It is illegal to post this copyrighted PDF on any website. Change in Employment Status in Bipolar Disorder: A Longitudinal Study Using National Claims Data

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ABSTRACT

Objective: To assess change in employment status in patients with bipolar disorder in comparison with non-mentally ill controls from 1 year before bipolar incidence to 10 years after. Sociodemographic factors of change in employment status were also examined for patients with bipolar disorder.

Method: A cohort of 502 patients with *ICD-9-CM* bipolar disorder was identified using claims data from the National Health Insurance Research Database of Taiwan between 1998 and 2001 and compared to non–mentally ill controls through December 31, 2008. The primary outcome measure was the time from bipolar incidence to the time of change in employment status, ie, from earning income to not earning income.

Results: The probability of changing to a non-income earner was significantly higher (P < .0001) in patients with bipolar disorder than in controls over time, even before the incidence of bipolar disorder (27% vs 14% for patients with bipolar disorder vs controls, respectively). Risks of occupational deterioration in patients with bipolar disorder were greater in the year before incidence and in the following year, with gradually decreasing risks over the subsequent 2 years, and comparable to controls from the third year onward. The adjusted hazard ratio of changing to a non-income earner was 2.06 (95% Cl, 1.82-2.33) in patients with bipolar disorder. Male sex, ages 18 to 25 years, lower payroll bracket (< NT\$50,001 [US \$1,489]), and living in an urban area and insured area in the Northern region were associated with the risk of changing to a nonincome earner in patients with bipolar disorder.

Conclusions: Patients with bipolar disorder had poorer employment outcomes than the controls, with greater risks of occupational deterioration before and after the bipolar episodes. Employment status should be incorporated as a measure of functioning and of treatment and intervention effectiveness in clinical practices and research.

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*Corresponding author: Kuan-Pin Su, MD, PhD, Department of Psychiatry, China Medical University Hospital, No. 2, Yuh-Der Rd, Taichung 404, Taiwan (cobolsu@gmail.com). **B** ipolar disorder is a chronic, severe, and recurrent mood disorder associated with high mortality and morbidity. Currently available treatments fail to adequately address the needs of bipolar patients,¹ making bipolar disorder a difficult-to-treat disease and a burdensome illness to a patient's life, family, and occupational function.² Recent studies suggest that employees with bipolar disorder have more job-related difficulties, manifested by days absent from work, higher health benefit claims, higher absentee costs, and absenteeism leading to productivity losses³ and are distinctly more vulnerable than the general population and even people with depression.^{4,5} The impact of individual productivity loss due to bipolar disorder is strikingly high, ranked among the top neuropsychiatric disorders, with up to 41.2 mean days out of role per year, as revealed in a World Health Organization survey of days out of role due to common physical and mental conditions.⁶

Evidence has shown that psychosocial impairment in patients with bipolar disorder can persist for years and lead to incomplete recovery in all areas of functioning, such as employment, income, education, and marital status.^{7,8} A large prospective observational study⁹ revealed that nearly 70% of patients with bipolar disorder had high work impairment at acute manic/mixed stages and half continued to suffer from the same level of impairment for 2 years. Patients with first-episode bipolar disorder also demonstrated better functioning than those with multiple-episode bipolar disorder, suggesting that the toxic effects of mood episodes contribute to sustained impairment in multiple areas of psychosocial functioning.¹⁰

Concurrent with a deterioration in functioning, employment problems are persistent and considerable in people with bipolar disorders. A US prospective cohort study¹¹ revealed that less than 20% of patients (N = 36) had not missed any time from work, while 35% (N=71) had prolonged unemployment during the past 5 years. Another prospective study¹² reported that 23% of manic patients became unemployed and 36% had a significant decline of work functioning during a 1.7-year follow-up after discharge. In a 6-month follow-up study of acute bipolar disorder,¹³ 80% of patients were symptom-free 6 months after discharge, while 43% were able to be employed, but only 21% were working at their expected level of employment. Moreover, studies revealed that the unemployment rate varied from 30% to 60% in patients with bipolar disorder in the United States,^{5,14-16} Spain,¹⁷ and Taiwan,⁷ a finding later confirmed in a systematic review¹⁸ that reported an employment rate of 40% to 60% in patients with bipolar disorder compared to a rate of 62% to 74% in the general population. However, previous studies were limited by small case numbers with unrepresentative samples, short-term follow-up, and the lack of information before hospital admission. Most importantly, the trend of unemployment risks over time could not be obtained with cross-sectional designs,

