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Long-Term Effects of Mental disorders on Employment In the National Comorbidity Survey Ten-Year Follow-up

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Abstract

Purpose—Although significant negative associations of mental disorders with employment have been documented in epidemiological research, much of this research was based on cross-sectional samples and focused only on severe and persistent mental disorders. The present study examined the longitudinal associations of more common mental disorders with employment.

Methods—Data on the associations of common mental disorders with employment are presented here from 4,501 respondents in the National Comorbidity Survey panel study, a two-wave community epidemiological survey of respondents aged 15-54 at baseline (1990-1992) who were re-interviewed in 2001-2003 and were employed, unemployed in the labor force or student at baseline. Lifetime mental disorders at baseline and disorders with onset after baseline were assessed with the Composite International Diagnostic Interview, a fully-structured interview that assessed lifetime prevalence of internalizing fear disorders (panic, phobias), anxiety/misery disorders (major depression, generalized anxiety disorder, post-traumatic stress disorder), externalizing disorders (conduct disorder, alcohol and illicit drug abuse-dependence), and bipolar disorder.

Results—Both baseline lifetime disorders and disorders with onsets after baseline were associated with significantly reduced odds of subsequent employment among respondents who were either employed or students at baseline. Population projections based on the assumption that these associations represented causal effects suggest that the mental disorders considered here were associated with 1.7-3.2 million adults being unemployed in the US population at follow-up.

Conclusions—Expanded access to treatment among current employees and students with mental disorders might lead to improved employment outcomes in these segments of the population.

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CONFLICT OF INTEREST

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INTRODUCTION

While the associations of psychiatric disorders with impaired role functioning has received significant research attention [1-3], much of this research has focused on severe psychotic illnesses known to be associated with substantial disability [4-6]. It is only in more recent years that research has broadened to include social and economic burdens of unemployment and underemployment among individuals with less severe but more common mental disorders [7-13]. Recent comparisons indicate that the societal burden of these common disorders with regard to impaired role functioning may be greater than that associated with most common physical disorders [14,15,7]. However, gaps of two sorts exist in this research. First, much of this research focused on depression [10,16-24] and little is known about the associations of other common mental disorders with employment outcomes. Second, this research has been mainly based on cross-sectional rather than longitudinal studies. Prospective data are important for examining the associations of mental disorders with employment outcomes because of possible reciprocal associations (i.e., unemployment leading to mental disorder) [25,26].

The current study addresses the above limitations by examining prospective associations of common mental disorders with employment status in a nationally representative two-wave panel survey of the US household population. The first wave of the panel was the 1990-1992 National Comorbidity Survey (NCS) [27]. The second wave was the 2001-2003 NCS follow-up survey (NCS-2) [28]. We also examine the association of mental disorders having first onsets after the baseline assessment with employment status at follow-up. The NCS panel data provide a rare opportunity to examine the long-term associations of a broad range of mental disorders with unemployment prospectively in a relatively large national sample.

METHODS

Sample

A total of 5,001 respondents completed interviews in both the 1990–1992 NCS and the 2001–2003 NCS-2. The NCS was a nationally representative survey of the US household population ages 15-54 that focused on estimating the prevalence and correlates of DSM-III-R mental and substance disorders [27]. The NCS was administered to 8,098 respondents. Informed consent was obtained before administering interviews. These recruitment and consent procedures were approved by the Human Subjects Committee of the Institute for Social Research at the University of Michigan. The response rate was 82.4%. Interviews were conducted by professional interviewers and administered in two parts. Part I, which included the core diagnostic interview, was administered to all respondents. Part II, which included assessments of additional disorders and risk factors, was administered to a probability subsample of 5,877 respondents including all those in the age range 15–24 years, all others with any lifetime DSM-III-R disorder assessed in Part I, and a random sub-sample of other Part I respondents. The Part II sample was weighted to adjust for differential probabilities of selection and for non-response bias. Further details about the NCS design and weighting are reported elsewhere [27].

The NCS-2 sought to trace and re-interview all 5,877 of the original Part II NCS respondents. Recruitment and consent procedures were identical to those in the baseline survey and were, as in the baseline survey, approved by the Human Subjects Committee of the Institute for Social Research at the University of Michigan. The data collection team successfully resolved 5,463 of the original 5,877 respondents (166 deceased, 5,001 re-interviewed), for a conditional response rate of 87.6%. Thus, the total response rate of the surveys was 72.2% ($.876 \times .824$). NCS-2 respondents were administered an expanded version of the baseline interview assessing onset and course of disorders between the two surveys. Relative to other baseline NCS respondents, those who were re-interviewed in NCS-2 were somewhat more likely to be female, well-educated, and residents of rural areas. A non-response adjustment weight corrected for these differences [29]. Analyses are based on these weighted data. Analyses were further limited to 4,501 participants with employment status data at T1 and T2 who were employed, unemployed in the labor force or student at T1 as described below.

