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# Prevalence and Patterns of Major Depressive Disorder in the United States Labor Force

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## Abstract

**Background and Aims of the Study:** In this paper, we identify the 12-month and lifetime prevalence of major depressive disorder in and out of the labor force, and among the employed and unemployed. We examine whether prevalence by labor force and employment status varies by gender and over the life cycle. Finally, we examine whether people can 'recover' from depression with time by identifying patterns of labor force participation and employment as time since most recent episode passes.

**Methods:** We examine data collected as part of the National Comorbidity Survey, a survey representative of the population of the United States designed to identify the prevalence of major mental illnesses. The National Comorbidity Study identified cases of major depression via the Composite International Diagnostic Interview. Using these data, we estimate univariate and bivariate frequency distributions of major depressive disorder. We also estimate a set of multivariate models to identify the effect of a variety of dimensions of major depression on the propensity to participate in the labor force, and be employed if participating.

**Results:** Lifetime and 12-month prevalence rates of depression are similar in and out of the labor force. Within the labor force, however, depression is strongly associated with unemployment. The negative relationship between depressive disorder and employment is particularly strong for middle age workers. Depression and the number of depressive episodes have a differing pattern of effects on labor market outcomes for men and women. We find evidence that labor force participation and employment rates for people with a history of depression increase significantly over time in the absence of additional depressive episodes.

**Discussion:** Labor market status represents an important dimension along which prevalence of major depression varies. The relationship between depression and employment status is particularly strong for middle aged persons, but becomes weaker as time passes since the last depressive episode. Continued exploration of the association between work (or lack of work) and depression may ultimately help in the prediction, treatment and assessment of the illness.

**Implications for Practice and Policy:** These results present a basic set of facts about the relationship between major depressive disorder and labor market outcomes. We have not, however, attempted to sort out the complexities of this relationship here. These complexities arise at almost every turn. For instance, the

high level of prevalence of depression among the unemployed may be due to the possibility that the stresses associated with unemployment trigger depressive episodes or to the possibility that workers who are depressed are more likely to be fired or quit.

**Implications for Further Research:** Our continuing research attempts to address these problems. Understanding when and how depression affects labor market outcomes and when and how labor market outcomes affect depression is an important endeavor for those interested in treating the disease and understanding its consequences. © 1999 John Wiley & Sons, Ltd.

## Introduction and Background

Recent advances in psychiatric epidemiology have made it clear that tens of millions of Americans suffer from major depression every year.<sup>1–3\*</sup> Many are in the prime of their working lives. Consequently, in addition to medical, personal and social costs, depression may have a heavy impact on the working lives of affected individuals. Unfortunately, little is known about the prevalence and consequences of major depression in the labor market.

In this paper, we make use of data from the National Comorbidity Survey (NCS) to identify the importance of major depressive illness in the labor force. In doing so, we have three principal objectives. First, we identify the prevalence of major depression among persons participating in the labor force.† We estimate lifetime and 12-month prevalence of major depressive disorder among people

\* Estimates of the 12-month prevalence rate of major depression in the US range from about 5 to 10 per 100 persons in the adult population (see Regier *et al.*<sup>3</sup> for estimates based on the Epidemiologic Catchment Area Study and Kessler *et al.*<sup>4</sup> for estimates from the National Comorbidity Survey).

† We focus our analysis in this paper on persons who have experienced episodes of major depression but who do not have a history of mania or hypomania. As a result, we do not identify the relationship between depressive episodes and labor market experiences of persons who have experienced episodes of mania and hypomania. Those persons would be diagnosed with some form of bi-polar affective disorder. Instead, we focus on persons who satisfy the diagnostic criteria for major depressive disorder. Our prevalence estimates therefore are for depressive disorder, not depressive episodes. However, the principal conclusions from all analyses presented in this paper are also valid for the relationship between depressive episodes and the labor force. The fact that our conclusions are not sensitive to whether we analyze depressive disorder or depressive episodes should not be surprising, since the prevalence of bi-polar disorders is quite low.

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currently participating in the labor force compared to those out of the labor force. The labor force consists of all persons currently working, or actively seeking work. Among those participating in the labor force, we also estimate prevalence rates separately for the employed and the unemployed.\*

Second, we examine whether the labor market consequences of depression vary by gender and over the life-cycle. We expect gender to be an important dimension of the relationship between depression and the labor market both because depression more commonly affects women and because choices about labor market participation vary by gender. We expect that the relationship between depression and labor force status is likely to vary by age for a number of reasons. For example, young people with depression may be more likely to drop out of school and participate in the labor force than comparable peers who are not depressed. However, as people age and leave school, we might expect depressives to be less likely to participate in the labor force than their healthy peers as long as major depression increases the costs or decreases the rewards associated with working.

