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ANNUAL DIRECT AND INDIRECT COSTS OF US EMPLOYEES WITH BIPOLAR DISORDER, SCHIZOPHRENIA AND CONTROLS FROM 2001 TO 2011

R. A. Brook, MS, MBA;[1] K. Rajagopalan, PhD;[2] N. Kleinman, PhD;[3] M. Hassan, PhD;[2] J. Young;[3] A. Pikalov, MD, PhD[4]

[1]*The JeSTARx Group, Newfoundland, NJ, US;* [2]*Sunovion Pharmaceuticals Inc, Marlborough, MA, US;* [3]*HCMS Group, Cheyenne, WY, US* [4]*Sunovion Pharmaceuticals Inc, Fort Lee, NJ, US*

ABSTRACT

Objective: To compare the annual direct and indirect costs between US employees (EMPs) with Bipolar Disorder (BPD), Schizophrenia (SCZD), and a Control group without BPD/SCZD (CTRL).

Methods: Analysis of administrative claims from the Human Capital Management Services Research Reference Database of geographically dispersed large US employers in years 2001-2012. Subjects with a BPD or SCZD diagnostic claim and ≥12 months follow-up after the index date were eligible. For BPD and SCZD subjects, the index date was the date of the initial claim, and for CTRLs, the average of BPD and SCZD index date by year. Outcomes measured annually were: medical, drug, sick leave (SL), short- and long-term disability (STD, LTD), and workers' compensation (WC) costs. The cohorts were examined using two-part regression models (logistic followed by generalized linear models), while controlling for potentially confounding factors (demographics, job related variables, region, and year). All costs were inflation adjusted to 2012.

Results: The analysis identified 5299 EMPs with BPD; 391 with SCZD; and 653,707 CTRLs. Compared with CTRLs, the BPD and SCZD cohorts were less likely to be married and exempt (salaried) and had lower salaries. In 2001, BPD EMPs annually cost $8573 more than CTRLs, with higher costs in all categories, and significantly higher costs (all P<0.003) for Medical ($4701), Rx ($2252), SL ($391), STD ($762), and WC ($461). Those with SCZD were $8,812 more costly than CTRLs and higher for Medical ($6549) and Rx ($2119) and $205 lower WC (all P<0.05). Overall, BPD EMP were $239 less expensive than those with SCZD despite $649 higher STD and $666 higher WC (both P<0.05). In 2011, BPD EMPs cost $9547 more than CTRLs, with higher costs in all categories, and significantly higher costs (all P<0.002) for Medical ($6147), Rx ($2552), SL ($208) and STD ($413). Those with SCZD were $7772 more costly than CTRLs and significantly higher for Medical ($5191, P<0.05) and Rx ($2630, P<0.02). BPD EMPs were $1775 more expensive than those with SCZD (all P>0.05). The significant BPD cohort changes (2001 to 2011) were +$1950 for Medical and -$473 for STD (both P<0.03). Since 2006, there have been consistent decreases in STD costs for the BPD and SCZD cohorts (since 2007 for LTD and WC). From 2001-2011, direct costs as a % of total increased for those with BPD from 78.9% to 86.7% and from 75.2% to 78.8% for CTRLs; for SCZD these percentages decreased through 2005 and then increased through 2011.

Conclusion: The impact of BPD and SCZD is costly in the workplace, leading to increased health benefit costs. While disability costs have become marginally lower since 2006, medical costs (e.g., doctor or inpatient visits) among these two patient populations still remain significantly high suggesting the need for better therapeutic options. Further research may explain if the health benefit cost changes are due to benefit design policies and/or antipsychotic drug use.

