The effect of bipolar I disorder and major depressive disorder on workforce function

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Abstract

This investigation was undertaken to explore and compare the effect of bipolar I disorder (BD) and major depressive disorder (MDD) on workforce function. The data for this analysis were procured from the Canadian Community Health Survey (CCHS 1.2). The sample consisted of 20 747 individuals ($\geq$ 18 years old and currently working); the proportions screening positive for lifetime BD and MDD were 2.4% and 11.2%, respectively. Individuals with BD or MDD had a significantly lower mean annual income, compared to people without these disorders. Individuals with BD had a significantly lower annual income when compared to MDD (p < 0.05). Results from a multiple logistic regression also indicate that employed individuals with BD had greater odds of reporting one or more mental health disability days in the past two weeks, compared with those with MDD (OR = 1.6; 95% CI = 1.0 to 2.6). Currently employed individuals with BD had lower odds of "good job security" relative to those with MDD (OR = 0.6 95% CI = 0.5 to 0.9). The data herein underscore the pernicious effect of BD on workforce function, and suggest that opportunistic screening for BD in all individuals utilizing employment assistance programs for depression might be warranted.

Key words: *bipolar disorder, major depressive disorder, workforce function, human capital*

Introduction

Mounting evidence indicates that mood disorders are a leading cause of disability and premature mortality.[1,2] Cost-of-illness studies indicate that mood disorders impart staggering direct and indirect costs in both developed and developing nations.[3] Decrements in workforce productivity comprise a significant component of the overall cost of illness.[4] Improved recognition and management of mood disorders

have important implications for averting expenditures and reducing cost.[5]

Most cost-of-illness studies focus on individuals diagnosed with major depressive disorder (MDD) with relatively fewer studies separately evaluating the effect of bipolar disorder (BD).[6-8] During the past decade, the estimated lifetime prevalence of BD has increased considerably largely due to the broadening diagnostic boundaries.[9] Taken together, the total cost of

mood disorders attributable to BD may be considerably higher than previously estimated.[6,10]

The only study to present comparative information on the workforce costs of MDD and BD reported that BD was associated with more lost work days per ill worker per year.[4] This effect was mediated by greater severity and persistence of depressive symptoms in BD versus MDD. It was also reported that presenteeism (i.e., low performance while at work) accounted for approximately two-thirds of the total workforce cost of illness.

This investigation was undertaken to describe and compare the effect of BD, relative to MDD and the general population, on workforce function. The data for this post hoc analysis was from a Canadian cross-national mental health survey.

Methods

The data for this analysis were procured from the 2002 Canadian Community Health Survey: Mental Health and Well-being (82-617-XIE); a component of the Canadian Community Health Survey (CCHS), conducted by Statistics Canada. Information about the survey is available at http://www.statcan.ca:8096/bsolc/english/bsolc?catno=82-617-X.

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The survey employed the World Health Organization (WHO) World Mental Health 2000 version of the Composite International Diagnostic Interview (WMH-CIDI). The questionnaire used can be found at http://www.statcan.ca/english/sdds/instrument/5015_Q1_V1_E.pdf .

Respondents were residents of private dwellings; a multistage stratified cluster design was used to sample dwellings. Most interviews (86%) were conducted in person; the remainder by telephone. The responding sample totaled 36 984 people aged 15 or older; the participation rate was high (77%). The data were weighted to be representative of the household population of the ten provinces of Canada in 2002. The analysis herein was limited to individuals aged 18 or older and currently working.

The CCHS collected information on determinants and correlates of mental health such as socio-demographics, income, self-reported distress, level of leisure-time physical activity, medication use, and social support. Based on WHM-CIDI screening criteria, the survey collected information on lifetime and past 12-month prevalence of various mental disorders and behaviours (i.e. major depressive episode, manic episode, panic disorder, agoraphobia, social phobia, alcohol and drug dependence, gambling, suicide, and abnormal eating behavior), self-reported height and weight, and previously diagnosed medical disorders. Work-related variables included current employment status, self-perceived job security and the number of "mental health disability days" experienced in the past two weeks. The latter variable was measured by asking respondents if, in the past 2 weeks, they had "stayed in bed all or most of day or cut down on activities because of illness or injury," or had days that "took extra effort to perform up to their usual level at work or in other daily activities due to emotional or mental health or use of alcohol or drugs."