Chang et al It is illegal to post this copyrighted PDF on any website. data were merged with the Registry for Beneficiaries;

- Changes in employment status over time among patients with bipolar disorder derived from nationwide data have not been reported.
- Analysis of claims data from a national database showed that bipolar patients had poorer employment outcomes than controls and that the greatest risk of occupational impairment occurred in the year before and the year after incident medical claims for bipolar disorder.
- Employment status should be incorporated as a measure of functioning, because difficulties in occupational functioning are seen early in the course of bipolar illness.
- Early detection policies should be implemented with special focus on vocational support and rehabilitation to ensure quality mental health care for bipolar patients.

and the assessment of the long-term course of incidence or early cases of bipolar disorder with regard to employment outcome is notably lacking.

There has been increasing interest in employment outcome among patients with bipolar disorder, despite the wide use of questionnaires for work-functioning measures, as employment outcome provides information in a comparable way across studies, such as employment rates specifically.¹⁸ Moreover, the real-world milestones, such as change of employment status, are warranted for their utility in the prognosis of patients with bipolar disorder,¹⁹ and employment outcome is suggested to be a measure of effective mental health services.²⁰ To our knowledge, change in employment status over time in a representative sample of patients with bipolar disorder has not been reported. To overcome these limitations, the present study sought to investigate the employment outcome over time and to also explore socioeconomic factors in patients with bipolar disorder by using a nationwide representative database.

METHOD

Clinical Points

Data Source

Data were drawn from the Psychiatric Inpatients Medical Claims Data (PIMC), which was part of the National Health Insurance Research Database (NHIRD), derived from the National Health Insurance Program (NHIP) of Taiwan. The National Health Insurance Research Database can be found at http://nhird.nhri.org.tw/en/, and the data are maintained by the National Health Research Institutes, Taiwan, and provided to scientists for research purposes. The NHIP is a compulsory national health insurance program that was launched in 1995 and provides comprehensive coverage for approximately 98% of the total population of 23 million in Taiwan. The PIMC, a sub-data set of the NHIRD for psychiatric inpatients, has been used for comparative effectiveness research in mental disorders,²¹ and it contains longitudinal cohort data for 91,104 NHIP beneficiaries who had once been admitted to psychiatric inpatient service between 1996 and 2001. Medical claims were then compiled and obtained annually. With encrypted identification,

data were merged with the Registry for Beneficiaries; demographic data, such as age, sex, geographic region, type of registration organization (employer or union), and monthly payroll bracket, in addition to service utilization record, were also obtained.

The monthly payroll bracket is generated to formulate the NHIP insurance premium, and it was applied in this study as a proxy, because measures of socioeconomic status were not available in the database (eg, annual income per household). The premium is calculated with the (1) income basis, (2) average number of dependents in the household, and (3) contribution ratio. The income basis is the levied premium on the insured, according to the monthly payroll bracket. The contribution ratio is set by the Bureau of National Health Insurance to determine the proportion of premiums the insured (employee or dependent), the registration organization (employer or union), and the government has to share in the consideration of whether the insured is an income earner or not. In the present study, income earners are referred to as those who work for a public or private employer and receive compensation in the form of wages, salaries, fees, gratuities, payment by results, or payment in kind, which has a fixed value of income, in contrast to non-income earners. The vast majority of income earners derive most of their income from occupational activities, and they were determined with the code of the registration organization in the NHIRD database to identify those who are civil servants, public office holders, school teachers, or employees of publicly or privately owned enterprises or institutions, and the premium was paid by the government, the insurer, and the insured. The codebook of the database used can be accessed on the NHIRD website. According to McHugo et al,²² income earners are considered to have relatively competitive jobs, which are positions in the regular job market that pay at least minimum wage and are indicative of recovery among people with mental illness. In contrast to income earners, non-income earners are considered to be those who work for profit in their own business, obtain a variable value of income, or are on welfare programs, and their premium is paid by the insured and the government.²³ Examples of non-income earners are the selfemployed, freelancers, farmers, fishermen, union members, family workers, volunteer workers, members of low-income households, or the unemployed.²³

