Course of Major Depressive Disorder and Labor Market Outcome Disruption

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Abstract

Background—Major depressive disorder (MDD) has been found to be negatively associated with labor market outcomes. However, MDD has many different courses that are chronic or persistent, relapsing and remitting, or limited to a single lifetime episode. Such heterogeneity has been ignored in most past analyses.

Aims of the Study—We examine the impact of heterogeneity in course of MDD on labor market outcomes.

Methods—Wave I (2001-2002) respondents of the National Epidemiological Survey on Alcohol and Related Conditions - a nationally representative panel survey - were interviewed on average 3 years later (2004-2005). We categorized changes in MDD before and after wave I and before wave II into six courses: incident, recent remission, persistent remission, relapse, persistent depression, and no history of MDD. Odds ratios (ORs) and marginal effects of MDD transitions in multivariable multinomial regressions of labor market outcomes (being out of the labor force, being unemployed, working part-time, and working full-time - the reference outcome) are reported.

Results—Men and women who exhibited *persistent remission* (2 to 3 years) were equally likely to be in the labor force, employed, and working full-time, compared to those with no history of MDD (reference group). For men, *recently remitted* MDD (<1 year), compared to the reference group, increased the likelihood of being unemployed (3.2% higher probability of being unemployed conditional on being in the labor force; OR = 1.97, 95% confidence interval [CI] = 1.13-3.44) and working part-time (5.8% higher probability of working part-time conditional on being employed; OR = 1.75, 95% CI = 1.10-2.80). For women, no statistically significant effect for recent remission was found. The negative effects of incident onset, relapse, and persistence of MDD were found on some labor market outcomes for men and, to a lesser extent, for women.

Discussion—Clinical treatment for depression should be coordinated and/or integrated with work-related interventions that help individuals who are recovering from depression to maintain their jobs. Such coordination will add to the value of clinical treatment for depression.

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Implications for Health Policies—The impact of MDD on labor market outcomes varies by course of illness. Past studies may have underestimated lost earnings due to mental illness because they did not distinguish between recent and persistent remission and thus did not account for lost earnings due to recent remission.

Implications for Further Research—Further research is needed to understand why there are differential impacts for men and women and to make causal inferences on the relationships between MDD and labor market outcomes.

Introduction

Among its many consequences, mental illness is associated with substantial annual lost earnings in the United States, with the most recent estimate being over $193 billion in 2002.[1] Negative labor market outcomes that underlie such losses have generally been associated with mental illness measured by Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria, symptom, and symptom counts in the past year or in lifetime.[2-14] One study found that recurring episodes of depression are associated with more unemployment than nonrecurring depression.[15] However, no study to date has examined systematically the effects of different courses of major depressive disorder (MDD) on labor market outcome. Typically, only the presence or absence of MDD is measured and no information currently exists on the labor market effects of new onset, relapse, and remission of MDD. To address this gap, we examine the labor market effects of MDD, which is both highly prevalent - approximately 7% of the U.S. population met the DSM-IV criteria for past-year MDD in 2001-2002[16] - and debilitating.[17,18] MDD has many different courses that are chronic or persistent, relapsing and remitting, or limited to a single lifetime episode. This heterogeneity may have differential consequences in the labor market with varying implications for workplace policy and allocation of resources to intervention and prevention.

Prospective longitudinal data provide direct measurement of the heterogeneous courses of MDD, which in turn allows the assessment of the effect of varying illness courses on outcomes of interest. Using the National Epidemiological Survey on Alcohol and Related Conditions (NESARC), we used a baseline assessment and a 3-year follow-up to address the following research questions: (i) Are the labor market outcomes of those in recent and persistent remission different from each other and from those with no history of MDD?; and (ii) Are the labor market outcomes of people with incident, relapse, or persistent MDD different from each other and from those in remission or with no history of MDD? Unlike previous studies that measured only the presence/absence of MDD, our study differentiates the heterogeneous courses of MDD. Such differentiations lead to a better understanding of the association of MDD with labor market outcomes and may suggest priorities for targeting interventions to keep people in or return them to the labor force.

Background

Relationship between Depression and Labor Market Outcomes

Much of the past work examining the relation between labor market activities and depression in the United States draws on the two most prominent community-based large-scale diagnostic interview surveys: the Epidemiologic Catchment Area (ECA) study in the 1980s and the National Comorbidity Survey (NCS) in the 1990s. Even though the measures of depression in these studies vary, they generally find a negative association between depression and labor market outcomes. However, none of the studies accounted for the heterogeneous course of MDD.

The ECA survey included two waves of personal interviews 1 year apart with a telephone interview in between using the Diagnostic Interview Survey[19] across five communities. Frank and Gertler[7] constructed an indicator of mental distress at wave I using the DSM-III diagnosis, the Mini-Mental State examination for cognitive impairment, the General Health Questionnaire[20] score indicating at least four symptoms of psychiatric distress, and a self-reported disability day. They found a 21% reduction in annual income in wave II among working men. Mitchell and Anderson[8] found that symptom counts for depression in wave I were negatively associated with labor force participation for older men (aged 50 or older) but had negligible effects for older women. Mullahy and Sindelar[21] found that self-reported mental health status (excellent, good, fair, and poor) was a significant predictor of working full-time in men and women, but the coefficients for DSM-III diagnosis of depression were not significant.

NCS covered persons aged 15 to 54 living in the 48 contiguous states. It used a modified version of the Composite International Diagnostic Interview to derive 13 DSM-III-R psychiatric diagnoses. Ettner et al.[9] found that having major depression in the past 12 months decreased employment probability for both men and women. Marcotte et al.[15] used lifetime diagnosis, years since onset, and episodes of depression, mania, and dysthymia in their specification and found that some forms of affective disorders were associated with negative labor market outcomes. For women, depression was associated with large income loss. Women with depression and a history of mania were increasingly less likely to be employed over time. For men, dysthymia was associated with income loss but not employment. Marcotte et al.[15] also found some evidence that an individual may recoup some of the income loss in each passing year since onset and that recurring bouts (episodes) of depression are associated with worse outcomes than nonrecurring depression.

Other studies examining the mental health-labor market relationship rely on nondiagnostic measures of mental health, such as the Center for Epidemiologic Studies Depression (CES-D). Three studies are of note because they exploit the longitudinal nature of panel data sets. Dooley et al.[12] used an abbreviated version of the CES-D in the National Longitudinal Survey of Youth in 1992-1994 and found that depressive symptoms at the first interview were significantly associated with increased odds of being unemployed 2 years later; however, there was no significant association between depressive symptoms and shifting out of the labor force or to inadequate employment (i.e., unemployment, involuntary part-time employment, or poverty wage employment). Gresenz and Sturm[13] used the Health Care for Communities data in 1998 and 2000-2001, which measured mental health with the Mental Health Inventory (MHI-5) and screening questions for several disorders including depression. They found that women with an anxiety or depressive disorder were more likely to leave the labor force. Finally, an analysis using the Health and Retirement Study found that predicted probabilities of being employed were lowest among those with depressive symptoms (based on CES-D) and severe pain.[14] These studies lack the diagnostic measure of MDD. A DSM-IV diagnosis may be a better predictor of poor labor market outcomes because it identifies those whose depression is sufficiently persistent and severe that they are significantly impaired in one or more domains of their lives and susceptible to poor labor market outcomes.