BACKGROUND

- Bipolar disorder is ranked as the 6th greatest cause of disability in the WHO's Global Burden of Disease study (WHO, 2013).
  - The age of onset varies from the teens to the 30s.
  - The life-time prevalence in the United States is about 4%.
- Schizophrenia is ranked as the 9th largest cause of disability in the WHO's Global Burden of Disease study (WHO, 2013).
  - The average age of onset of schizophrenia is 18 years for men and 25 years for women.
  - The life-time prevalence in the United States is about 1%.
- Although the deleterious effects of these serious mental illnesses on the patients themselves and their immediate surroundings have long been recognized, the impact of the significantly diminished economic productivity of these patients is less well studied.
  - Due to the early onset of these mental health disorders, they have a disproportionate impact on the most productive decades of life, often arresting the social and educational development necessary for sustained successful participation in the work place, as these patients that are employed demonstrate severely compromised occupational, interpersonal, and self-supportive abilities (McGorry, 2013; Dewa, 2012; Bowden, 2005; Sajatovic, 2005; Slade & Salkever, 2001).
- Overall, bipolar disorder ($45 billion) and schizophrenia ($62.7 billion; Wyatt) result in a significant economic burden with high direct (medical and prescription) and indirect health care costs (sick leave, short- and long-term disability, and worker's compensation (Gardner, 2006; Hirschfeld, 2005). The significantly high indirect costs are primarily related to un/under employment and lower productivity when employed (Dewa, 2012; Brook, 2007; Hirschfeld, 2005; Kleinman, 2005).

OBJECTIVE

- To compare the annual direct and indirect costs among United States employees with bipolar disorder, schizophrenia, and a control group without either of these conditions.

METHODS

Data Source

- Analysis of data extracted from adjudicated health insurance claims among employees within the Human Capital Management Services Research Reference Database, which:
  - Pools anonymous data from more than 30 geographically dispersed United States employers (including manufacturing, insurance, retail, transportation, telecommunications, health care, and pharmaceuticals).
  - Contains claims information from more than 1.8 million employees, plus more than 1 million spouses and eligible dependents
  - Covers a variety of health plans,
  - Has been used in prior bipolar disorder (Gardner 2006; Brook 2007) research.
- The study focused on the time period from 1/1/2001 through 6/30/2012.

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METHODS (cont.)

Study Cohorts

- Subjects with claims from 1/1/2001 through 6/30/2012 with any diagnosis of schizophrenia (ICD-9 codes 295.xx) or bipolar disorder (ICD-9 codes 296.0x, 296.1x, 296.4x, 296.5x, 296.6x, 296.7x, or 296.8x) were assigned to the schizophrenia and bipolar disorder cohort respectively. Subjects without any schizophrenia or bipolar disorder ICD-9 were considered to be the control cohort.
  - Employees with a dual diagnosis of schizophrenia and bipolar disorder were classified as either schizophrenia or bipolar if their initial diagnosis of one condition happened at least a year before the second condition. If the first bipolar disorder or schizophrenia diagnosis occurred within one year of the diagnosis of the other condition, then the employee was excluded from this analysis.
- The first date of claim for schizophrenia or bipolar disorder formed the index date for the respective disease cohorts, and the average index date of the schizophrenia and bipolar disorder cohorts by year formed the index date for the control cohort. All eligible subjects were required to have continuous health plan enrollment for 12 months following their index date.
- Demographics, job-related variables (e.g. salary, percent full time, exempt status), location (based on the 1st digit of the Zip code), Charlson Comorbidity Index score, alcohol, drug, and other abuse diagnoses, as well as Type I and II diabetes status were used to describe the population and to control for any confounding effects.
- Outcomes measured annually were: medical (including inpatient, outpatient, office, emergency department, lab and other), prescription drug, sick leave, short- and long-term disability, and workers' compensation costs.

STATISTICAL ANALYSIS

- Differences in descriptive characteristics between the study cohorts were compared using student t-tests for continuous variables and chi-square tests for discrete (categorical) variables:
- Two-part regression models were utilized for all cost and absenteeism dependent variables to yield estimates of annual outcomes for all employees:
  - Stage 1: Logistic regression to predict employees with any cost/absence.
  - Stage 2: Generalized linear models with log link with gamma distribution to predict amount of cost/absence.
  - Models controlled for confounding factors, including: age, gender, marital status, race, salary, region (by first digit of Zip code), year of index date, year squared, and interactions between cohorts and the year and year squared variables.
- All comparisons were considered significant when P≤0.05.

Inflation Adjustment

- Costs were inflation adjusted to constant 2012 US dollars using the US Bureau of Labor Statistics Consumer Price Index factors for medical services, prescription drugs, and all consumer goods.

RESULTS

- The analysis identified 5,299 employees with bipolar disorder, 391 with schizophrenia, and 653,707 controls, with descriptive information about these cohorts in **Table 1**.
  - Prevalence rates were 0.804% for bipolar disorder and 0.059% for schizophrenia.
  - Means, standard errors, and percentages are provided for demographic, job-related, and comorbid condition variables.

