Overland S, Neckelmann D, et al. The long-term effect of insomnia on work disability: the HUNT-2 historical cohort study. *Am J Epidemiol* 2006;163(11):1018-1024.
- Kuppermann M, Lubeck DP, Mazonson PD, et al. Sleep problems and their correlates in a working population. *J Gen Intern Med* 1995;10(1):25-32.
- Walsh JK, Engelhardt CL. The direct economic costs of insomnia in the United States for 1995. *Sleep* 1999;22 Suppl 2:S386-S393.
- Civilian Labor Force (Thousands). *Economagic*. [http://www.economagic.com/em-cgi/find.exe/blsin+Civilian\\_Labor\\_Force](http://www.economagic.com/em-cgi/find.exe/blsin+Civilian_Labor_Force). Accessed April 2, 2007.
- Clemens-Cope L, Garrett B. Changes in employer-sponsored health insurance sponsorship, eligibility, and participation: 2001-2005. Kaiser Commission on Medicaid and the Uninsured. <http://www.kff.org/uninsured/7599.cfm>. Accessed April 2, 2007.
- 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(5):373-383.