The body of research in this area thus far has not distinguished between different MDD courses. We address this knowledge gap by examining the relationship between MDD new onset, relapse, and remission on labor market outcomes, using NESARC, a newly available, longitudinal, nationally representative survey in the United States.

Theoretical Motivation

Under the framework of the human capital model, health and labor market activities are related, but the direction of causality and the magnitude of that relationship are theoretically undetermined.[22,23] An occurrence of depression, for example, may lower productivity, especially for cognitively demanding jobs, and thus would reduce the incentives and tastes for work. On the other hand, a decline in health would induce an increase in the need for work to maintain health insurance or to pay for extra health expenses. A reverse causal relationship between labor market outcomes and a decline in health could also exist. For example, some jobs may have high stress that would lead to deterioration of mental health over time. Our empirical strategy relies on capturing transitions in depression status before measuring labor market outcomes.

More importantly, the human capital model does not predict the labor market consequences of remission and relapse of MDD. If the negative consequences of depression result from the gradual depletion of skill level and work effort, it is not clear if remission would mitigate the effects completely or if relapse would exacerbate the effects more than the initial onset. These issues can only be addressed empirically. Our research questions clearly delineate the onset, remission, relapse, and persistent cases in the course of a person's depression history.

Methods

Data

NESARC is a nationally representative panel survey of noninstitutionalized household and group-quarters population, aged 18 or older, residing in the United States in 2001-2002. The second wave of NESARC was fielded in 2004-2005. Wave I had a total of 43,093 completed interviews, and the overall survey response rate was 81%.[24] Among the respondents who completed the wave I interview, 39,959 persons were eligible for the second wave* and 34,653 respondents completed the wave II interview, leading to a response rate of 87%.[25] Those who were lost to follow-up were younger, had higher unemployment rates, had a lower proportion of whites and Hispanics, were less likely to be married, and had a lower mean education level.† We restrict our data to respondents who were in the labor force and between the ages of 18 and 60 at the time of the wave I interview (unweighted $n = 22,026$). The age cutoff ensures that the study sample is younger than the earliest full retirement age of 65 at the time of the wave II interview. For those who are not in the labor force in wave I, the number of observations is too small to examine the main relationship of interest in this study (see Measures section). In addition, the depression status of individuals out of the labor force at wave I is more likely influenced by negative labor market experiences. Thus, estimating the effect of depression on labor market activity disruption may be less affected by potential reverse causality. We additionally exclude people who self-reported being retired at wave II ($n = 492$); the reason for retirement was unavailable in the survey. Our final sample consists of 10,058 men and 11,476 women.

Measures

Dependent Variable—The dependent variable is a four-level nominal variable of labor market outcome at wave II: working full-time, working part-time, being unemployed, and being out of the labor force. We defined labor market outcomes in accordance with the

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definitions of the Bureau of Labor Statistics (BLS) as follows. In both waves of NESARC, a respondent was asked to mark all of the following statements that apply to describe his/her current situation:

1. Work full-time, that is, 35 hours or more per week

2. Work part-time, that is less than 35 hours per week

3. Have a job or business, but not working because of temporary illness or injury

4. Have a job or business, but on paid vacation

5. Have a job or business, but absent from work without pay

6. Unemployed or laid off and looking for work

7. Unemployed or laid off and not looking for work

8. Unemployed and permanently disabled

9. Retired

10. In school, full-time

11. In school, part-time

12. Currently on summer break/holiday from school

13. Full-time homemaker

14. Something else

Per the BLS definition, a person is considered *employed* if he or she answered yes to any of the first five questions. If an *employed* person also answered yes to questions 6, 7 or 8, he or she was considered to have a conflict in response and was still assigned as employed ($n = 45$ in wave I, and $n = 58$ in wave II). If an *employed* person also self-reported as retired, he or she is considered working after retirement (i.e., still employed) ($n = 105$ in wave I, and $n = 163$ in wave II). An *employed* person is defined as *working part-time* if he or she answered yes to question 2 (less than 35 hours a week) and no to question 1 ($n = 3,530$ in wave I, and $n = 2,417$ in wave II). If a respondent self-reported as working both full-time and part-time, he or she is considered *working full-time* ($n = 157$ in wave I, and $n = 197$ in wave II). A person is considered *unemployed* if he or she was not *employed* and was looking for work (i.e., answered yes to question 6). If an unemployed person also answered yes to questions 7 and 8, he or she had a conflict in response and was still considered unemployed ($n = 7$ in wave I, and $n = 12$ in wave II). *Labor force participants* include all persons classified as *employed* or *unemployed*. Being *out of the labor force* means not employed and not looking for work.

MDD Courses—NESARC uses the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) to generate 22 DSM-IV psychiatric disorders.[24,26] We focus on major depression not induced by substance use or medical illnesses.

Figure 1 segments a person's lifetime into four periods using wave I and II interview dates: Period 1 is from any time in the past up to 12 months before wave I interview; Period 2 is the past 12 months at wave I interview; Period 3 begins immediately after the wave I interview and ends before the past 12 months at wave II; and Period 4 is the past 12 months at wave II. DSM-IV major depressive episode was measured for each of these periods, allowing us to categorize a person's MDD course across these periods. Because the labor market outcome is assessed at Period 4, MDD for Period 4 is not used, thus mitigating possible simultaneity bias in statistical analyses.

As seen in **Figure 1**, there are eight possible depression transition histories from Period 1 to Period 3. We classified depression course history into six categories. "No–No–No" was a reference case with no depression in all three periods ($n = 16,757$). The other five categories were (i) incidence ("No–No–Yes" or "No–Yes–Yes," $n = 805$), (ii) recent remission ("Yes–Yes–No" or "No–Yes–No," $n = 1,254$), (iii) persistent remission ("Yes–No–No," $n = 1,925$), (iv) relapse ("Yes–No–Yes," $n = 326$), and (v) persistent depression ("Yes–Yes–Yes," $n = 365$). Because the average elapsed time between wave I and II interviews was 3 years (min 2 years, max 4 years), the average length of Period 3 was 2 years (min 1 year, max 3 years). Thus, a persistent remission in our sample lasted on average 3 years.

Other Conditions—Substance use and other psychiatric disorders have also been found to be associated with negative labor market outcomes.[15,21] It is therefore important to control for the courses of these disorders to disentangle the independent effects of MDD course. Other psychiatric disorders include dysthymia, mania, hypomania, panic disorder with or without agoraphobia, agoraphobia with no history of panic disorder, social phobia, specific phobia, and generalized anxiety disorder. Substance use disorders include abuse/dependence of alcohol, amphetamine, opioid, sedative, tranquilizer, cocaine, inhalant solvent, hallucinogen, cannabis, heroin, or other drugs. Both classes of disorders were categorized into the same six courses using diagnoses in the three periods described above. The rationale for using the courses of these disorders is that they parallel the structure of the courses of MDD.

Data Analytic Procedures

Because of the differences in prevalence of MDD and labor market experience by gender, we estimated the impact of depression on each labor market outcome for men and women separately. Because of the complex sampling design and longitudinal follow-up of NESARC, wave II weights were recalibrated to account for attrition and were used to carry out subpopulation analysis using Stata 11®.