Statistical analyses were calculated by producing frequencies, cross-tabulations and multiple regression models. All analyses were based on data weighted to be representative of the Canadian population aged 18 or older in 2002. Based on data for those screened positive for lifetime mood disorder (bipolar I or depression), multiple logistic regression modeling was used to compare the associations of lifetime bipolar I disorder and lifetime depressive disorder with self-reported job security, and with mental health disability days in the past two weeks. For the analysis, mutually exclusive groups were created as follows: persons screened positive for lifetime bipolar I disorder (BD); persons screened positive for lifetime major depressive disorder (without bipolar I disorder) (MDD); and persons with neither mood disorder.

The models controlled for the effects of sex, age group, level of education, presence of physician-diagnosed chronic medical disorders (arthritis, asthma, back problems excluding fibromyalgia and arthritis, high blood pressure, migraine, chronic bronchitis, emphysema or chronic obstructive pulmonary disease, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, bowel disorder/Crohn's disease or colitis, Alzheimer's disease or other dementia, cataracts, glaucoma, and thyroid disorder) and body mass index. Preliminary analysis revealed a relatively high prevalence of substance (alcohol or illicit drugs) dependency in persons with BD or MDD. Twelve-month dependency estimates were 23% and 7%, respectively, compared with 3% in the general population (data not shown). Therefore, to avoid multicollinearity, no variable for substance dependency was included in the multivariate regression models.

All statistical analyses were performed using SAS statistical software, release 9.1 (SAS Institute, Cary, NC). Variables

for analysis were selected *a priori*, based on previous research. To account for the complex sampling design of the CCHS, coefficients of variation on estimates and significance of differences between estimates were calculated using the boot-strap technique. The level of statistical significance was defined as $p < 0.05$.

Results

A positive screen for a lifetime manic episode (i.e. DSM-IV-defined bipolar I disorder) was ascertained in an estimated 2.4% of the currently employed Canadian population aged 18 or older. Lifetime history of BD was more frequent in younger respondents, in persons not married or living with a partner, and in those with incomplete post-secondary education (Table 1). The proportion of the employed population aged 18 or older with a positive screen for lifetime MDD (without BD) was estimated at 11.2%.

Among Canadians aged 18 or older in 2002, the proportion of people who were currently employed did not differ significantly according to the presence of lifetime mood disorder, nor did it differ between persons with lifetime BD and those with lifetime MDD. In persons with no history of mood disorder, 70% were employed; the proportion in those with BD was 68%, and in those with MDD, 69% reported employment at the time of the survey (data not shown). In all three groups, most individuals who were employed had full-time jobs (86% in those with no mood disorder; 87% in those with lifetime BD; 84% in those with lifetime MDD; the differences between proportions were not statistically significant) (data not shown).

The mean annual income of employed persons with mood disorder was substantially lower than that for those who were unaffected. Persons with lifetime BD had an average income of $32,000—nearly

$5,000 less than the average income ($36,800) of those with MDD ($p < 0.05$) (Table 2). For persons with neither mood disorder, the average yearly income was $40,300—substantially and statistically higher than that of either of the mood disorder groups ($p < 0.05$).

The results of multivariate modeling indicated that the odds of having experienced at least one mental health disability day within the past two weeks was significantly higher in persons with lifetime BD (OR = 8.8; 95% CI = 5.9 to 13.1) or lifetime MDD (OR = 5.6; 95% CI = 4.1 to 7.7), compared

with the odds for persons with neither disorder (Table 3a). In comparison with persons with lifetime MDD, those with lifetime BD had significantly higher odds of having experienced at least one mental health disability day within the past two weeks (OR = 1.6; 95% CI = 1.0 to 2.6)

TABLE 1
Prevalence of lifetime bipolar I disorder (BD) and major depressive disorder (MDD) (excluding BD) by selected socio-demographic characteristics, employed household population aged 18 or older, Canada excluding territories, 2002

	Lifetime BD		Lifetime MDD (excl. BD)		Neither lifetime BD nor lifetime MDD	
	Est'd number	%	Est'd number	%	Est'd number	%
Total	**371 000**	**2.4**	**1 737 000**	**11.2**	**13 320 000**	**86.3**
Sex						
Males†	207 000	2.5	677 000	8.1	7 506 000	89.5
Females	164 000	2.3	1 060 000	15.0*	5 814 000	82.6*
Age group						
18 to 34	146 000	2.8*	529 000	10.0*	4 592 000	87.2
35+†	225 000	2.2	1 208 000	11.9	8 728 000	85.9
Level of education						
Secondary graduation or less	140 000	2.6	512 000	9.7*	4 628 000	87.6
Some post-secondary	50 000	3.7*	152 000	11.4	1 134 000	84.8*
Post-secondary graduation†	173 000	2.0	1 046 000	12.0	7 450 000	85.9
Marital status						
Married/living with partner†	177 000	1.7	1 503 000	10.1	9 195 000	88.2
Separated/divorced/widowed	77 000	5.7*	293 000	21.4*	997 000	72.9*
Never married	117 000	3.2*	390 000	10.8	3 110 000	86.0

† Reference group.