Urbanicity was coded according to 359 townships where the insured were registered. The urbanization stratification was carried out on the basis of (1) population density, (2) percentage of residents with college or higher education, (3) percentage of residents over 65 years old, (4) percentage of residents who were agriculture workers, and (5) the number of physicians per 100,000 people.²⁴ In addition, insured areas were categorized into 7 regions among 22 cities/counties in Taiwan.²³

Study Subjects

We first identified a cohort who were (1) aged from 18–65 years when (2) first diagnosed with bipolar disorder, either

a primary or secondary diagnosis (ICD-9-CM code 296 296.1, 296.4, 296.5, 296.6, or 296.7) between 1998 and 2001, and (3) not enrolled in the National Disability Registry or National Health Insurance Registry of Catastrophic Illness prior to the bipolar diagnosis. To assess the difference of employment status 1 year before bipolar incidence, ie, the time of diagnosis rather than the time of illness onset, a comparison cohort was retrieved from the Longitudinal Health Insurance Database (LHID2005), which comprised 1 million beneficiaries who were randomly sampled from the 2005 Registry of the NHIRD; longitudinal claims data were obtained accordingly. Those with psychiatric diagnoses (ICD-9-CM codes 230-239 or A-codes A210-A219) or in the National Disability Registry or the National Health Insurance Registry of Catastrophic Illness were excluded; those remaining were then matched for age, sex, and urbanicity at a 1:4 ratio with the bipolar disorder cohort. Second, income earners in the bipolar disorder group were then matched synchronically with a second cohort of controls, who were also income earners, using the data set LHID2005 for the comparison of change in employment status from income earners to non-income earners between patients with bipolar disorder and controls over time. In other words, only income earners at baseline were included for longitudinal observation.

Outcome Measurement

An index date for bipolar incidence was identified when the incident medical claim with the *ICD-9-CM* code of bipolar disorder occurred. Baseline was marked 365 days before the index date of bipolar incidence. Subjects were observed from the baseline until no longer eligible for NHIP (dropout or death) or the end of the study (December 31, 2008), whichever came first. The primary outcome measure was the time from bipolar incidence to the time of change in employment status, which was seen as an event whereby the subject had a change of status from income earner to non–income earner. Subjects without event occurrence were considered censored at the end of observation. Change in employment status from income earners to non–income earners, from competitive jobs to less demanding jobs, is considered a deterioration of employment outcome.¹⁸

Statistical Analysis

In the descriptive characteristic comparisons, χ^2 tests were used to examine the difference between 2 groups. Kaplan-Meier survival analyses were used to estimate time elapsed between the incident bipolar diagnosis and the change to non-income earners. Log-rank test was conducted to test the differences in the risk of change in employment status between the 2 populations. Cox proportional hazard model was then performed to determine the odds of change in employment status, adjusting for covariates (age, sex, monthly payroll bracket, urbanicity, and insured area). Monthly payroll bracket at baseline was considered as premorbid adjustment in the analyses. The differences were considered significant if a 2-sided *P* value was <.05. All

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	Eastern region	13	3	22	1		

^aTaiwan New Dollar (NT); US dollars calculated based on a 0.030 exchange rate.

*Statistically significant.

analyses were performed using the SAS system for Windows, version 9.02 (SAS Institute, Cary, North Carolina).

RESULTS

Demographics

A total of 1,749 subjects who had a diagnosis of bipolar disorder were identified. At baseline, which was 1 year before the diagnosis was made, only 29% of patients with bipolar disorder (n = 502) were income earners, which was significantly lower than 55% among controls (P < .0001). The 502 bipolar income earners and matched controls of 2,008 income earners (1:4 ratio) then made a total of 2,510 subjects to be included for survival analyses.