Third, we hope to identify whether people can recover from depression with time, at least in terms of their ability to seek and find employment. Major depressive disorder may fundamentally alter a person's working career, rendering him/her less productive or less secure than healthy workers. Alternatively, the ill may be able to surmount or recover from depression, so that, over time, their labor market prospects are not remarkably different from their counterparts who have never had to deal with the debilitating effects of major depression.

Identifying the extent to which major depressive disorder affects workers is crucial if we hope to understand the full costs of one of the most common and debilitating forms of mental illnesses. An important step towards understanding the full costs of depression is identifying the extent to which depression occurs in the labor market. Furthermore, studying the labor market consequences of major depression may provide insight into the processes through which environmental factors aggravate illness and help in predicting whether and how the afflicted can adapt to or recover from their illness. The links between stresses inherent in the labor market and the onset and severity of depression are well established.† By examining the relationship between depression and labor market outcomes, we hope to lay the groundwork for a more complete understanding of the ties between the labor market and depression.

## Data and Methods

Until recently, work on depression and the labor force has been hindered by a lack of nationally representative

\* There are three distinct labor market states into which economists classify people. A person can choose not to participate in the labor force at all (*as about 41% of women and 25% of men do*). If a person chooses to participate in the labor force, s/he may be employed or unemployed.

† Indeed, of all life events which have emerged as predictors of depression, the strongest has been the occurrence of markedly stressful events prior to onset.<sup>5-10</sup> Consistently, this research provides evidence that for depressives life stress is unusually high.

information about labor market experiences and mental illness. Data from the National Comorbidity Survey (NCS) provide the first opportunity to develop an understanding of the prevalence of depression in the labor market and to understand the consequences of this disease for those afflicted. The NCS is the first nationally representative survey designed to study the prevalence, causes and consequences of mental illnesses and comorbidity between various psychiatric disorders.<sup>2</sup> The data are a stratified, multi-stage area probability sample of persons 15-54 years old, living in the 48 contiguous states. The survey was administered by the Survey Research Center (SRC) at the University of Michigan between September 1990 and February 1992. The response rate was 82.6 percent with 8098 total respondents.<sup>4‡</sup>

The NCS provides information about respondents' employment status as well as their ongoing and past experiences with mental illness. To diagnose mental illnesses, the NCS used a modified version of the Composite International Diagnostic Interview (CIDI), a structured diagnostic interview based on the Diagnostic Interview Schedule and designed to be used by trained interviewers who are not clinicians.§ Responses to these questions are used to diagnose the prevalence of several DSM-III-R psychiatric disorders, including major depressive disorder over sample members' lifetimes and during the previous 12 months.

Using the NCS data, we estimate the prevalence of these lifetime and 12-month cases of major depressive disorders. First, we estimate the frequency with which NCS respondents report symptoms which satisfy diagnostic criteria for major depression during the 12 months prior to interview. We then estimate the frequency with which respondents experienced such symptoms at any time during their lifetimes, comparing these frequencies for persons participating in the labor force and for those not participating, and for the employed and unemployed.

*A priori*, we anticipate major depression will have an impact on the working lives of the ill in a variety of ways. First, those suffering from depression may be unable to participate in the labor market at all. Second, within the labor market, workers with a history of major depression or with a current depressive episode may experience more unemployment if their illness hinders job performance and subsequently leads to a higher probability of dismissal, or if they have a harder time engaging in the job search process when unemployed and therefore become employed at a slower rate. Alternatively, we may observe higher levels

‡ The response rate for the NCS is high compared to previous mental health surveys. Nonetheless, data available from the original NCS survey were supplemented by a special survey of non-respondents, which elicited information from approximately half of the original 'non-respondents'.

§ Diagnoses known to have low prevalence in population-based surveys (such as somatization disorder) were deleted from the survey. Other modifications included the addition of commitment and motivation probes for recall of lifetime episodes and clarifying probes for CIDI questions found in pilot work to be unclear or confusing to respondents. See Kessler<sup>2</sup> for details. See Anthony *et al.*,<sup>11</sup> Robins *et al.*<sup>12</sup> and Helzer *et al.*<sup>13</sup> for discussion of diagnoses based on interviews conducted by lay interviewers using the Diagnostic Interview Schedule.

of depression among the unemployed if the stresses associated with unemployment itself can serve to trigger depressive episodes. Such precursors may include stress brought about by economic insecurity or the negative personal and social consequences of unemployment.