Assessments

Diagnostic assessment—The baseline NCS assessed lifetime DSM-III-R disorders using a modification of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) Version 1.1, a fully-structured, lay-administered diagnostic interview [30]. Lifetime DSM-IV disorders with first onsets between the two interviews were assessed in the NCS-2 using CIDI Version 3.0 [31]. The disorders assessed were divided into four broad categories based on the results of previous studies of the latent structure underlying common mental disorders [32,33]. These categories included internalizing fear disorders (simple phobia, social phobia, panic disorder with or without agoraphobia, agoraphobia without panic disorder), internalizing anxiety/misery disorders (major depressive disorder, generalized anxiety disorder, post-traumatic stress disorder), externalizing disorders (conduct disorder, alcohol and drug abuse or dependence), and broadly-defined bipolar disorder (bipolar I and II disorders and sub-thresholds bipolar disorder). We focused on these categories rather than on individual disorders because the number of respondents with specific disorders was small and comorbidity was common, leading to the associations of individual disorders with employment status being unstable in multivariable models. Blinded clinical reappraisal interviews administered to a probability sub-sample of NCS respondents using the Structured Clinical Interview for DSM-III-R [34] documented generally good concordance between CIDI diagnoses and clinical diagnoses. Because employment status in the NCS-2 could have been influenced by mental disorders with first onsets in the decade after the NCS, we used retrospective reports in the NCS-2 to code disorders with onsets after the NCS into the same four categories as those used in the NCS except that the latter were based on DSM-IV criteria rather than DSM-III-R criteria. Blinded clinical reappraisal interviews administered to a probability sub-sample of NCS-2 respondents using the Structured Clinical Interview for DSM-IV [35] documented generally good concordance between CIDI diagnoses and independent blinded clinical reappraisal interviews [36,37].

Employment status—Employment status was assessed in both surveys using an 11-category scheme that included response categories of employed, self-employed, temporarily

laid off, on sick leave, on maternity leave, unemployed and looking for work, student, homemaker, disabled, retired, and an open-ended category of “other” that, if chosen, was followed by a probe asking for a description of this employment status. Respondents could select multiple categories. The vast majority of the open-ended responses were subsequently recoded into one or more of the other 10 categories based on the fact that they typically represented multiples of those categories (e.g., a student with a part-time job). For purposes of our analysis, baseline values on this 11-category coding scheme were collapsed into 4 categories. The first category, which we refer to as *broadly-defined* employed, includes respondents who reported that they were either currently employed, self-employed, temporarily laid off, on sick leave, or on maternity leave. The latter 4 groups were included in the definition of broadly-defined employed because these statuses imply the existence of a permanent job. The second category, unemployed in the labor force, consists of respondents not coded in the broadly-defined employed category who reported being unemployed and looking for work. The third category, student, consisted of respondents not coded in either the broadly-defined employed or unemployed in the labor force who reported being students at the time of interview. All remaining baseline respondents (i.e., homemakers, retired, disabled, others) were categorized as not in the labor force. The coding scheme used to define employment status outcomes in the NCS-2 was somewhat different. The main outcome was whether or not the respondent was in the broadly-defined employed category at the time of the NCS-2 interview. Additional outcomes were whether or not the respondent was disabled or was unemployed in the labor force.

Baseline controls—We included a number of baseline socio-demographic variables as controls. These included age, sex, race/ethnicity, marital status, number of years of education, and number of years of education of the head of household of the respondent’s family of origin.

Analytic approach

Analyses examined the associations of lifetime mental disorders in the NCS (T1) with current employment status in the NCS-2 (T2). Parallel analyses were carried out for the associations of lifetime mental disorders having onsets after T1 with T2 employment status. Caution is needed in interpreting results involving significant associations of disorders having onsets after T1 because temporal priority between these disorders and T2 employment is uncertain as timing of change in employment status at T2 was not recorded. Logistic regression was used to estimate these associations. Three T2 dichotomous employment status outcomes were considered separately: employed, disabled, and unemployed in the labor force. Models were estimated separately among respondents who at T1 were either employed, unemployed in the labor force, or students. Controls were included in each model for baseline socio-demographic characteristics. We also carried out preliminary analyses of respondents who were classified at T1 as homemakers or retired, but the numbers employed at T2 among these groups were too small for reliable estimation of associations with mental disorders.

Analyses were conducted in three stages. First, associations were examined between each individual lifetime disorder group (any vs. none) and outcomes controlling for T1 socio-

demographic characteristics. Second, a summary disorder count variable was added to each of these models for the number of disorders in the same category (i.e., fear, anxiety/misery, externalizing, bipolar) and the same time frame of onset (i.e., either prior to or subsequent to T1). This was done in order to determine if the existence of any disorder had a significant association with the outcome not captured by the summary disorder count variable. Based on the finding that the summary disorder count variables captured the associations of the individual disorders with the outcomes, the third stage of analysis examined multivariable associations of the 8 count variables (4 categories of disorder having onsets either before or subsequent to T1) with the outcomes. We tested whether the coefficients of the within-category count variable for disorders having onsets prior to T1 were significantly different from those of the count variable for disorders having onsets subsequent to T1. In cases where the two coefficients were not significantly different, they were combined in a final model.