We used weighted multivariable multinomial logistic regressions to provide odds ratios (ORs) of the associations between the labor market outcomes and each of the six depression courses; the reference outcome was working full-time, and the reference MDD course was no depression in all three periods. Strictly speaking, the exponential of the coefficient of a discrete covariate x, $\exp(\beta_j)$ is not the OR in the traditional sense because it does not

measure $\dfrac{\left(p_j/1 - p_j\right)_{x=1}}{\left(p_j/1 - p_j\right)_{x=0}}$, but measures $\dfrac{\left(p_j/p_0\right)_{x=1}}{\left(p_j/p_0\right)_{x=0}}$, where $p_j(p_0)$ is the probability of outcome j (outcome 0, the reference outcome). By convention, however, this is still called an OR.[27]

One disadvantage of the multinomial logistic regressions is that the marginal effect of any covariate on probabilities of outcomes $\partial p_j/\partial x = p_j\left(\beta_j - \sum_{k=1}^{J}\beta_k p_k\right)$, may not have the same sign as its coefficient in multinomial logistic regressions. Thus, we evaluated the marginal effects of the MDD course on the probabilities of outcomes using the recycled prediction approach on the estimation sample.[28] The standard errors of the predictive margins on the population were calculated taking into account the complex sampling design of the NESARC.

The multinomial logistic model embodies the independence of irrelevant alternatives (IIA) property, which states that the relative odds of choosing outcome j over outcome k is the same no matter what other outcomes are available or what the attributes of the other outcomes are. This is clearly not an attractive property. We tested if the data reject this property using the Small and Hsiao test.[29] The test did not reject the IIA for all outcomes in

our data except for "working part-time" for women. Alternative modeling techniques that relax the IIA assumption, such as the nested logit model, require choice-specific attributes that are unavailable in the data.

Covariates included courses of other psychiatric disorders; courses of substance use disorders; age; age squared; race/ ethnicity; education; marital status; changes in education and marital status between wave I and wave II; geographic region; U.S. citizenship; number of children 5 years of age or younger and between 6 and 17 years old at wave I and II; physical health status at wave I and II measured by the continuous norm-based physical functioning scale of the 12-item Short Form (SF-12) health survey, version 2.[30]

Results

Table 1 reports the baseline characteristics of respondents aged 18 to 60 who were in the labor market at the wave I interview. Although similar proportions of men and women self-reported being unemployed at wave I, at least two findings support analysis by gender. First, women were almost three times more likely to be part-time workers than men. Second, baseline prevalence of MDD, other psychiatric disorders, and substance use disorders differed between men and women. Women had higher prevalence of MDD and other psychiatric disorders, and men had higher prevalence of substance use disorders.

Effects of MDD Transitions on Labor Market Outcomes among Men

Table 2 presents the adjusted ORs for working part-time, being unemployed, and leaving the labor force at wave II for men associated with different courses in MDD; the corresponding marginal effects of MDD course on the probabilities of outcomes are shown in **Table 3** (see **Appendix, Table A1** for detailed regression results with all regressors). The estimates were used to address the research questions outlined in the Introduction.

Research Question 1: Recent and persistent remission—Men in persistent remission (lasting 3 years on average) were as likely as men who had never suffered an episode of MDD to work full-time, be employed, and be in the labor force. In contrast, men with recent remission were more likely to work part-time (5.8% higher probability of working part-time conditional on being employed; OR = 1.79, 95% Confidence Interval [CI] = 1.10-2.80) and be unemployed (3.2% higher probability of being unemployed conditional on being in the labor force; OR = 1.97, 95% CI = 1.13-3.44) than men with no MDD. Men with recent remission were more likely to be unemployed than persistent remitters (OR = 2.67, 95% CI = 1.20-5.95).

Research Question 2: Incident, relapse, and persistent depression—Compared to men with no history of MDD, men with incident depression were more likely to work part-time (6.3% higher probability of working part-time conditional on being employed; OR = 1.92, 95% CI = 1.05-3.49), be unemployed (6.9% probability of being unemployed conditional on being in the labor force; OR = 3.19, 95% CI = 1.71-5.92), and be out of the labor force (4.9% probability; OR = 2.66, 95% CI = 1.51-4.70). Relapsed men were more likely to work part-time (16.3% higher probability of working part-time; OR = 4.54, 95% CI = 1.86-11.11) and be out of the labor force (9.4% higher probability; OR = 4.72, 95% CI = 1.26-17.71). Persistently depressed men were more likely to be unemployed (8.0% higher probability of being unemployed conditional on being in the labor force; OR = 3.64, 95% CI = 1.62-8.20) and be out of the labor force (6.7% higher probability; OR = 3.28, 95% CI = 1.19- 9.04) than men with no history of MDD. Men with incident, relapse, and persistent depression were not statistically different from each other on all outcomes.

Effects of MDD Transitions on Labor Market Outcomes among Women

Table 4 presents the results for women for the aforementioned research questions; and **Table 5** shows the corresponding marginal effects (**Appendix, Table A2** displays estimates for all regressors).

Research Question 1: Recent and persistent remission—Similar to men, women in persistent remission were not statistically different in all three labor market outcomes from the reference group of women with no history of MDD. In contrast with men, women in recent remission were also not statistically different from the reference group in all three outcomes. As a result, women in recent and persistent remission had similar labor market outcomes.

Research Question 2: Incident, relapse, and persistent depression—Compared to women with no history of MDD, women with incident depression were more likely to be working part-time (5.4% higher probability of working part-time conditional on being employed; OR=1.39, 95% CI = 1.04-1.87), and women with persistent depression were more likely to be unemployed (3.9% higher probability of being unemployed conditional on being in the labor force; OR=2.18, 95% CI = 1.17-4.04), both compared to women with no history of MDD. Surprisingly, relapsed women were not statistically different on all three outcomes from women with no MDD.

Addressing Potential Biases

Reverse Causality—Several past studies of the impact of depression on labor market outcomes address the potential reverse causality problem (endogeneity bias or simultaneity bias) using the instrumental variables (IV) approach.[6,15,31-33] The current study draws two insights from this literature. First, with the exception of Marcotte *et al*.,[15] these studies find that the IV approach did not lead to qualitatively different results from regular regression approaches. Second, these studies all have one binary endogenous variable to which the IV approach can be applied with relative ease.[34,35]

In our study, the potentially endogenous variable – trajectories of MDD courses – is a discrete variable with six categories, and our labor outcome variable is a four-level nominal variable. To address the endogeneity issue is much more complicated than the above cases with a binary endogenous variable. The IVs that have been used in past studies may predict the presence of depression well, but they do not predict the transition histories in our study. For example, we examined whether the presence of depression among family members and alcohol, drug, and behavioral problems of brothers and sisters were good IVs. We found that these variables were predictive of having depression at baseline, but none were strong predictors of MDD transitions. At this stage, we can only surmise that if an unobserved variable ξ_{MDD} (such as the onset of physical disability) leading to more depressive symptoms and negative labor market outcomes existed, then the deleterious effect of MDD would be overstated. Similarly, if an unobserved variable ξ_{MDD} leading to fewer depressive symptoms and positive labor market outcomes existed, then the protective effect of improving MDD would be overstated. Because we controlled for baseline and wave II physical functioning status of the respondents, the influence of the unobserved heterogeneity due to somatic symptoms may be less important. Further research is needed to find proper instruments for MDD transitions and to investigate whether endogeneity is likely to have little impact in our situation as is found in past studies.