* Estimate is significantly different from estimate for reference category ($p < 0.05$).

  Because of rounding and data not available (level of education), detail does not always sum to total.

Source: 2002 Canadian Community Health Survey: Mental Health and Well-being.

TABLE 2
Mean annual income, by presence of mood disorder (lifetime bipolar I disorder (BD) or major depressive disorder (MDD)), employed household population aged 18 or older, Canada excluding territories, 2002

Disorder	Mean income (C$)
Lifetime BD	32,000*
Lifetime MDD (excluding BD)	36,800
General population without mood disorder	40,300

* Estimate is significantly lower than estimates for other categories ($p < 0.05$)

Source: 2002 Canadian Community Health Survey: Mental Health and Well-being.

TABLE 3a

Adjusted odds ratios for one or more mental health disability days in past two weeks in relation to presence of mood disorder (lifetime bipolar I disorder (BD) or lifetime major depressive disorder (MDD)), controlling for selected characteristics, currently employed household population aged 18 or older, Canada excluding territories, 2002

	Odds ratio	95% confidence interval
Mood disorder		
Lifetime BD	8.8*	5.9 to 13.1
Lifetime MDD (excluding BD)	5.6*	4.1 to 7.7
None†	1.0	–
Sex		
Males	0.8	0.6 to 1.0
Females†	1.0	–
Age group		
18 to 34	1.6*	1.2 to 2.1
35+†	1.0	–
Level of education		
High school graduation or less†	1.0	–
Some post-secondary education	0.8	0.5 to 1.3
Post-secondary graduation	0.7*	0.5 to 1.0
Comorbidity		
Chronic condition present§	2.0*	1.5 to 2.8
Body mass index category		
Underweight/normal weight/ overweight (BMI < 30.0)†	1.0	–
Obese (BMI 30.0+)	0.8	0.5 to 1.1

* Estimate is significantly different from estimate for reference category ($p < 0.05$)

† Reference group, for which the odds ratio is always 1.0

– Not applicable

§ Reference group is absence of arthritis, asthma, back problems excluding fibromyalgia and arthritis, high blood pressure, migraine, chronic bronchitis, emphysema or COPD, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, bowel disorder/Crohn's disease or colitis, Alzheimer's disease or other dementia, cataracts, glaucoma, and thyroid disorder.

Odds ratios have been rounded; some with 1.0 as the lower or upper confidence limit are statistically significant (as indicated).

Model is based on records of 20 431 respondents.

Source: 2002 Canadian Community Health Survey: Mental Health and Well-being.

(Table 3b). Similarly, the odds of reporting good job security were significantly lower in persons with BD (OR = 0.4; 95% CI = 0.3 to 0.6) or MDD (OR = 0.7; 95% CI = 0.6 to 0.8) than in persons without either mood disorder (Table 4a). As well, those with BD (OR = 0.6; 95% CI = 0.5 to 0.9) compared unfavorably to those with MDD (Table 4b). These associations were present after controlling for the effects of the potentially confounding influences of sex, age group, level of education, medical comorbidity and body mass index category.

Discussion

These results suggest that, on several indices of workforce function, individuals with either BD or MDD are strikingly more impaired than persons without mood disorder. These data further suggest that individuals with BD may be more impaired than individuals with MDD as evinced by annual income, more mental health disability days, and job security.

The only other investigation to present comparative information on the workforce costs of MDD and BD also reported that mood disorders predicted overall lost work performance with an estimated 65.5 lost workdays per worker with BD and 27.2 lost workdays per worker with MDD.[4] No significant differences in the association of BD and MDD with work performance were found by sex or age. Work loss associated with BD affected all occupational groups with a significantly greater effect noted among technical and professional workers in the case of absenteeism and among laborers and professional workers in the case of presenteeism.