Table 1. Descriptive Statistics for Employees[1] in the Study Cohorts

Variable	Bipolar Disorder (N=5,299)	Schizophrenia (N=391)	Controls (N=653,707)
Age[2], years, mean (SE)	39.15 (0.14)[†,§]	42.37 (0.55)[†]	40.82 (0.01)
Tenure[2], years, mean (SE)	6.61 (0.10)[†,§]	8.77 (0.43)	8.49 (0.01)
Female	60.7%[†,§]	49.1%	46.7%
Marital status, %			
Married	26.0%[§]	21.7%[§]	31.5%
Not married	28.9%[†]	35.3%[§]	27.1%
Missing	45.1%[§]	43.0%	41.4%
Race/ethnicity, %			
White	35.9%[†,§]	27.6%	33.0%
Black	3.3%[†,§]	11.8%	8.9%
Other	1.1%[§]	1.8%	3.2%
Missing	54.4%[§]	55.5%[§]	49.0%
Hispanic	5.3%	3.3%[§]	5.8%
Employment status, %			
Exempt	26.3%[†,§]	19.4%[§]	32.9%
Annual salary	$49,542 ($461)[§]	$45,040 ($1737)[§]	$56,018 ($90)
Full-time	95.3%[§]	94.9%	93.5%
Post-Dx Charlson Index, mean (SE)	0.37 (0.01)[†]	0.45 (0.06)[§]	0.36 (0.00)
Alcohol Abuse (303.xx)	3.0%[§]	1.5%	0.2%
Drug Abuse (304.xx)	2.8%[†,§]	1.3%	0.2%
Other Non-Dependent Abuse (305.xx)	8.1%[§]	8.7%[§]	1.8%
Type I Diabetes (250.x1 or 250.x3)	0.9%	1.8%	0.8%
Type II Diabetes (250.x0 or 250.x2)	5.7%[§]	9.7%[§]	5.3%

S.E. Standard Error

[1]All employees had at least 12 months of health plan enrollment after their index date. Descriptive statistics for the Control Cohort are given as of each employee's most recent eligibility period. Age data were missing for 18 Control employees. Salary data were missing for 102 Bipolar Disorder, 7 Schizophrenia, and 17,873 Control employees.

[2]at index date.

[†] P<0.05 vs. Schizophrenia Cohort, adjusting for multiple comparisons between cohorts using the Tukey-Kramer procedure for continuous variables or the Marascuilo procedure for binary variables.

[§] P<0.05 vs. Control Cohort, adjusting for multiple comparisons between cohorts using the Tukey-Kramer procedure for continuous variables or the Marascuilo procedure for binary variables.

RESULTS

Table 2. Annual Health Benefit Costs in 2001 and 2011 by Benefit and Cohort

Benefit	N			Adjusted Annual Cost Mean (2001-2011)			P-Values of Adjusted Mean Differences between Cohorts			P-Values of Adjusted Mean Differences within Cohorts (2001 versus 2011)		
	Bipolar Disorder	Schizophrenia	Controls	Bipolar Disorder	Schizophrenia	Controls	Bipolar Disorder - Schizophrenia	Bipolar Disorder - Controls	Schizophrenia - Controls	Bipolar Disorder	Schizophrenia	Controls
2001					**2001**			**2001**			**2001 versus 2011**	
Medical	797	85	244,125	$7,645	$9,493	$2,944	0.2212	**< 0.0001**	**< 0.0001**	**0.0165**	0.7749	**< 0.0001**
Prescription Drug	797	85	244,125	$3,091	$2,957	$839	0.7841	**< 0.0001**	**< 0.0001**	0.3505	0.6703	**< 0.0001**
Sub-total Direct				$10,736	$12,450	$3782						
Sick Leave	350	31	120,891	$1,055	$884	$664	0.3220	**< 0.0001**	0.1730	0.2488	0.1990	**< 0.0001**
Short-term Disability	263	24	100,905	$1,109	$460	$347	**0.0251**	**< 0.0001**	0.6095	**0.0275**	0.9232	**< 0.0001**
Long-term Disability	550	42	173,803	$7	$19	$2	0.8843	0.7024	0.8271	0.7854	0.8143	0.0814
Workers' Compensation	714	76	221,062	$695	$29	$234	**< 0.0001**	**0.0021**	**< 0.0001**	0.0885	0.3947	**< 0.0001**
Sub-total Indirect				**$2,866**	**$1,391**	**$1,247**						
Total				**$13,602**	**$13,841**	**$5,029**						
2011					**2011**			**2011**				
Medical	360	22	269,525	$9,594	$8,638	$3,447	0.7136	**< 0.0001**	**0.0466**	NA	NA	NA
Prescription Drug	360	22	269,525	$3,368	$3,446	$816	0.9423	**< 0.0001**	**0.0123**	NA	NA	NA
Sub-total Direct				**$12,962**	**$12.084**	**$4,263**						
Sick Leave	191	10	138,373	$952	$553	$744	0.0587	**0.0014**	0.3417	NA	NA	NA
Short-term Disability	273	17	219,019	$636	$425	$223	0.4873	**0.0001**	0.4794	NA	NA	NA
Long-term Disability	187	12	173,937	$34	$0	$1	0.7320	0.7336	0.9656	NA	NA	NA
Workers' Compensation	325	20	245,628	$372	$119	$178	0.1014	0.0946	0.5627	NA	NA	NA
Sub-total Indirect				**$1,994**	**$1,097**	**$1,146**						
Total				**$14,956**	**$13,181**	**$5,409**						