Attrition Bias—As noted earlier, those who were lost to follow-up by wave II were younger, less likely to be married, less likely to be white or Hispanic, and had a lower mean education level and a higher unemployment rate. It is difficult to speculate whether there is a

bias and how that would influence the findings. Attrition bias could not be formally tested in our study because the data contain no baseline variables that successfully predicted attrition independently from labor market outcomes at wave II. On the other hand, three features of the data may mitigate such bias. First, 35% of attriters were not eligible for the wave II interview. These respondents were institutionalized, dead, permanently moved abroad, or deployed U.S. armed forces members. Second, we used the final wave II weights that correct for non-interview by region, age, sex, race, and ethnicity. Third, in analyses not reported, we found in wave I the prevalence of depression was lower among attriters than non-attriters (4.2% vs. 5.2% for men, 9.1% vs. 10.2% for women). Similarly, the physical component score and the mental component score of the SF-12 summary measures were also better among the attriters. This is contrary to the usual belief that respondents with worse physical or mental health are more likely to drop out. The influence of differential dropout due to depression or labor market activities remains unknown.

Occupation—The impact of depression may differ by occupation depending on the characteristics and cognitive demand of the work. There is substantial variation in the 30-day prevalence of MDD by occupation,[36] ranging from 0.8% among lawyers and clergy to 7% among sales representatives and bartenders. Even though NESARC did not include questions on job conditions such as occupational prestige or complexity, we were able to roughly match occupation descriptions to the clusters in Kessler and Frank[36] and stratify the sample by baseline occupation into four broad categories: professional; administrator and clerical; craftsman and laborer; and household, farming, fishery, and military. Because the limited sample size precluded stratifying analyses for each of the main outcomes, we combined the three outcomes in one (work/not work). A significant negative effect of persistent depression was observed among professional men and women, and a significant negative effect of incidence was observed among craftsman and laborer for men. Professional women in recent remission were more likely to be working (see **Appendix, Table A3**).

Severity of MDD and Physical Disability—Having a physical disability may be a major barrier to employment and may compound the effect of mental illness.[37] In our analyses we controlled for the SF-12 physical component score and its squared term at waves I and II. Nineteen symptoms were used in AUDADIS to define MDD based on DSM-IV criteria. We added the number of symptoms to the models as a measure of severity of MDD and found that the ORs of the number of symptoms were close to 1 for all three outcomes in both men and women. Major conclusions on persistent and recent remission do not change for both sexes.

Personality Traits—Personality traits were potential confounders in the analysis. Hirshfeld *et al*.[38] found that individuals with sociotropic or autonomous personality traits are more susceptible to depression. Bagley[39] suggested that income and some affective disorders may be linked by personalities associated with "successful striving." As a sensitivity analysis, we included in all regressions indicators for lifetime antisocial, avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic, borderline, schizotypal, and narcissistic personality disorders. Adding these variables did not substantively change our main results, providing further evidence for the validity of our estimates.

Labor Force Attachment of Women—To examine the extent to which the observed differences between men and women were due to the difficulty in identifying women. With stronger labor force attachment, we carried out a subgroup analysis of individuals aged 45 to 60. Because women in their fertile years are likely to have labor force interruptions due to

childbearing and/or rearing, excluding them might shed some light on the differences in the impact of MDD on labor outcomes. The results indicated that, for women aged 45 to 60, the only significantly negative effects occurred among those with persistent depression. However, for similar-aged men, both recent remission and persistent depression had negative effects.

Discussion

In this paper, we used nationally representative longitudinal data to identify distinct courses of MDD and examine their effects on subsequent labor market outcomes. We are primarily interested in the impact of recent and persistent remission, new onset, relapse, and persistence in MDD on labor market activities. Two findings have implications for policy and treatment.

First, men and women with *persistent remission* have similar odds for working part-time and being unemployed, compared to those without a history of MDD. With respect to *recent remission*, men differ from women: whereas men with recent remission have higher odds of working part-time and being unemployed compared to men with no history of MDD, women with recent remission do not differ significantly from women with no history of MDD. Thus, although remission, by definition, relieves depressive symptoms and may improve quality of life, recent remission in men might not be enough to restore them to full-time employment; it may take more time for men to become employed and working full-time. Men and women in *remission, recent* or *persistent*, were equally likely to stay in the labor force, compared to those with no history of MDD.

The above indicates that clinical treatment for depression should be coordinated and/or integrated with work-related interventions. Because individuals may be considerably delayed in realizing their full productive potential even after depression has remitted, workplace interventions that help individuals who are recovering from depression to maintain their jobs will add to the value of clinical treatment for depression. This finding also has implications for the estimation of lost earnings due to mental illness as men in *recent* remission suffer from unemployment. Previous studies[1,40,41] may have underestimated the societal cost of depression because they do not differentiate *recent* remission from the reference case with no history of depression.

Second, we examined labor market outcomes for new onset, relapse, and persistent cases. For men, relapse was associated with working part-time; new onset and persistent depression were associated with unemployment; and new onset, relapse, and persistent depression were all associated with leaving the labor force. For women, new onset was associated with working part-time, and persistent depression was associated with leaving the labor force. The high rates of relapse MDD (5% for men and 8% for women) and of persistent MDD (6% for men and 9% for women) among those with a history of depression in our sample point to the need to take actions against recurring and lasting MDD. A comprehensive decision analysis found that enhanced depression care consisting of a depression screen and care management for depressed workers yields a net cumulative benefit of $2,895 after 5 years.[42] A business case can be made for the "Work, Family and Health Network" initiative (National Institutes of Health) that identifies interventions such as training on family-supportive supervisory behaviors to help reduce work stress and increase the health of workers and their dependents.[43]

Consistent with some recent studies, many of the significant effects in our study were for men, and they were larger than the effects for women[1,44] However, older studies generally found a stronger impact on employment in women than in men.[9,21] Our study used the

population in the labor market in 2001-2002, a relatively recent sample. In addition, we focused on labor market outcome disruption among those in the labor market at baseline, not on those who were already affected by MDD. Twenty-four percent of women and 14% of men with lifetime depression by wave I interview were not included in the study sample. Thus, some of the negative effects of MDD are not captured in this study. In the subgroup of men and women aged 45 to 60 at wave I, the effects were also stronger in men than in women. Because this age group largely excludes women of child-bearing age, it suggests that the lower effects for women were not entirely due to decisions regarding child-bearing. Further research is needed to examine whether societal changes in women's role at work and in the family moderated the association between MDD and labor market outcomes.