Simulations based on the parameter estimates in the final models were used to calculate population attributable risk proportions (PARP) of not being employed, broadly-defined, at T2 associated with mental disorders. PARP can be interpreted as the percent of observed adverse outcomes that would have been avoided if the causal effects of mental disorders could have been prevented based on the assumption that the regression coefficients accurately represent causal effects [38]. Population projections for PARP were made based on US Census data for 2010 [39] showing that 161,902,094 Americans were in the age range 15-54 (the age range of the NCS), assuming that 67.9% of these individuals were employed and 11.2% were students at T1 (based on NCS proportions), and assuming that the proportions of these people who were employed, disabled, or unemployed in the labor force at T2 were the same as those in the NCS-2.

Standard errors and significance tests were estimated using the Taylor series method [40] implemented in the SUDAAN software system [41] to adjust for the geographic clustering and weighting of the sample. Multivariable significance was evaluated using Wald χ^2 tests based on design-corrected coefficient variance-covariance matrices. Statistical significance was evaluated consistently using two-tailed .05-level tests. All reported coefficients (percentages and regression coefficients) are based on weighted data.

RESULTS

Baseline employment status and employment outcomes

The breakdown of the sample according to the cross-classification of T1 and T2 employment statuses is presented in Table 1. A total of 3,583 respondents met our broad definition of being employed at T1. The vast majority of these broadly-defined T1 employed respondents (84.5% of the T1 employed; and 74.1% of those who at T1 were either temporarily laid off, on sick leave, or on maternity leave) continued to be employed (broadly-defined) at T2. An additional 303 respondents were unemployed in the labor force at T1, 66.7% of whom had returned to being employed (broadly-defined) at T2. An additional 615 respondents were students at T1, 82.4% of whom were employed (broadly-defined) at T2. Finally, an additional 399 respondents were homemakers at T1, 52.4% of whom were employed (broadly-defined) at T2. The remaining respondent groups had low

base rates at T1 (n=74 disabled, n=13 retired, n=14 “other”). We excluded T1 homemakers from the analyses because their T2 broadly-defined employment rate (52.4%) was lower than that of the other T1 categories considered here (66.7-84.5%).

Lifetime prevalence of mental disorders

Prevalence of mental disorder groups are reported in Table 2. Both lifetime and disorders with first onset after T1 were more common among individuals who were unemployed at T1, with the single exception of first onset externalizing disorders after T1.

Associations of mental disorders with employment outcomes

The results of multivariable analyses of the association of individual groups of mental disorders with employment outcomes are presented in Table 3. Among those who were employed at T1, lifetime disorders at T1 as a whole were significantly associated with disability at T2; whereas, disorders with first onset after T1 were associated with remaining employed and with being temporarily unemployed at T2.

Looking at specific disorder groups among those employed at T1, respondents with lifetime fear disorders at T1 had more than two times the odds of being disabled at T2 (adjusted odds ratio [AOR]=2.08, 95% CI=1.07-4.06, $p=.032$); whereas, respondents with first onset of bipolar disorder after T1 had less than half the odds of remaining employed (AOR=.46, 95% CI=.25-.85, $p=.014$) and more than two times the odds of being temporarily laid off at T2 (AOR=2.35, 95% CI=1.00-5.49, $p=.049$). Respondents with first onset anxiety/misery disorders after T1 also had more than two times the odds to be laid off at T2 (AOR=2.32, 95% CI=1.31-4.10, $p=.004$).

Among those who were unemployed in the labor force, only lifetime T1 disorders were significantly associated with being temporarily laid off and looking for work at T2, mainly due to the strong negative association of bipolar disorder with this outcome at T2 (Table 3). However, only 11 respondents among the T1 unemployed in the labor force met the lifetime criteria for bipolar disorder (Table 2). In contrast, bipolar disorder with first onset after T1 was associated with more than 6 times the odds of being temporarily laid off and looking for work at T2 in this subsample of respondents (AOR=6.54, 95% CI=1.25-34.33, $p=.026$).

Very few T1 students were disabled at T2. Therefore, this outcome was not included in the analyses for these respondents (Table 3). Lifetime mental disorders at T1 were associated with both current employment and being temporarily laid off and looking for work at T2. In analyses of individual diagnostic groups, T1 lifetime bipolar disorder was strongly associated with the greater odds of being employed at T2 and with lower odds of being unemployed in the labor force. The odds ratios for these associations were very large due to the small number of individuals with T1 lifetime bipolar disorder among T1 students (n=5; Table 2).

In the next stage of the analyses, the associations of summary scores of T1 lifetime disorders and disorders with first onset after T1 with employment outcomes were assessed (Table 4). Among the T1 employed, the summary score for T1 lifetime disorders was associated with

22% lower odds of employment at T2 in the model that included only this measure of mental disorders (AOR=.78, 95% CI=.63-.96, $p=.016$). Thus, every 1 additional lifetime disorder at T1 decreased the odds of being employed by 22%. This summary score was also significantly associated with a 44% higher odds of being unemployed in the labor force at T2 (AOR=1.44, 95% CI=1.12-1.85, $p=.004$).