To more fully understand the significance of depression in the workplace, we also attempted to account for the complexity of the disorder. Persons affected by major depressive disorder can have vastly different experiences with their illnesses. For some, one episode may be all that is ever endured. For others, repeated cycling into depressive episodes marks the course of the disorder. In addition, during any one episode, different individuals may experience different levels of debilitation. Some experience symptoms which only mildly impede their daily functioning. Others experience symptoms which more severely interfere with their lives. To examine these issues, we separately estimate the bivariate frequency distributions of labor market outcomes and the frequency or severity of depressive episodes.

We then examine differences in depression and labor market outcomes by gender. We do so because depression more commonly afflicts women. Women also make different choices about labor market participation and employment.\* Because of these different patterns of illness and employment status, we expect to observe different patterns of depression conditional on labor market status by gender. We analyse the relationship between labor market status, gender, and depression in cross-tabular form. We do this for two reasons. First, an interesting public health question is: In which labor market states does depression affect men and women? Second, an interesting economic question is: What are the labor market choices made by men and women who have a history of depression? We present simple answers to both questions. However, these questions are likely to be related, and which question one asks reveals an assumption about causation. In fact, it may be the case that labor market status has a direct effect on the prevalence of depression and depression has an effect on labor market status. Consideration of such a complicated relationship will be left to later research. Here, our aim is to point out the empirical regularities which future theoretical and empirical work will need to explain.

Next, we examine the relationship between depression and labor market status over the life-cycle. Depression may affect early decisions about whether or not a person seeks employment or remains in school. We analyze depression over the life-cycle by direct comparison of lifetime and 12-month prevalence rates of different age groups within the NCS sample. Unfortunately, the cross-sectional NCS data require us to draw inferences about depression and the labor market over the life-cycle by comparison of different cohorts. We discuss our findings in the context of potential cohort effects.

\* The rate at which women supply their labor in the market has consistently been found to be more sensitive to the level of wages.<sup>14</sup> At low wages, women are more likely than men to stay or drop out of the labor force, opting instead to devote time to non-market activities such as raising children.

Our final analysis supplements the univariate and bivariate analyses by separately examining the effects of various dimensions of illness on labor force participation and employment for men and women. We estimate bivariate logit models to identify the contributions of the presence, severity and recency of major depressive disorder on these labor market outcomes separately. We control for standard life-cycle changes in labor market behavior. Labor force participation tends to rise with age through the 40s, and then fall as workers start to retire in their 50s.† We particularly investigate the possibility that, as time since onset of a major depressive episode passes, the labor force participation rates and employment status of the afflicted may come to look more and more like those of the non-afflicted.

## Results

### *Lifetime and 12-Month Prevalence of Major Depression in the Labor Market*

Based on lifetime prevalence, depression is as common in the labor market as in the general population. Among the population participating in the labor force, 15.7 percent have suffered from major depressive disorder at some time in their lives (see **Table 1**). This compares with 15.8 percent of the total population and 16.2 percent of the population not participating in the labor force (these rates are not statistically different at conventional levels). While lifetime prevalence rates differ little by labor force status, the differences are more dramatic among those with 12-month disorders. Specifically, 8.6 percent of those in the labor force endured a bout of major depression during the 12 months prior to being interviewed, compared to 11.6 percent for those not participating in the labor market (these rates are statistically different ( $p$ -value = 0.001)). So, while lifetime prevalence of major depressive disorder is as high in the labor force as it is in the general population, 12-month depressive disorders are more common among the population not participating in the labor force.

Among those participating in the labor force, the relationship between depression and employment status is much starker. Employed workers are significantly less likely to report a history of depression, and especially a depressive episode within the 12 months prior to the interview, than the unemployed (again, see **Table 1**). Among workers currently unemployed, 21.9 percent had a history of depression, compared to 15.2 percent of the employed. 12-month prevalence of depression among the unemployed is more than twice as high as prevalence among the employed—16.5 percent versus 7.9 percent.

† Unemployment tends to fall with age. Time since most recent onset is naturally correlated with age, and developing a sense of the effect of time since most recent onset on labor market outcomes requires some basic control for this effect.