One limitation of our study is that we do not completely exclude the countervailing possibility of reverse causality; for example, a depressive episode may be prompted by a period of unemployment between baseline and current assessment.[45,46] Nonetheless, there is some evidence that a reverse causality bias is small in the case of depression.[31] It is also possible that the causality goes both ways. Resolving the issue of causality may require applying more advanced methods, such as nonlinear instrumental variable and structural equation models, with data that cover a longer span of time with more frequent follow-up. We examined whether the presence of depression among family members and alcohol, drug, and behavior problems of brothers and sisters were good instrumental variables. As found in previous literature,[9] we found that these were good instrumental variables for an endogenous indicator of having MDD at baseline, but none of these instruments were strong predictors for MDD transition courses. Further research is needed to identify valid instruments to resolve the potential endogeneity issue.

Another potential limitation is that the estimates between depression transitions and labor market outcomes may be confounded by the duration of depression in different study periods. Because the MDD duration in each of the study periods cannot be constructed with the NESARC data, we cannot directly address the issue of confounding. However, we found that using the total duration of MDD (if more than one episode, the longest one is used) as the main regressor, instead of using the five discrete MDD courses in our analyses, the only effect of statistical significance is on being out of the labor force at wave II for men. To speculate how omitting MDD duration in our model would affect the estimates of the main variables of interest, we assume longer duration leads to worse labor market outcomes in the presence of MDD courses. Recall that the MDD courses were constructed from the first three of the four study periods. Of these study periods, the first – any time until 12 months before wave I – had the greatest potential variation in length and was likely to be significantly longer than the other two periods. If the partial correlations between duration and some MDD courses were positive, e.g., with persistent depression, relapse and recent remission, then the positive effects of these courses (recall all significant coefficients were positive) on outcomes would have been overestimated (biased away from zero). Similarly, if the partial correlations between duration and other MDD courses were negative, e.g., shorter duration leading to persistent remission, then the positive effects of these courses would have been underestimated (biased toward zero). This may be why the estimates of persistent remission were not statistically significant. If the partial correlations between duration and the MDD courses are zero (as is likely the case with incidence cases), then there is no omitted variable bias.

In summary, our study extends the current literature by explicitly examining the courses of MDD using a nationally representative panel survey and DSM-IV measures of psychiatric disorders. Past studies ignored the history of transition in MDD altogether. Our analysis revealed the importance of differentiating courses of MDD, such as, distinguishing between recent remission and persistent remission of 2 to 4 years. Collapsing all courses into one

binary indicator of MDD may obscure important heterogeneity in the disorder and its impact on labor market outcomes, potentially leading to inaccurate policy conclusions.

Acknowledgments

Appendix

Table A1

Detailed Multinomial Logistic Regression Results for Men

	Working Part Time		Unemployment		Out of Labor Force	
	OR	95%CI	OR	95%CI	OR	95%CI
Recent remission MDD	1.75[**]	(1.10 - 2.80)	1.97[**]	(1.13 - 3.44)	1.24	(0.67 - 2.30)
Persistent remission MDD	1.32	(0.91 - 1.90)	0.74	(0.38 - 1.45)	1.17	(0.68 - 2.00)
Incident MDD	1.92[**]	(1.05 - 3.49)	3.19[***]	(1.71 - 5.92)	2.66[***]	(1.51 - 4.70)
Relapse case MDD	4.54[***]	(1.86 - 11.11)	1.51	(0.46 - 4.96)	4.72[**]	(1.26 - 17.71)
Persistent depression MDD	1.37	(0.44 - 4.25)	3.64[***]	(1.62 - 8.20)	3.28[**]	(1.19 - 9.04)
Age	0.79[***]	(0.75 - 0.84)	0.99	(0.90 - 1.09)	0.89[**]	(0.80 - 0.98)
Age squared	1.00[***]	(1.00 - 1.00)	1.00	(1.00 - 1.00)	1.00[**]	(1.00 - 1.00)
Black	1.59[***]	(1.19 - 2.14)	1.76[***]	(1.25 - 2.48)	1.88[***]	(1.31 - 2.71)
Other race	1.36	(0.80 - 2.30)	1.43	(0.73 - 2.77)	1.75[*]	(0.98 - 3.15)
Hispanic	0.88	(0.58 - 1.34)	0.90	(0.52 - 1.55)	0.81	(0.51 - 1.29)
Widowed/Divorced/Separated	1.27	(0.92 - 1.75)	1.69[**]	(1.07 - 2.66)	1.68[**]	(1.11 - 2.54)
Single	2.06[***]	(1.49 - 2.85)	2.06[***]	(1.37 - 3.08)	2.21[***]	(1.32 - 3.68)
Changed marital status Wave I&II	0.50[***]	(0.32 - 0.77)	1.01	(0.68 - 1.50)	0.42[***]	(0.26 - 0.70)
High school/GED	0.77	(0.55 - 1.09)	0.48[***]	(0.32 - 0.72)	0.47[***]	(0.31 - 0.71)
Some college	0.77	(0.54 - 1.10)	0.51[***]	(0.32 - 0.82)	0.61[**]	(0.41 - 0.89)
College degree	0.53[***]	(0.38 - 0.76)	0.29[***]	(0.18 - 0.47)	0.47[***]	(0.30 - 0.72)
Graduate school	0.72	(0.46 - 1.13)	0.25[***]	(0.13 - 0.48)	0.58	(0.29 - 1.14)
Changed education level W I&II	1.84[***]	(1.30 - 2.60)	0.88	(0.50 - 1.57)	2.76[***]	(1.82 - 4.18)
Number of children = 5 years, W I	0.84	(0.63 - 1.13)	1.40[**]	(1.03 - 1.90)	1.18	(0.82 - 1.70)
Number of children > 5 years, W I	0.92	(0.76 - 1.10)	1.05	(0.90 - 1.22)	1.04	(0.84 - 1.29)
Number of children = 5 years, W II	0.85	(0.57 - 1.25)	0.73[*]	(0.51 - 1.04)	0.94	(0.65 - 1.37)
Number of children > 5 years, W II	0.79[*]	(0.61 - 1.03)	0.77[**]	(0.62 - 0.94)	0.79	(0.54 - 1.16)
Census Region Midwest	1.73[***]	(1.21 - 2.47)	1.34	(0.92 - 1.95)	1.03	(0.65 - 1.64)
Census Region South	1.59[***]	(1.13 - 2.25)	0.72	(0.49 - 1.07)	0.91	(0.61 - 1.34)
Census Region West	1.88[***]	(1.36 - 2.60)	1.18	(0.79 - 1.77)	1.78[***]	(1.19 - 2.67)
In MSA not central city	0.87	(0.65 - 1.15)	0.83	(0.64 - 1.09)	0.75[*]	(0.53 - 1.05)
Not in MSA	0.89	(0.65 - 1.20)	0.78	(0.52 - 1.17)	0.71[*]	(0.49 - 1.03)