When summary scores for disorders with first onset after T1 were added to these models, the odds ratios for T1 lifetime disorders were somewhat attenuated but remained statistically significant for being temporally laid off and looking for work at T2. In addition, the summary score for disorders with first onset after T1 was statistically significant in these models with 32% lower odds of remaining employed (AOR=.68, 95% CI=.56-.83, $p<.001$) and 59% higher odds of being temporarily laid off and looking for work (AOR=1.59, 95% CI=1.14-2.21, $p=.006$) associated with each 1 additional disorder. The overall tests of these summary scores were also statistically significant in models predicting employment at T2 and being temporarily unemployed. None of the tests comparing the summary scores for T1 lifetime disorders and disorders with onset after T1 were statistically significant (Table 4). Therefore these summary scores were combined. The combined summary score was significantly associated with lower odds of being employed at T2 (AOR=.75, 95% CI=.66-.86, $p<.001$) and higher odds of being temporarily laid off and looking for work (AOR=1.46, 95% CI=1.19-1.79, $p<.001$). In addition, this combined summary score was significantly associated with higher odds of disability at T2 (AOR=1.39, 95% CI=1.04-1.86, $p=.026$). These results suggest that presence of every 1 additional mental disorder is associated with 25% lower odds of remaining employed, 46% higher odds of becoming temporally laid off and looking for work and 39% higher odds of becoming disabled.

Among respondents who were temporarily unemployed in the labor force at T1, only the summary score for disorders with onset after T1 in the model predicting being employed at T2 was statistically significant (AOR=.70, 95% CI=.51-.97, $p=.031$), suggesting that presence of every 1 additional disorder is associated with 30% lower odds of remaining employed. The overall test for the summary scores was also statistically significant in this model, as was the test for comparing the two summary scores, indicating that the association of T1 lifetime disorders with being employed at T2 is different than the association of disorders with onset after T1 (Table 4). Therefore, the combined summary score for all mental disorder groups was not computed.

Among T1 students, the summary score for T1 lifetime disorders was significantly associated with higher odds of being temporarily laid off and looking for work at T2 (AOR=1.85, 95% CI=1.00-3.41, $p=.049$) (Table 4). In addition the summary score for disorders with first onset after T1 was associated with lower odds of being employed at T2 (AOR=.65, 95% CI=.42-1.00, $p=.048$) and the overall test in this model was statistically significant. These results suggest that presence of every 1 additional lifetime disorder is associated with 85% higher odds being temporarily laid off and looking for work at T2 and every 1 additional disorder with onset after T1 with 35% lower odds of being employed. As the test for comparison of summary scores of T1 lifetime disorders and disorders with onset after T1 was not statistically significant, these summary scores were combined and a combined summary score for all disorders was computed. This combined summary score

was significantly associated with lower odds of being employed (AOR=.71, 95% CI=.55-.92, $p=.010$) and higher odds of being temporarily laid off and looking for work at T2 (AOR=1.51, 95% CI=1.07-2.13, $p=.020$). These data suggest that presence of every 1 additional disorder was associated with 29% lower odds of being employed and 51% higher odds of being temporarily laid off and looking for work at T2.

Population attributable risk proportions

The PARPs were computed for summary scores of T1 lifetime disorders and the combined T1 lifetime disorders and disorders with onset after T1 that were associated with the outcomes at a statistically significant level (Table 5). A PARP estimate of -1.8% obtained from the model predicting T2 employment among T1 employed respondents suggests that 1.8% more of currently employed individuals would remain employed 10 years later if the effect of T1 lifetime mental disorders on employment outcomes could be fully prevented and assuming that the model is correctly specified. This PARP value translates into 1,777,000 more employed individuals. Similarly, a PARP estimate of 26.7% suggests 26.7% fewer temporarily unemployed individuals 10 years later if the effect of T1 lifetime disorders on employment can be fully prevented. Both the PARP estimates and the projected numbers were larger when the combined associations with both T1 lifetime disorders and disorders with onset after T1 were considered compared to T1 lifetime disorders only.

DISCUSSION

The results of this study are consistent with past research identifying significant associations between mental disorders and employment outcomes [7-13]. In addition, the nationally representative sampling and longitudinal design of the NCS panel allowed us to assess the contribution of mental disorders to the overall burden of unemployment and disability at the population level. While the associations of individual disorder groups with unemployment were for the most part statistically non-significant, tests involving summary scores showed significant associations. Furthermore, many of the associations were in the expected direction for both T1 lifetime disorders and disorders with onset after T1. The lack of statistical significance, therefore, is likely attributable to the small sizes of the samples and the relatively low prevalence of change in employment status between T1 and T2. It is also difficult to compare coefficients for specific disorder groups due to lack of precision in these coefficients as a result of the small sample sizes. Past research has found some differences in the association of the mental disorders with work disability according to the type and severity of disorders [42-44]. For example, in a clinical study, bipolar I disorder was associated with greater work impairment than major depressive disorder [43]. Future research with larger sample sizes may be needed to more accurately assess variations in employment outcomes across diagnostic groups.