NA Not Applicable.

Figure 1. Annual Medical Costs by Cohort and Year

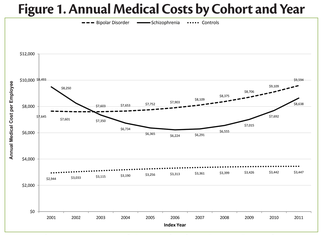


Figure 2. Annual Prescription Drug Costs by Cohort and Year

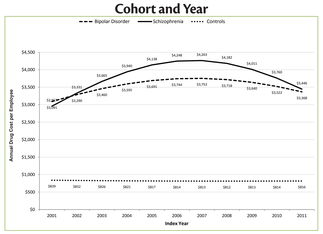


Figure 3. Annual Sick Leave Costs by Cohort and Year

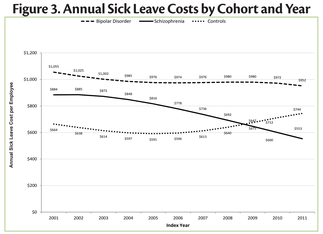


Figure 4. Annual Short-term Disability Costs by Cohort and Year

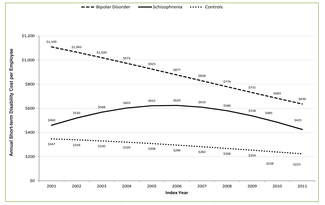


Figure 5. Annual Long-term Disability Costs by Cohort and Year

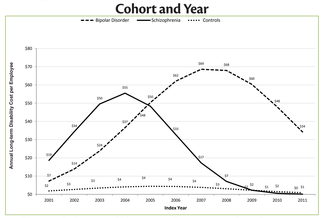
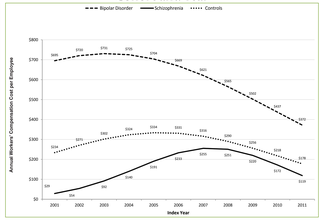


Figure 6. Annual Workers' Compensation Costs by Cohort and Year



LIMITATIONS

- Limitations include use of retrospective data with lack of information on diagnosis and disease severity.
- Small sample size in the data set may also limit the generalizability of findings.
- Although regression techniques were used to control for differences between cohorts, the cohort sizes differed greatly.

CONCLUSIONS

- This study quantifies the trend in employee costs of bipolar disorder and schizophrenia over the 2001-2011 time period, and indicates that both diagnoses continue to be costly for employers.
- Prevalence rates for bipolar disorder and schizophrenia were lower in this study's employed population compared to rates in general popluation. In the bipolar and schizophrenia cohorts, average years with the current employer, and average salaries, were both lower compared with the control cohort.
- This study found that from 2001-2011 total costs for employees with a bipolar disorder diagnosis rose significantly (e.g. hospitalization costs) while the costs associated with a schizophrenia diagnosis declined. Increased costs were largely driven by lower medical costs associated with a diagnosis of schizophrenia, but higher medical costs associated with a diagnosis of bipolar disorder. Disability costs for both diagnoses have become marginally lower since 2006
- Further research may explain if the observed health benefit cost changes are due to the differential impact of antipsychotic drug use.
- These findings suggest that better treatment options for patients with bipolar disorder or schizophrenia are needed to improve health outcomes and improve health care quality.

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