	Working Part Time		Unemployment		Out of Labor Force	
	OR	95%CI	OR	95%CI	OR	95%CI
Born in the United States	0.70	(0.45 - 1.10)	1.29	(0.71 - 2.31)	1.33	(0.87 - 2.03)
Physical component score PCS, W I	1.01	(0.95 - 1.06)	0.94**	(0.89 - 0.99)	0.96	(0.91 - 1.01)
PCS squared, W I	1.00	(1.00 - 1.00)	1.00*	(1.00 - 1.00)	1.00	(1.00 - 1.00)
PCS, W II	0.91***	(0.85 - 0.97)	0.96	(0.89 - 1.04)	0.77***	(0.74 - 0.81)
PCS squared, W II	1.00*	(1.00 - 1.00)	1.00	(1.00 - 1.00)	1.00***	(1.00 - 1.00)
Incident Other Psych Disorder, OPD	1.11	(0.71 - 1.73)	1.16	(0.68 - 1.98)	1.72**	(1.12 - 2.64)
Recent remission OPD	0.96	(0.66 - 1.39)	1.32	(0.86 - 2.02)	1.01	(0.58 - 1.74)
Persistent remission OPD	1.13	(0.79 - 1.62)	0.84	(0.41 - 1.74)	0.80	(0.46 - 1.40)
Relapse case OPD	0.38*	(0.14 - 1.06)	1.16	(0.47 - 2.83)	0.49	(0.14 - 1.66)
Persistent OPD	1.14	(0.65 - 2.01)	0.76	(0.41 - 1.41)	1.68	(0.88 - 3.20)
Incident Substance Use Disorder, SUD	1.21	(0.83 - 1.77)	0.99	(0.62 - 1.58)	0.73	(0.37 - 1.44)
Recent remission SUD	0.78	(0.52 - 1.18)	0.85	(0.45 - 1.61)	0.78	(0.48 - 1.27)
Persistent remission SUD	0.80	(0.60 - 1.07)	1.04	(0.72 - 1.50)	0.78	(0.55 - 1.10)
Relapse case SUD	1.49*	(0.97 - 2.29)	1.70**	(1.11 - 2.60)	0.59	(0.31 - 1.16)
Persistent SUD	1.16	(0.83 - 1.64)	0.98	(0.64 - 1.51)	0.84	(0.53 - 1.32)

Note.

*
Significant at 10%

**
significant at 5%

***
significant at 1%.

Table A2

Detailed Multinomial Logistic Regression Results for Women

	Working Part Time		Unemployment		Out of Labor Force	
	OR	95%CI	OR	95%CI	OR	95%CI
Recent remission MDD	0.96	(0.74 - 1.25)	1.34	(0.86 - 2.09)	1.21	(0.92 - 1.59)
Persistent remission MDD	0.93	(0.77 - 1.14)	0.84	(0.56 - 1.26)	1.11	(0.87 - 1.42)
Incident MDD	1.39**	(1.04 - 1.87)	1.49	(0.89 - 2.50)	1.34*	(0.95 - 1.88)
Relapse case MDD	0.79	(0.48 - 1.31)	1.67	(0.88 - 3.14)	0.76	(0.40 - 1.43)
Persistent depression MDD	1.41	(0.91 - 2.18)	2.18**	(1.17 - 4.04)	1.60*	(0.95 - 2.68)
Age	0.81***	(0.77 - 0.85)	0.96	(0.87 - 1.07)	0.88***	(0.83 - 0.94)
Age squared	1.00***	(1.00 - 1.00)	1.00	(1.00 - 1.00)	1.00***	(1.00 - 1.00)
Black	0.72***	(0.59 - 0.87)	2.14***	(1.59 - 2.89)	0.72***	(0.56 - 0.91)
Other race	0.73*	(0.53 - 1.02)	1.72**	(1.00 - 2.96)	0.91	(0.60 - 1.40)
Hispanic	0.63***	(0.50 - 0.80)	0.69	(0.42 - 1.13)	0.85	(0.65 - 1.11)
Widowed/Divorced/Separated	0.53***	(0.44 - 0.65)	1.51**	(1.07 - 2.12)	0.64***	(0.52 - 0.79)
Single	0.69***	(0.59 - 0.82)	1.39	(0.94 - 2.06)	0.67***	(0.53 - 0.86)
Changed marital status Wave I&II	0.59***	(0.46 - 0.76)	1.32	(0.93 - 1.89)	0.93	(0.73 - 1.20)
High school/GED	0.85	(0.67 - 1.07)	0.39***	(0.26 - 0.60)	0.65***	(0.51 - 0.82)

	Working Part Time		Unemployment		Out of Labor Force	
	OR	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Some college	0.88	(0.68 - 1.14)	0.47[***]	(0.31 - 0.72)	0.50[***]	(0.39 - 0.65)
College degree	0.87	(0.67 - 1.12)	0.29[***]	(0.18 - 0.46)	0.44[***]	(0.34 - 0.58)
Graduate school	0.64[***]	(0.46 - 0.88)	0.19[***]	(0.10 - 0.34)	0.28[***]	(0.20 - 0.39)
Changed education level W I&II	1.50[***]	(1.14 - 1.96)	0.87	(0.55 - 1.37)	1.46[**]	(1.04 - 2.05)
Number of children = 5 years, W I	0.99	(0.87 - 1.14)	1.03	(0.76 - 1.41)	0.90	(0.74 - 1.09)
Number of children > 5 years, W I	1.15[***]	(1.05 - 1.26)	1.16[**]	(1.00 - 1.35)	1.08	(0.97 - 1.20)
Number of children = 5 years, W II	1.46[***]	(1.23 - 1.74)	1.35[*]	(0.98 - 1.88)	2.66[***]	(2.21 - 3.21)
Number of children > 5 years, W II	1.17[***]	(1.06 - 1.29)	0.96	(0.81 - 1.14)	1.13[*]	(0.99 - 1.30)
Census Region Midwest	0.94	(0.78 - 1.14)	1.01	(0.67 - 1.53)	0.98	(0.74 - 1.30)
Census Region South	0.71[***]	(0.58 - 0.86)	0.87	(0.60 - 1.25)	0.98	(0.75 - 1.27)
Census Region West	0.97	(0.78 - 1.20)	1.06	(0.71 - 1.56)	1.15	(0.85 - 1.55)
In MSA not central city	1.09	(0.95 - 1.25)	0.92	(0.70 - 1.21)	0.99	(0.82 - 1.19)
Not in MSA	1.12	(0.91 - 1.38)	1.09	(0.76 - 1.56)	1.04	(0.78 - 1.37)
Born in the United States	0.85	(0.68 - 1.06)	0.59[***]	(0.41 - 0.87)	0.67[***]	(0.51 - 0.86)
Physical component score PCS, W I	0.98	(0.95 - 1.01)	0.99	(0.94 - 1.05)	0.96[**]	(0.92 - 1.00)
PCS squared, W I	1.00	(1.00 - 1.00)	1.00	(1.00 - 1.00)	1.00	(1.00 - 1.00)
PCS, W II	0.98	(0.94 - 1.03)	0.93[***]	(0.89 - 0.97)	0.86[***]	(0.83 - 0.89)
PCS squared, W II	1.00	(1.00 - 1.00)	1.00[***]	(1.00 - 1.00)	1.00[***]	(1.00 - 1.00)
Incident Other Psych Disorder, OPD	1.08	(0.83 - 1.39)	1.60[**]	(1.08 - 2.37)	0.97	(0.72 - 1.31)
Recent remission OPD	1.13	(0.92 - 1.38)	1.01	(0.70 - 1.45)	1.04	(0.80 - 1.36)
Persistent remission OPD	1.42[***]	(1.11 - 1.80)	1.40	(0.84 - 2.33)	1.06	(0.74 - 1.51)
Relapse case OPD	0.84	(0.57 - 1.23)	0.93	(0.46 - 1.88)	1.17	(0.71 - 1.93)
Persistent OPD	0.92	(0.70 - 1.22)	1.27	(0.83 - 1.95)	1.13	(0.83 - 1.55)
Incident Substance Use Disorder, SUD	0.96	(0.64 - 1.42)	1.61[**]	(1.00 - 2.58)	1.48[*]	(0.96 - 2.26)
Recent remission SUD	1.17	(0.85 - 1.61)	0.77	(0.43 - 1.41)	1.48[**]	(1.03 - 2.12)
Persistent remission SUD	1.12	(0.94 - 1.34)	1.04	(0.73 - 1.47)	0.97	(0.78 - 1.21)
Relapse case SUD	1.14	(0.73 - 1.78)	1.61	(0.74 - 3.50)	1.20	(0.65 - 2.22)
Persistent SUD	0.92	(0.62 - 1.37)	1.55[*]	(0.94 - 2.57)	0.90	(0.57 - 1.41)