The population impact of mental disorders is especially pronounced among individuals who are currently employed or student at baseline. Over 1.7 million more currently employed working age adults would remain employed 10 years later if the effect of lifetime mental disorders on occupational functioning can be prevented. This number will be much larger if the effect of emergent mental disorders on occupational functioning is also considered. The

currently employed people comprise the bulk of young and middle-aged adults in the community. Thus, even small attributable risk in this population group translates into large numbers of unemployed or disabled people years later. The effects among students were comparable. However, fewer associations were statistically significant in the student sample because of the smaller size of the sample. This finding highlights the importance of prevention and early intervention efforts to reduce the burden of mental illness and associated disability in working adults and students [20,45,46]. Individuals suffering from mental disorders, their families, employers and the society at large would potentially benefit from these efforts.

Over the years a number of programs to enhance access to mental health services among employees and students have been implemented [45,20,47,48]. While the long-term effects of these programs on employment outcomes have rarely been examined, many have been shown to be effective in short-term with regard to symptoms and associated disability. The benefits of these programs are not limited to improved retention in workforce but also improved performance of current workers [17].

We found some differences in associations with employment outcomes among mental disorders with first onset after T1 compared to T1 lifetime disorders. These differences may simply reflect recall bias as T1 lifetime disorders could have had onsets many years before T1, whereas disorders with first onset after T1 were, by definition, more recent. It is also possible that the impact of recent onset disorders on employment outcomes may be different than the impact of disorders with onset in the remote past. Many lifetime fear disorders in NCS had very early ages of onset [49]; whereas, first onset disorders after T1, by definition started after age of 15.

The limitations of this study and of the NCS data should be considered in interpreting the results. First, despite the large sample size, the number of respondents with individual mental disorders was too small to provide reliable estimates, requiring us to combine individual disorders into groups. Second, the list of mental disorders assessed in the NCS was incomplete and did not include psychotic disorders, attention deficit hyperactivity disorder, or personality disorders, which have been shown in past research to impact employment outcomes. Third, although analyses adjusted for socio-demographic characteristics, the possibility of residual confounding by unmeasured variables limits causal inference. For example, the educational level of the head of the household may not fully capture the social class of origin of the respondents and the residual confounding may bias the observed association of mental disorders and employment outcomes. In addition, a number of other social and contextual factors that can impact both the risk of mental disorders and employment opportunities (e.g., early upbringing, early socialization, and neighborhood factors) were not captured in the surveys. Fourth, we did not assess the impact of mental health treatment. However, treatments in the community often fall short of minimally adequate quality indicators [50]. Fifth, we did not assess the impact of the types of jobs on the association of mental disorders with employment outcomes. Mental disorders may have a different impact on blue-collar than white-collar employment. Sixth, the temporal order between mental disorders with onset after T1 and employment at T2 could not be established based on the NCS-2 data. Thus, it is possible that loss of employment or

disability occurred before the onset of mental disorder. This is especially a concern with regard to the younger respondents at T1 and for mental disorders with typically later ages of onset (e.g., major depression). Unemployment is a known risk factor for common mental disorders and psychological distress [51]. Therefore, the results of these analyses should be interpreted with caution. Seventh, the NCS and NCS-2 assessed employment in a period of relatively low unemployment rates in the US. The mid-year (June) unemployment rates varied between 5.2-7.8% in 1990-1992 when NCS interviews were conducted and 4.5-6.3% in 2001-2003 when NCS-2 interviews were fielded [52]. The association of mental disorders with unemployment may be different in periods of high unemployment because individuals with mental disorders face greater challenges when competing for scarce employment opportunities [53]. There is also evidence for variation in employment across states and between rural and urban counties [54]. We could not assess these variations in NCS because the survey is designed to provide representative national data and is not representative at state or county level. Finally, loss of employment is only one work-related adverse outcome of mental disorders. Many individuals with mental disorders who continue to work experience work-related impairment and there is evidence that mental disorders are associated with lower income among those who remain employed [55,56]. These adverse effects of mental illness need to be investigated in future research using NCS panel data.

In the context of these limitations, the findings highlight potentially significant prospective associations between mental disorders and employment outcomes. Research on treatment and prevention programs in workplaces, schools and colleges has produced promising results [45,20,47,48]. However, significant barriers to broader implementation of these programs remain [57-60,21]. Improvements in insurance coverage in the Affordable Care Act, most notably the age extension for coverage under parents' insurance for the youth, mandating insurance coverage for workers, and strengthening of mental health parity may enhance mental health treatment seeking in the coming years. The potential effects of these efforts to improve access to care on employment and other social outcomes needs to be assessed in future research.

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ETHICAL STANDARDS

Original collection of NCS and NCS-2 data has been approved by the Institutional Review Board of Harvard University and performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The analyses reported here have been approved by the Institutional Review Board of Johns Hopkins University, Bloomberg School of Public Health. All persons interviewed for NCS and NCS-2 surveys gave their informed consent prior to their inclusion in the study.