During the past decade, several observations in mood disorders provide a relevant context to workforce dysfunction studies. Firstly, the estimated lifetime prevalence of bipolar spectrum disorders is considerably higher than previously estimated.[9] For example, it is now estimated that 2 to 5% of the general population may be affected by BD.[11,12] In keeping with this view, the percentage of employable individuals with BD may be higher than previously estimated. Secondly, similar to MDD, the longitudinal symptomatic structure of BD is dominated by chronic subsyndromal depressive symptoms.[13-16] It is increasingly recognized that depressive symptoms are a more impairing aspect of BD when compared to manic symptoms.[17] Moreover, individuals with bipolar spectrum disorders (a predominantly depressive phenotype) exhibit impairment in functioning inter-mediate between those with bipolar I disorder and of non-cases in the general population.[9,18] Thirdly, several cost-of-illness studies indicate that mood disorders are associated with substantial decrement in work performance, as well as appreciable caregiver burden, medical service utilization, and premature mortality.[1,7,19] Improved recognition and management of non-bipolar depression has been shown to reduce overall illness burden and reduce costs.[20]

Several factors limit the interpretations and inferences that can be drawn from this analysis. The major limitation of this post hoc analysis is that the CCHS was not designed *a priori* to evaluate and compare the effects of mood disorders on workforce function. The CCHS did not have a specific

TABLE 3b

Adjusted odds ratios for one or more mental health disability days in past two weeks in relation to lifetime bipolar I disorder (BD) and lifetime major depressive disorder (MDD), controlling for selected characteristics, currently employed household population aged 18 or older with mood disorder, Canada excluding territories, 2002

	Odds ratio	95% confidence interval
Mood disorder		
Lifetime BD	1.6*	1.0 to 2.6
Lifetime MDD[†] (excluding BD)	1.0	–
Sex		
Males	0.9	0.5 to 1.4
Females[†]	1.0	–
Age group		
18 to 34	1.5	0.9 to 2.5
35+[†]	1.0	–
Level of education		
High school graduation or less[†]	1.0	–
Some post-secondary education	0.5*	0.2 to 1.0
Post-secondary graduation	0.5*	0.3 to 0.8
Comorbidity		
Chronic condition present[§]	2.0*	1.2 to 3.3
Body mass index category		
Underweight/normal weight/ overweight (BMI < 30.0)[†]	1.0	–
Obese (BMI 30.0+)	1.2	0.7 to 1.9

* Estimate is significantly different from estimate for reference category ($p < 0.05$)

[†] Reference group, for which the odds ratio is always 1.0

– Not applicable

[§] Reference group is absence of arthritis, asthma, back problems excluding fibromyalgia and arthritis, high blood pressure, migraine, chronic bronchitis, emphysema or COPD, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, bowel disorder/Crohn's disease or colitis, Alzheimer's disease or other dementia, cataracts, glaucoma, and thyroid disorder.

Odds ratios have been rounded, some with 1.0 as the lower or upper confidence limit are statistically significant (as indicated).

Model is based on records of 2 999 respondents screened positive for lifetime BD or MDD.

Source: 2002 Canadian Community Health Survey: Mental Health and Well-being

TABLE 4a

Adjusted odds ratios for good job security in relation to presence of mood disorder (lifetime bipolar I disorder (BD) or lifetime major depressive disorder (MDD)), controlling for selected characteristics, currently employed household population aged 18 or older, Canada excluding territories, 2002

	Odds ratio	95% confidence interval
Mood disorder		
Lifetime BD	0.4*	0.3 to 0.6
Lifetime MDD (excluding BD)	0.7*	0.6 to 0.8
None†	1.0	−
Sex		
Males	1.0	0.9 to 1.1
Females†	1.0	−
Age group		
18 to 34	1.0	0.9 to 1.1
35+†	1.0	−
Level of education		
High school graduation or less†	1.0	−
Some post-secondary education	0.9	0.8 to 1.1
Post-secondary graduation	0.9*	0.8 to 1.0
Comorbidity		
Chronic condition present§	0.9	0.8 to 1.0
Body mass index category		
Underweight/normal weight/ overweight (BMI < 30.0)†	1.0	−
Obese (BMI 30.0+)	1.0	0.9 to 1.2

* Estimate is significantly different from estimate for reference category ($p < 0.05$)

† Reference group, for which the odds ratio is always 1.0

− Not applicable

§ Reference group is absence of arthritis, asthma, back problems excluding fibromyalgia and arthritis, high blood pressure, migraine, chronic bronchitis, emphysema or COPD, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, bowel disorder/Crohn's disease or colitis, Alzheimer's disease or other dementia, cataracts, glaucoma, and thyroid disorder.