Note.

[*] Significant at 10%

[**] significant at 5%

[***] significant at 1%.

Table A3

Odds Ratios for Not Working by Occupation

	Professional		Administrator/Clerical/Sales		Craftsman/Laborer	
	OR	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
MDD						

	Professional		Administrator/Clerical/Sales		Craftsman/Laborer	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Men						
Recent remission	0.28	(0.05 - 1.63)	1.72[*]	(0.94 - 3.16)	1.54	(0.77 - 3.12)
Persistent remission	0.88	(0.32 - 2.45)	0.67	(0.33 - 1.39)	1.07	(0.57 - 2.01)
Incident	2.91	(0.51 - 16.71)	1.84	(0.75 - 4.49)	2.90[***]	(1.54 - 5.47)
Relapse case	1.62	(0.12 - 21.17)	2.80	(0.63 - 12.40)	1.78	(0.40 - 7.88)
Persistent depression	10.44[***]	(3.01 - 36.26)	3.07[*]	(0.86 - 10.96)	2.23[*]	(0.86 - 5.80)
Women						
Recent remission	0.41[**]	(0.18 - 0.90)	1.24	(0.84 - 1.84)	1.22	(0.77 - 1.93)
Persistent remission	0.97	(0.56 - 1.70)	0.99	(0.73 - 1.33)	1.25	(0.81 - 1.94)
Incidence	1.33	(0.53 - 3.34)	0.93	(0.58 - 1.49)	1.42[*]	(0.95 - 2.14)
Relapse case	1.56	(0.68 - 3.58)	0.78	(0.37 - 1.64)	0.91	(0.37 - 2.22)
Persistent depression	3.05[***]	(1.37 - 6.76)	1.28	(0.70 - 2.35)	1.83	(0.88 - 3.79)

Note.

[*] Significant at 10%

[**] significant at 5%

[***] significant at 1%. Other control variables included in the regressions but not reported are as in Appendix Tables A1 and A2.

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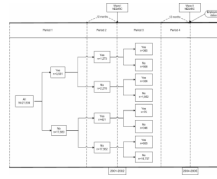
Figure 1.
Transition in Major Depressive Disorders between Wave I and Wave II of NESARC
Note. NESARC = National Epidemiologic Survey on Alcohol and Related Conditions.
Period 1 = life time to 12 months before wave I interview. Period 2 = past 12 months at
wave I interview. Period 3 = between wave I interview and 12 months before wave II
interview. Period 4 = past 12 months at wave II interview. Yes = diagnosed with major
depression; and No = no depression.

Table 1

Characteristics of Individuals Aged 18 to 60 in the Labor Force at Wave I Weighted by NESARC Wave II Weights

Characteristic	Men (n = 10,058)	Women (n = 11,476)	p-value[a]
Wave I unemployed[b] (%)	4.62%	4.97%	0.339
Wave I work part-time (%)	7.32%	21.43%	<0.001
Race (%)			
White	68.94%	68.39%	<0.001
Black	10.02%	13.67%	
Other[c]	6.56%	6.49%	
Hispanic	14.48%	11.45%	
Marital status (%)			
Married/living with someone	65.85%	60.94%	<0.001
Widowed/divorced/separated	9.23%	15.77%	
Single	24.92%	23.29%	
Education level (%)			
Less than high school	12.11%	9.01%	<0.001
High school/GED	28.04%	26.60%	
Some college	21.07%	23.60%	
College degree	25.47%	27.12%	
Graduate school	13.31%	13.67%	
Census region (%)			
Northeast	19.44%	19.70%	0.584
Midwest	23.24%	23.82%	
South	34.32%	34.38%	
West	23.01%	22.10%	
Metropolitan statistical area (MSA) (%)			
In MSA central city	29.10%	30.08%	0.422
In MSA not central city	51.80%	51.46%	
Not in MSA	19.10%	18.46%	
Born in the United States (%)	83.56%	86.68%	<0.001
Major depressive disorder in past 12 months (%)	4.91%	10.17%	<0.001
Other co-occurring psychiatric disorder (%)	11.23%	18.35%	<0.001
Co-occurring substance use disorder (%)	15.62%	7.46%	<0.001
Age, mean (linearized standard error [s.e.])	38.02 (0.15)	38.07 (0.12)	0.792
Number of children = 5 years old, mean (s.e.)	0.26 (0.01)	0.22 (0.01)	<0.001
Number of children 6 to 17 years old, mean (s.e.)	0.66 (0.01)	0.71 (0.01)	0.010
Physical component score[d], mean (s.e.)	54.01 (0.12)	53.90 (0.12)	0.423

[a] To account for the survey design, the p-value is based on the F statistic with noninteger degrees of freedom using a second-order Rao and Scott correction[47] for categorical variables and on the t statistics for continuous variables.

[b] Percentages of unemployed and working part-time were conditional on being in the labor market at the wave I interview.

[c]Other races are American Indian/Alaska Native/Asian/Native Hawaiian/Pacific Islander.

[d]Physical component score is a continuous norm-based physical functioning scale of the 12-item Short Form (SF-12) health survey, version 2.