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Table 1

Employment status of 5001 respondents of the National Comorbidity Survey (T1) and its 10-years follow-up (T2).

<div> <div>Employment at T2</div> <div>Employment at T1</div> </div>	Employed	Unemployed, looking for work	Temporarily laid off, on sick leave, or maternity leave	Disabled	Retired	Homemaker	Student	Other	Missing	Total
	N Row %	N Row %	N Row %	N Row %	N Row %	N Row %	N Row %	N Row %	N Row %	N Row %
Employed	2,944 83.5%	96 2.7%	34 1.0%	88 2.5%	75 2.1%	97 2.8%	11 0.3%	38 1.1%	142 4.0%	3,525 100%
Unemployed, looking for work	195 64.4%	35 11.6%	7 2.3%	19 6.3%	4 1.3%	15 5.0%	1 0.3%	11 3.6%	16 5.3%	303 100%
Temporarily laid off, sick leave, or maternity leave	42 72.4%	4 6.9%	1 1.7%	5 8.6%	0 0%	2 3.5%	0 0%	3 5.2%	1 1.7%	58 100%
Disabled	7 9.5%	0 0%	6 8.1%	47 63.5%	8 10.8%	3 4.1%	0 0%	0 0%	3 4.1%	74 100%
Retired	4 30.8%	1 7.7%	0 0%	4 30.8%	4 30.8%	0 0%	0 0%	0 0%	0 0%	13 100%
Homemaker	202 50.6%	25 6.3%	7 1.8%	35 8.8%	17 4.3%	92 23.1%	2 0.5%	13 3.3%	6 1.5%	399 100%
Student	500 81.3%	33 5.4%	7 1.1%	6 1.0%	1 0.2%	43 7.0%	10 1.6%	9 1.5%	6 1.0%	615 100%
Other	8 57.1%	0 0%	0 0%	5 35.7%	0 0%	1 7.1%	0 0%	0 0%	0 0%	14 100%
Total	3,902 78.0%	194 3.9%	62 1.2%	209 4.2%	109 2.2%	253 5.1%	24 0.5%	74 1.5%	174 3.5%	5,001 100%

Table 2

Mental disorder groups among respondents of the National Comorbidity Survey (T1) and its 10-years follow-up (T2) according to employment status at T1.

Mental disorder groups	Employed at T1 ^a n=3,583		Unemployed in the labor force at T1 n=303		Students at T1 n=615	
	N	Column % ^b	N	Column % ^b	N	Column % ^b
Lifetime disorders at T1						
Bipolar disorder	60	1.2%	11	3.8%	5	1.3%
Any fear disorders ^c	1,018	20.1%	100	30.0%	93	15.8%
Any anxiety/misery disorders ^d	1,011	20.6%	99	30.5%	129	22.9%
Any externalizing disorders ^e	1,611	32.2%	145	46.3%	135	22.2%
Disorders with first onset after T1						
Bipolar disorder	161	3.9%	30	10.0%	31	5.1%
Any fear disorder ^c	686	17.3%	70	25.4%	107	20.5%
Any anxiety/misery disorders ^d	598	16.4%	60	20.4%	101	17.2%
Any externalizing disorders ^e	510	13.9%	55	19.9%	173	30.8%

^a Also include respondents who reported being temporarily laid off, on sick leave or maternity leave at T1.

^b Weighted percentages.

^c Includes simple phobia, social phobia and panic disorder with or without agoraphobia.

^d Includes major depressive disorder, generalized anxiety disorder and post-traumatic stress disorder.

^e Includes alcohol or non-alcohol drug dependence and abuse as well as conduct disorder.

Table 3

Multivariable logistic regression models for the association of lifetime mental disorders assessed in National Comorbidity Survey (T1) and mental disorders with first onset after T1 with employment outcomes at 10-year follow-up (T2).