Odds ratios have been rounded, some with 1.0 as the lower or upper confidence limit are statistically significant (as indicated).

Model is based on records of 20 251 respondents.

Source: 2002 Canadian Community Health Survey: Mental Health and Well-being

quantitative measure of work performance (e.g., World Health Organization Health and Work Performance Questionnaire). We are also unable to comment on components of impaired function and their contribution to overall performance and cost. For example, presenteeism may account for a larger component of workforce cost than absenteeism in the BD population.[4] In keeping with this view, the CCHS does not have detailed longitudinal ratings of mood symptoms which prevents us from commenting on the relative contribution of depressive (or manic) symptoms to overall work performance. A symptomatic analysis of the comparative study by Kessler et al. indicates that the greater severity and persistence of depressive symptoms in the BD population mediates the greater effect of BD on workforce performance. The restriction of the study sample to persons currently employed also limits the interpretation of the results of the analysis. Specifically, any tendency for persons with BD or MDD to have disproportionately exited (or never entered) the labour force, relative to persons without these disorders, would result in diluting the strength of the observed association of mood disorder with work impairment from its true magnitude.

Other limitations of the CCHS include: diagnosis was based on the CIDI which is less able to distinguish mixed episodes and bipolar spectrum conditions from MDD;[21] insufficient information regarding prior work history and details of effects across different occupational groups; no objective measures of workforce performance; reliance on self-reporting for all dependent variables; the inclusion of persons whose manic episodes may have been due to

substance abuse; and inability to control for the effect of treatment. As well, although previous versions of the CIDI have been validated for use in community-based surveys, a version updated for the 2000 World Mental Health Initiative was used by the CCHS, and its validation has not been completed. Therefore, the extent to which assessments made by trained clinicians would correspond with CCHS findings is unknown. Nevertheless, individuals screening positive for MDD or BD in the CCHS survey are representative of other individuals with these disorders with respect to their lifetime prevalence, demographics, patterns of comorbidity, functional medical service utilization, and functional outcome.[22-24]

There is general awareness that mood disorders differentially affect disabled workers.[3] The higher prevalence of MDD versus BD in the general population (and workforce) indicates that the aggregate cost of MDD is greater.[4] Nevertheless, at an individual level, the study herein as well as the results from the Kessler et al. investigation, suggest that BD may be a more costly disorder. Emanating from this observation, screening and intervention programs for individuals with bipolar I disorder, and bipolar spectrum, may be more cost-effective than such programs for those with MDD.[8] Behavioural health providers and employment assistance programs should incorporate opportunistic facile screening for BD.

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TABLE 4b

Adjusted odds ratios for good job security in relation to lifetime bipolar I disorder (BD) and lifetime major depressive disorder (MDD), controlling for selected characteristics, currently employed household population aged 18 or older with mood disorder, Canada excluding territories, 2002

	Odds ratio	95% confidence interval
Mood disorder		
Lifetime BD	0.6*	0.5 to 0.9
Lifetime MDD† (excluding BD)	1.0	–
Sex		
Males	0.8*	0.6 to 1.0
Females†	1.0	–
Age group		
18 to 34	0.9	0.7 to 1.1
35+†	1.0	–
Level of education		
High school graduation or less†	1.0	–
Some post-secondary education	0.6*	0.4 to 0.9
Post-secondary graduation	0.8	0.6 to 1.1
Comorbidity		
Chronic condition present§	0.9	0.7 to 1.2
Body mass index category		
Underweight/normal weight/ overweight (BMI < 30.0)†	1.0	–
Obese (BMI 30.0+)	0.8	0.6 to 1.2

* Estimate is significantly different from estimate for reference category ($p < 0.05$)

† Reference group, for which the odds ratio is always 1.0

– Not applicable

§ Reference group is absence of arthritis, asthma, back problems excluding fibromyalgia and arthritis, high blood pressure, migraine, chronic bronchitis, emphysema or COPD, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, bowel disorder/Crohn's disease or colitis, Alzheimer's disease or other dementia, cataracts, glaucoma, and thyroid disorder.

Odds ratios have been rounded, some with 1.0 as the lower or upper confidence limit are statistically significant (as indicated).

Model is based on records of 2 966 respondents screened positive for lifetime BD or MDD.

Source: 2002 Canadian Community Health Survey: Mental Health and Well-being

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