Table 2

Odds Ratios for Working Part-Time, Being Unemployed, and Being Out of the Labor Force for Men by Depression Transition Status

	Working Full-Time	Working Part-Time			Unemployed			Out of the Labor Force		
	N	N	OR	95% CI	N	OR	95% CI	N	OR	95% CI
MDD Course										
Reference - no MDD	7,374	481	1		310	1		310	1	
Recent remission (RR)	313	38	1.75[**]	(1.10-2.80)	34	1.97[**]	(1.13-3.44)	25	1.24	(0.67-2.30)
Persistent remission (PR)	610	54	1.32	(0.91-1.90)	22	0.74	(0.38-1.45)	35	1.17	(0.68-2.00)
Incident case (IC)	209	25	1.92[**]	(1.05-3.49)	29	3.19[***]	(1.71-5.92)	26	2.66[***]	(1.51-4.70)
Relapse case (RC)	55	9	4.54[***]	(1.86-11.11)	4	1.51	(0.46-4.96)	8	4.72[**]	(1.26-17.71)
Persistent depression (PD)	58	4	1.37	(0.44-4.25)	11	3.64[***]	(1.62-8.20)	14	3.28[**]	(1.19-9.04)
Contrasts:[a]										
RR vs. PR			1.33	(0.77-2.30)		2.67	(1.20-5.95)		1.06	(0.50-2.24)
RR vs. RC			0.39	(0.15-1.02)		1.31	(0.36-4.73)		0.26	(0.06-1.06)
RR vs. PD			1.28	(0.37-4.43)		0.54	(0.21-1.37)		0.38	(0.12-1.18)
PR vs. RC			0.29	(0.11-0.75)		0.49	(0.12-1.93)		0.25	(0.06-1.00)
PR vs. PD			0.96	(0.29-3.19)		0.20°	(0.07-0.55)		0.36	(0.12-1.07)
RC vs. PD			3.32	(0.80-13.75)		0.41	(0.13-1.31)		1.44	(0.30-7.00)
IC vs. RC			0.42	(0.15-1.18)		2.11	(0.58-7.71)		0.56	(0.13-2.43)
IC vs. PD			1.40	(0.39-4.99)		0.88	(0.33-2.31)		0.81	(0.24-2.70)
IC vs. RR			1.09	(0.54-2.22)		1.62	(0.78-3.34)		2.15	(0.93-4.96)
IC vs. PR			1.46	(0.74-2.88)		4.31°	(1.97-9.43)		2.28	(1.01-5.16)

Note.

[**] Significant at 5%

[***] Significant at 1%. Control variables included in each regression but not reported were the following baseline information: age, age squared, race, marital status, highest education level, census region, metropolitan statistical area, born in the United States, number of children 5 years of age or younger, number of children between 6 and 17 years of age, physical component score, physical component score squared, co-occurring substance abuse/dependence, co-occurring other psychiatric disorders in each period, changes in education level, changes in marital status, and physical component score at wave II.

[a] After using the Bonferroni adjustment by dividing the alpha level by 10 (the number of contrasts), the contrasts with p-value less than 0.005 are significant (°).Contrasts with conventional p-value less than 0.05 are not marked by asterisk.

Table 3

Marginal Effects on Predicted Probabilities for Men in Each Depression Course Compared to Those without History of Depression

	Working Part Time		Unemployment		Out of Labor Force	
	Marginal probability	Standard error	Marginal probability	Standard error	Marginal probability	Standard error
MDD Course						
Recent remission MDD	0.058 **	(0.026)	0.032 *	(0.019)	0.003	(0.017)
Persistent remission MDD	0.026	(0.018)	−0.012	(0.012)	0.008	(0.015)
Incident MDD	0.063 **	(0.034)	0.069 **	(0.028)	0.049 **	(0.022)
Relapse case MDD	0.163 **	(0.063)	0.006	(0.029)	0.094	(0.066)
Persistent depression MDD	0.008	(0.053)	0.080 *	(0.042)	0.067	(0.045)

Note. Marginal effects were derived from the regression in **Table 2.**

***significant at 1%.

*
Significant at 10%

**
significant at 5%

Table 4

Odds Ratios Working Part-Time, Being Unemployed, and Being Out of the Labor Force for Women by Depression Transition Status

	Working Full-Time	Working Part-Time			Unemployed			Out of the Labor Force		
	N	N	OR	95% CI	N	OR	95% CI	N	OR	95% CI
MDD Course										
Reference - no MDD	5,905	1,296	1		332	1		749	1	
Recent remission (RR)	568	124	0.96	(0.74-1.25)	49	1.34	(0.86-2.09)	103	1.21	(0.92-1.59)
Persistent remission (PR)	873	203	0.93	(0.77-1.14)	43	0.84	(0.56-1.26)	112	1.11	(0.87-1.42)
Incident case (IC)	377	98	1.39**	(1.04-1.87)	39	1.49	(0.89-2.50)	77	1.34	(0.95-1.88)
Relapse case (RC)	180	35	0.79	(0.48-1.31)	13	1.67	(0.88-3.14)	22	0.76	(0.40-1.43)
Persistent depression (PD)	168	50	1.41	(0.91-2.18)	21	2.18**	(1.17-4.04)	39	1.60	(0.95-2.68)
Contrasts:[a]										
RR vs. PR			1.03	(0.76-1.40)		1.60	(0.93-2.75)		1.08	(0.76-1.54)
RR vs. RC			1.22	(0.70-2.11)		0.80	(0.40-1.62)		1.60	(0.87-2.93)
RR vs. PD			0.68	(0.43-1.08)		0.61	(0.32-1.18)		0.75	(0.45-1.26)
PR vs. RC			1.18	(0.70-2.01)		0.50	(0.25-1.02)		1.47	(0.75-2.90)
PR vs. PD			0.66	(0.42-1.04)		0.38°	(0.20-0.73)		0.70	(0.42-1.16)
RC vs. PD			0.56	(0.29-1.07)		0.77	(0.34-1.73)		0.47	(0.22-1.02)
IC vs. RC			1.76	(0.98-3.16)		0.89	(0.39-2.03)		1.77	(0.87-3.62)
IC vs. PD			0.99	(0.58-1.68)		0.68	(0.33-1.43)		0.84	(0.47-1.50)
IC vs. RR			1.45	(1.01-2.08)		1.11	(0.57-2.18)		1.11	(0.73-1.68)
IC vs. PR			1.49	(1.06-2.10)		1.78	(0.94-3.37)		1.20	(0.80-1.80)

Note.

***Significant at 1%. Control variables included in each regression but not reported were the following baseline information: age, age squared, race, marital status, highest education level, census region, metropolitan statistical area, born in the United States, number of children 5 years of age or younger, number of children between 6 and 17 years of age, physical component score, physical component score squared, co-occurring substance abuse/dependence, co-occurring other psychiatric disorders in each period, changes in education level, changes in marital status, and physical component score at wave II.

**
Significant at 5%

[a] After using the Bonferroni adjustment by dividing the alpha level by 10 (the number of contrasts), the contrasts with p-value less than 0.005 are significant (°). Contrasts with conventional p-value less than 0.5 are not marked by asterisk.

Table 5

Marginal Effects on Predicted Probabilities for Women in Each Depression Course Compared to Those without History of Depression

	Working Part Time		Unemployment		Out of Labor Force	
	Marginal probability	Standard error (s.e.)	Marginal probability	Standard error (s.e.)	Marginal probability	Standard error (s.e.)
MDD Course						
Recent remission MDD	−0.005	(0.022)	0.014	(0.012)	0.017	(0.013)
Persistent remission MDD	−0.011	(0.016)	−0.007	(0.008)	0.012	(0.012)
Incident MDD	0.054[**]	(0.026)	0.018	(0.015)	0.017	(0.017)
Relapse case MDD	−0.035	(0.038)	0.032	(0.021)	−0.022	(0.025)
Persistent depression MDD	0.062	(0.041)	0.039[*]	(0.023)	0.031	(0.027)

Note. Marginal effects were derived from the regression in **Table 4.**

***significant at 1%.

[*]
Significant at 10%

[**]
significant at 5%