Sociodemographic comparisons are presented in Table 1. Among 502 bipolar income earners, 71% were diagnosed as outpatients and 29% were diagnosed during hospitalization. Their mean age was 33 (SD = 10) years, and over 65% of the patients were aged 18 through 35 years. Two-thirds of the patients lived in semiurban to urban areas, with over 50% insured in Taipei, the capital of Taiwan, where health care is considered more accessible. With the matching of sex, age, and urbanicity, significant differences were shown in monthly payroll brackets and insured areas between patients with bipolar disorder and controls. Monthly payroll brackets showed statistical significance between bipolar and control illonal

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Figure 1. Kaplan-Meier Curve for the Probability of Changing to Non–Income Earner Status Between Bipolar and Control Groups^a



^aLog-rank test was used to assess the differences in the risk of changing to a non–income earner between bipolar (n = 502) and control (n = 2,008) groups.

groups (P < .0001). Nearly 80% of bipolar patients were in the lowest 2 brackets (41% in \leq NT\$20,000 [US \$596] and 37% in NT\$20,001–NT\$35,000 [US \$596–\$1,042) as compared with 64% of the controls, while fewer with bipolar disorder were in the top 2 brackets. The difference of insured area was also significant (P = .0159).

Probability of Change in Employment Status

A total of 2,510 income earners were included to compare the probability of change in employment status up to 10 years. In Figure 1, Kaplan-Meier curves demonstrate the survival distribution function between bipolar patients and controls, and the probability of change in employment status was statistically different (P<.0001). The survival-computed median time to event was 1.39 years (95% CI, 0.80–2.10) in bipolar patients, compared to 9.67 years (95% CI, 8.71– 10.63) in controls, with a marked gap of 8.28 years.

At 1 year from the index date, the probability of changing to non–income earners went up greatly to 47% for bipolar patients and 22% for controls, and it steadily increased thereafter to 64% for bipolar patients and 38% for controls at the end of the fifth year. Notably, the probability of changing to non–income earners was significantly different even before illness incidence, at 27% for bipolar patients and 14% for controls (P<.0001). As noted in Figure 1, risks of occupational impairment in patients with bipolar disorder were greater in the year before incidence and the following year, with gradually decreasing risks over the subsequent 2 years and risks comparable to controls from the third year onward.

Sociodemographic Factors Associated With Change in Employment Status

After controlling for covariates, Cox regressions revealed that, compared to controls, bipolar patients had a 106% (adjusted hazard ratio [HR] = 2.06; 95% CI, 1.82–2.33) higher

characterized PDF on any website. hazard of changing to non-income earners throughout the 10 years after bipolar incidence (data not shown). As presented in Table 2, bipolar subjects in lower payroll brackets were strongly associated with higher hazard of changing to non-income earners (adjusted HR = 3.59, 3.42, and 2.08) as compared to payroll brackets of NT\$50,001 (US \$1,489) and above (all *P* values < .0001), indicating that bipolar patients with higher incomes were less likely to change to non-income earners. In addition, male patients (HR = 1.24; 95% CI, 1.00–1.54), age of 18–25 years (HR = 1.70; 95% CI, 1.19–2.43), and being registered in an urban area (HR = 1.59; 95% CI, 1.06–2.38) and a northern region (HR = 2.60; 95% CI, 1.01–6.67) were also significantly associated with higher risks in bipolar patients of changing to non-income earners.

DISCUSSION

To our knowledge, this study is the first to examine the risk of change in employment status over time in bipolar disorder that used national claims data. With greater risks of changing to non–income earners, bipolar populations were also more vulnerable than controls in the workforce, having less demanding jobs and lower payrolls, which added evidence to previous findings.^{8,9,13,15,16}