Mental disorders	Employed at T2 ^a			Disabled at T2			Temporarily laid off and looking for work at T2		
	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p
Employed at T1 (n=3,583) ^a									
Lifetime disorders at T1									
Bipolar disorder	.74	.34-1.60	.444	2.15	.75-6.23	.157	.58	.07-4.79	.609
Any fear disorders ^b	.75	.55-1.03	.071	2.08	1.07-4.06	.032	1.69	.89-3.22	.111
Any anxiety/misery disorders ^c	.89	.61-1.30	.530	1.20	.55-2.62	.654	.79	.42-1.47	.452
Any externalizing disorders ^d	.84	.59-1.20	.343	1.07	.54-2.13	.841	1.76	.99-3.13	.056
Overall test	$\chi^2_{df=4}=6.53$ $p=.163$			$\chi^2_{df=4}=1.02$, $p=.040$			$\chi^2_{df=4}=8.59$, $p=.072$		
Disorders with first onset after T1									
Bipolar disorder	.46	.25-.85	.014	1.43	.52-3.95	.491	2.35	1.00-5.49	.049
Any fear disorder ^b	.82	.59-1.14	.236	1.38	.63-3.03	.420	1.28	.74-2.20	.380
Any anxiety/misery disorders ^c	.62	.37-1.05	.074	1.18	.55-2.52	.670	2.32	1.31-4.10	.004
Any externalizing disorders ^d	.69	.44-1.08	.106	1.40	.66-2.99	.383	1.13	.56-2.29	.731
Overall test	$\chi^2_{df=4}=14.96$, $p=.005$			$\chi^2_{df=4}=3.46$, $p=.484$			$\chi^2_{df=4}=14.00$, $p=.007$		
Unemployed in the labor force at T1 (N=303)									
Lifetime disorders at T1									
Bipolar disorder	.69	.13-3.70	.666	7.44	.74-75.23	.089	<.01	<.01-<.01	<.001
Any fear disorders ^b	1.07	.46-2.49	.879	1.23	.37-4.11	.742	1.63	.62-4.24	.320
Any anxiety/misery disorders ^c	.99	.55-1.79	.971	1.33	.58-3.08	.501	.44	.18-1.11	.083
Any externalizing disorders ^d	1.96	.92-4.18	.084	.40	.08-2.04	.269	.53	.22-1.28	.159

Mental disorders	Employed at T2 ^a			Disabled at T2			Temporarily laid off and looking for work at T2		
	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p
Overall test	$\chi^2_{df=4}=3.64, p=.457$			$\chi^2_{df=4}=4.43, p=.350$			$\chi^2_{df=4}=359.91, p<.001$		
Disorders with first onset after T1									
Bipolar disorder	.46	.15-1.39	.169	.52	.07-4.02	.529	6.54	1.25-34.33	.026
Any fear disorder ^b	.84	.43-1.63	.606	.68	.10-4.42	.683	.72	.22-2.38	.592
Any anxiety/misery disorders ^c	.67	.33-1.36	.264	1.68	.44-6.37	.445	1.94	.66-5.72	.227
Any externalizing disorders ^d	.80	.29-2.21	.662	2.00	.35-11.60	.438	.55	.12-2.51	.437
Overall test	$\chi^2_{df=4}=5.19, p=.269$			$\chi^2_{df=4}=1.00, p=.910$			$\chi^2_{df=4}=6.68, p=.154$		
Student at T1 (n=615)									
Lifetime disorders at T1									
Bipolar disorder	>999	>999>999	<.001		-- ^e		<.01	<.01-<.01	<.001
Any fear disorders ^b	.83	.28-2.48	.736		-- ^e		1.31	.30-5.69	.718
Any anxiety/misery disorders ^c	.93	.51-1.71	.819		-- ^e		1.72	.71-4.17	.227
Any externalizing disorders ^d	.63	.26-1.48	.285		-- ^e		2.62	.89-7.72	.081
Overall test	$\chi^2_{df=4}=256.15, p<.001$						$\chi^2_{df=4}=131.70, p<.001$		
Disorders with first onset after T1									
Bipolar disorder	.48	.11-2.03	.320		-- ^e		1.66	.30-9.15	.560
Any fear disorder ^b	.91	.40-2.08	.828		-- ^e		.94	.31-2.82	.910
Any anxiety/misery disorders ^c	.60	.21-1.71	.336		-- ^e		2.01	.54-7.44	.296
Any externalizing disorders ^d	.52	.29-.94	.031		-- ^e		1.34	.61-2.98	.466
Overall test	$\chi^2_{df=4}=6.08, p=.193$						$\chi^2_{df=4}=1.56, p=.815$		

Note: AOR stands for adjusted odds ratio from logistic regression models adjusting for age, sex, race/ethnicity, number of years of education of the head of household of the family of origin, number of years of education of the respondent and marital status. CI stands for confidence interval.

^a Also include respondents who reported being temporarily laid off, on sick leave or maternity leave at T1.

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- ^qIncludes simple phobia, social phobia and panic disorder with or without agoraphobia.
- ^cIncludes major depressive disorder, generalized anxiety disorder and post-traumatic stress disorder.
- ^dIncludes alcohol or non-alcohol drug dependence and abuse as well as conduct disorder.
- ^eOnly 6 (1.0%) T1 students reported being disabled at T2, therefore this outcome was not considered in the analyses of employment outcomes of the student group.

Multivariable logistic regression results for the association of lifetime mental disorders assessed in National Comorbidity Survey (T1) and disorders with first onset after T1 with employment outcomes at 10-year follow-up (T2). Results for the summary scores of disorder groups.