Employment Outcome in Bipolar Patients

Our current study further confirmed that the greatest risks of occupational impairment in bipolar patients appeared to be in the year before incidence and the following year, with gradually decreasing risk over the subsequent 2 years. Occupational impairment in bipolar patients can be pervasive and enduring over time, and it can persistently damage employment outcome in the long run, as evidenced by the tendency for bipolar patients to change jobs to ones that are less demanding and of lower status.^{9,18} Possible rationales for bipolar patients to change to non-income earners include functional deterioration caused by the illness and functional impairment, which likely mirrors their employment status, particularly when there are multiple episodes.^{10,25} Another reason for the downward trend of employment outcome over time in bipolar patients could be the parlous state of a recovery-focused approach that failed to provide continuing vocational support to patients with mental illness. Despite good evidence for the effectiveness of rehabilitation, barriers do exist for implementation, and supported employment strategies are not placed as a core integrated facet of health services nowadays.²⁰ This study highlights the importance of considering employment status as a hard variable to be incorporated as a coprimary measure in clinical practices to assess functioning and disability in severe psychiatric disorders. Moreover, its importance increases since employment outcome can be reversed; for example, an income earner can become a nonincome earner with the onset of illness, and then return to income earner if remission is achieved over time. Change of employment status could be used for research studies as a

	,		Adjusted	
	Hazard Ratio		Hazard Ratio ^a	
Factor	(95% CI)	Р	(95% CI)	Р
Sex				
Male	1.06 (0.86-1.30)	.5932	1.24 (1.00–1.54)	.0465*
Female	Reference			
Age, y				
18–25	2.22 (1.58-3.11)	<.0001*	1.70 (1.19–2.43)	.0036*
26–35	1.25 (0.91–1.71)	.1747	1.10 (0.79–1.52)	.5820
36–45	0.90 (0.63-1.30)	.5850	0.97 (0.66-1.41)	.8531
46–65	Reference			
Monthly payroll bracket ^b				
≤NT\$20,000	3.98 (2.52-6.28)	<.0001*	3.59 (2.23–5.78)	<.0001*
(US \$596)				
NT\$20,001-35,000	3.61 (2.28-5.70)	<.0001*	3.42 (2.14–5.47)	<.0001*
(US \$596-\$1,042)				
NT\$35,001-50,000	2.15 (1.26-3.67)	.0048*	2.08 (1.21-3.56)	<.0001*
(US \$1,042-\$1,489)				
≥NT\$50,001	Reference			
(US \$1,489)				
Urbanicity				
Urban	1.59 (1.13-2.22)	.0070*	1.59 (1.06–2.38)	.0264*
Semiurban	1.46 (1.03-2.09)	.0363*	1.27 (0.86–1.87)	.2259
Semirural	1.62 (1.11–2.37)	.0119*	1.36 (0.91-2.02)	.1350
Rural	Reference		. ,	
Insured area				
Taipei branch	3.00 (1.24-7.30)	.0151*	1.82 (0.72-4.62)	.2058
Northern region	3.26 (1.30-8.18)	.0118*	2.60 (1.01-6.67)	.0471*
Central region	2.98 (1.19-7.45)	.0198*	2.03 (0.80-5.13)	.1354
Southern region	2.98 (1.16-7.65)	.0231*	2.03 (0.78-5.30)	.1472
Kao-Ping region	2.06 (0.81-5.25)	.1297*	1.41 (0.54-3.68)	.4879
Eastern region	Reference			

^aAdjusted for subject's sex, age, monthly income, and urbanicity.

^bTaiwan New Dollar (NT); US dollars calculated based on a 0.030 exchange rate.

*Statistically significant.

measure of intervention and treatment effectiveness from a societal perspective.

Another important finding from our present study is that the baseline employment rate was already significantly lower and the probability of changing from income earner to non-income earner was greatly higher in bipolar patients even before the incidence of the disorder. In other words, people with bipolar disorders have lower rates of open employment even before the incidence of illness. This may be explained by the premorbid underperformance in younger ages and its substantial impact on education and employment later on, given an early onset of illness and by the delayed medical treatment received as well. As mentioned, impairment of psychosocial function sustained in bipolar patients and the impact on employment could be persistent and considerable. Although it is still unclear when the first signs of the illness in adults become apparent, a study by Vonk et al²⁶ showed the impact of bipolar disorder in its prodromal phase with underperformance at school in late adolescence and early adulthood. Moreover, in the current study, the mean age of our study subjects when bipolar disorder was diagnosed was 34 years old, which echoes the fact of delayed medical treatment received by bipolar patients.¹⁶ Studies have reported that long durations of untreated psychosis predicted poor occupational function for first-episode schizophrenia,²⁷ and prolonged unemployment was associated with bipolar patients who were older and who experienced more episodes of depression.¹¹ A later prospective study²⁸ further revealed that delay between onset of nonspecific symptoms and treatment, defined as delayed untreated illness, emerged as a more robust independent **POF on any website**. predictor of occupational functioning than durations of untreated psychosis in patients with first-episode psychosis. Also, treating such signs and symptoms as early as possible could be of great value in reducing likelihood or severity of psychotic symptoms. Similarly, Hegelstad and colleagues'²⁹ urging of early detection of first-episode psychosis appears to increase the chances of milder deficits and superior functioning, manifested by higher employment rates specifically. Recognition of premorbid underperformance due to illness is evidently crucial since the treatment prevalence of bipolar disorder was lower in Taiwan than rates found by community studies in Western countries.^{26,30}

Sociodemographic Factors Associated With Changes in Employment Status

The present study revealed that lower monthly payroll brackets at baseline were strongly associated with increased risks of changing to non-income earners in bipolar patients, a finding that is consistent with other studies,^{9,31} as lower payroll brackets were seen as a possible reflection of work impairment and a proxy of lower levels of education⁹ and a less professional post, which might make one easier to be replaced by others.³¹ Moreover, being male, of younger age, and insured in an urban area and in the Northern region all had higher risks of change in employment status after adjusting for covariates. Shippee et al⁵ also suggested that male bipolar patients had higher odds of unemployment compared to female patients as revealed by a selfreported national survey in the United States. In addition, Yang et al³² revealed exceptionally low employment rates among schizophrenia patients in urban China, and subjects were 3 times more likely to be employed in rural settings as compared to urban settings, which is consistent with findings from our current study. Another study of regional unemployment in Taiwan²⁴ also supported that regional unemployment differentials do exist and appear as region-idiosyncratic differences.

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Study Limitations and Strengths

There were some limitations in the present study. First, the diagnoses were based on clinical judgments by the physicians in routine-practice settings, rather than by structured research diagnostic interviews. However, the accuracy of diagnoses could be confirmed because all of the subjects had been treated as psychiatric inpatients with the diagnoses of bipolar disorder.²¹ Second, although medical claims with any service utilizations, including outpatient, inpatient, and emergency care uses, were assessed to identify bipolar incidence, subjects are restricted to those in the PIMC data set, which includes those patients who had progressed to moderately to

Chang et al

It is illegal to post this cop severely mentally ill and required psychiatric admission at some point in time between 1996 and 2001. Bipolar patients with mild severity, who had not been hospitalized, were excluded in the study. Third, some information was unavailable with claims data, such as clinical data, disease severity and stages, education levels, cognitive functioning, relationship status, and housing condition, which have been thought to be important factors of unemployment.9,11,14,25 Therefore, caution should be taken when comparing employment rates across studies with different inclusion criteria.^{5,7} Fourth, the term *bipolar incidence* used in the current claims data study referred to the time of diagnosis rather than the time of illness onset. Fifth, the data set used failed to separate the self-employed and freelancers from other income earners, and thus both were seen as holding a less demanding job, although not necessarily true. However, the bias was minimized with the design of matched controls, and the difference could be even more significant if both were categorized as income earners. Notwithstanding these limitations, the current study has notable strength with the robust nature of the NHIRD, which involves a large, population-based comparison preserving the heterogeneity of subjects, as well as the longitudinal observation beyond bipolar incidence.³³

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confirmed and over the subsequent 2 years. This longitudinal study, objectively measuring the change in employment status, provided understanding of the determinants of employment outcome in bipolar disorder. The surprisingly low percentage that only 29% of bipolar patients were income earners 1 year before diagnosis also highlights the difficulties in occupational functioning seen early in the course of the illness. Evidence³⁴ has supported the importance of introducing design and delivery of the continuum of mental health care for early detection and recovery-focused treatment and rehabilitation in the community, workplaces, and hospitals, as well as evaluating treatment effectiveness, and providing critical information to policymakers when considering making health care research and resource-allocation decisions.

Employment status should be incorporated as a measure of functioning in clinical practice. Future studies on effectiveness of treatment and interventions that specifically address the improvement of employment outcome in early phases of bipolar disorder are warranted to assure quality of mental health care desired by patients and society.

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