Table 4

Mental disorders	Employed at T2 ^a			Disabled at T2			Temporarily laid off and looking for work at T2		
	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p
Employed at T1 (n=3,583)									
Model for T1 lifetime disorders only									
Lifetime disorders at T1 ^b	.78	.63-.96	.016	1.48	.99-2.21	.055	1.44	1.12-1.85	.004
Model including both T1 lifetime disorders and disorders with onset after T1									
Lifetime disorders at T1 ^b	.81	.66-1.00	.051	1.43	.95-2.14	.085	1.36	1.07-1.73	.012
Disorders with onset after T1 ^c	.68	.56-.83	<.001	1.34	.94-1.91	.104	1.59	1.14-2.21	.006
Overall test									
	$\chi^2_{df=2}=2.73, p<.001$			$\chi^2_{df=2}=5.05, p=.080$			$\chi^2_{df=2}=13.67, p=.001$		
Test for comparing T1 lifetime disorders and disorders with onset after T1									
	$\chi^2_{df=1}=1.32, p=.250$			$\chi^2_{df=1}=.06, p=.809$			$\chi^2_{df=1}=55, p=.458$		
Unemployed in the labor force at T1 (N=303)									
Model for T1 lifetime disorders only									
Lifetime disorders at T1 ^b	1.22	.85-1.76	.281	1.00	.48-2.09	.998	.71	.45-1.12	.138
Model including both T1 lifetime disorders and disorders with onset after T1									
Lifetime disorders at T1 ^b	1.27	.88-1.83	.200	1.00	.48-2.07	.994	.67	.41-1.08	.100
Disorders with onset after T1 ^c	.70	.51-.97	.031	1.04	.66-1.65	.859	1.47	.92-2.36	.106
Overall test									
	$\chi^2_{df=2}=7.72, p=.021$			$\chi^2_{df=2}=.03, p=.983$			$\chi^2_{df=2}=5.22, p=.073$		
Test for comparing T1 lifetime disorders and disorders with onset after T1									
	$\chi^2_{df=1}=7.09, p=.008$			$\chi^2_{df=1}=.01, p=.908$			$\chi^2_{df=1}=5.22, p=.022$		

Mental disorders	Employed at T2 ^a			Disabled at T2			Temporarily laid off and looking for work at T2		
	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p
Student at T1 (n=615)									
Model for T1 lifetime disorders only									
Lifetime disorders at T1 ^b	.75	.49-1.14	.177				1.85	1.00-3.41	.049
Model including both T1 lifetime disorders and disorders with onset after T1									
Lifetime disorders at T1 ^b	.80	.50-1.29	.361				1.78	.91-3.48	.092
Disorders with onset after T1 ^c	.65	.42-1.00	.048				1.33	.69-2.56	.392
Overall test	$\chi^2_{df=2}=6.88, p=.032$						$\chi^2_{df=2}=6.00, p=.050$		
Test for comparing T1 lifetime disorders and disorders with onset after T1	$\chi^2_{df=1}=31, p=.580$						$\chi^2_{df=1}=26, p=.612$		

Note: AOR stands for adjusted odds ratio from logistic regression models adjusting for age, sex, race/ethnicity, number of years of education of the head of household of the family of origin, number of years of education of the respondent and marital status. CI stands for confidence interval.

^a Also include respondents who reported being temporarily laid off, on sick leave or maternity leave at T1.

^b Number of lifetime mental disorders excluding bipolar disorder (range: 0-3).

^c Number of mental disorders with first onset after T1 (range: 0-4).

Table 5

Population attributable risk proportion (PARP) and projected number of individuals based on logistic regression models for the association of lifetime mental disorders assessed in National Comorbidity Survey (T1) and disorders with first onset after T1 with employment outcomes at 10-year follow-up (T2).

Model	Employed at T2 ^a		Disabled at T2		Temporarily laid off and looking for work at T2	
	PARP	Projected number of individuals ^a	PARP	Projected number of individuals ^a	PARP	Projected number of individuals ^a
Employed at T1						
Model for T1 lifetime disorders only ^c	-1.8	1,777,000	-- ^b	-- ^b	26.7	704,000
Model including both T1 lifetime disorders and disorders with onset after T1 ^d	-3.2	3,159,000	36.6	925,000	44.1	1,164,000
Student at T1						
Model for T1 lifetime disorders only ^c	-- ^b	-- ^b			31.8	294,000
Model including both T1 lifetime disorders and disorders with onset after T1 ^d	-3.6	594,000			44.7	413,000

Note: Logistic regression models adjusted for age, sex, race/ethnicity, number of years of education of the head of household of the family of origin, number of years of education of the respondent and marital status.

^aProjections are based on the 2010 census of the US population estimates of the actual number of individuals between ages 15 to 54 (N=161,902,094; <http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf>) and assuming that 67.9% of these individuals were employed and 11.2% were students (based on NCS estimates). We also assumed that 89.8% of those employed in 2010 would be also employed 10 years later, 2.3% would be disabled and 2.4% would be temporarily unemployed (based on NCS-2). Among 2010 students we assumed that 91.0% would be employed 10 years later and 5.1% temporarily unemployed (based on NCS-2). Projected numbers were rounded to the closest 1,000.

^b PARP was not reported because the regression coefficient for mental disorders was not statistically significant in the model.

^cNumber of T1 lifetime mental disorders excluding bipolar disorder (range: 0-3).

^dCombined number of T1 lifetime mental disorders excluding bipolar disorder and disorders with first onset after T1 (range: 0-7).