Table 1. Prevalence of depression among NCS sample, by gender and by labor force participation

	Sample size	Proportion w/major depression (lifetime)	Proportion w/major depression (12 months)
Total sample	8093	0.158	0.092
By gender			
Men	3846	0.117	0.066
Women	4247	0.198	0.117
By employment status			
1) Out of the labor force	1465	0.162	0.116
2) Participating in the labor force	6476	0.157	0.086
a) Unemployed	572	0.219	0.165
b) Employed	5904	0.152	0.079
Test of independence of labor force participation and depression	Chi-square <i>p</i> -value	0.187 0.665	13.725 0.001
Test of independence of employment status (conditional on labor force participation) and depression	Chi-square <i>p</i> -value	16.350 0.001	45.312 0.001

### Measures of Severity of Major Depression by Labor Market Status

It is rare that people with a history of depressive illness have endured only one episode of major depression (see **Table 2**). For example, only 24.5 percent of people out of the labor force who have suffered from depression have *as yet* experienced just one episode. At the same time, two-thirds have experienced five or fewer episodes.

We find no significant differences in the number of lifetime episodes suffered by depressives who are not participating in the labor market and those who are (see **Table 2**). However, within the labor market, depressives who are unemployed have suffered from more episodes of major depression than any other group. Only 17.7 percent of the unemployed have experienced just one episode of

depression, compared to 28.6 percent of the employed (see **Table 2**). This suggests that, even if there is some causal relationship from unemployment to depression, depressives observed in unemployment have a history of depression, not just a single episode associated with their current employment state.

We also find evidence of a relationship between a second dimension of severity and labor market status. In general, people who have experienced at least one major depressive episode report significant interference in their lives due to depression. But, those out of the labor force are more likely than those who participate in the labor force to report that their episode(s) interfered 'a lot' or 'some' with their lives (84 percent versus 77 percent). They are also less likely to report little or no interference. This suggests that to some degree, depressives participating in the labor force have

Table 2. Number of depressive episodes among those experiencing lifetime MDE: by labor force status

Number of episodes of depression ever experienced	In the labor force							
	Out of the labor force		Total		Unemployed		Employed	
	Frequency (%)	Cumulative frequency (%)	Frequency (%)	Cumulative frequency (%)	Frequency (%)	Cumulative frequency (%)	Frequency (%)	Cumulative frequency (%)
1	24.5	24.5	27.3	27.3	17.7	17.7	28.6	28.6
2	15.5	40.0	17.4	44.7	22.3	40.0	16.8	45.3
3	12.3	52.3	12.2	56.9	6.3	46.3	13.0	58.3
4	7.7	60.0	8.9	65.8	10.2	56.5	8.7	67.0
5	6.9	67.0	6.5	72.2	6.3	62.7	6.5	73.5
6-10	14.9	81.9	12.2	84.4	11.9	74.6	12.2	85.7
11-20	6.9	88.8	5.3	89.7	11.6	86.2	4.5	90.2
21-30	2.4	91.2	2.4	92.0	2.5	88.7	2.4	92.6
31+	8.8	100.0	8.0	100.0	11.3	100.0	7.5	100.1
			$\chi^2$ 3.706 <i>p</i> -value 0.883				$\chi^2$ 21.519 <i>p</i> -value 0.006	



experienced (or are experiencing) episodes of major depression involving less severe impairment, on average ( $\chi^2 = 9.611$ ). Clearly, however, even among those participating in the labor force, depression is reported to result in substantial impairment.

While depressives in and out of the labor force differ in the reported interference in their lives associated with depressive episodes, such variation does not exist by employment status among those in the labor force. As we saw above, prevalence of major depression is much higher among unemployed workers than among employed workers. However, we do not find a significant relationship among those participating in the labor market between employment status and the degree of interference caused by the illness. The unemployed were more likely to report the highest level of interference due to depression (42.7 percent, versus 37.1 percent among employed workers). They were also more likely to report only a little interference (26.1 percent, versus 18.2 percent among the employed). So, while the stressful state of unemployment may be associated with higher prevalence and frequency of major depressive episodes for a variety of reasons, it does not appear to be associated with markedly more debilitating episodes than average. This may be due to the fact, identified above, that individuals with the most debilitating bouts of depression are more likely to have dropped out of the labor force altogether.

### Gender Differences

The results presented in **Table 1** illustrate that lifetime and 12-month prevalence of depression is nearly twice as high among women than men. While prevalence rates are consistently higher for women, we consider below whether patterns of depression in various labor force and employment states vary by gender. In **Table 3**, we present results of our analysis of gender, depression and labor market outcomes.

For both men and women, there are no large differences in lifetime prevalence of major depression by labor force participation status. 10.0 percent of men and 19.2 percent of women out of the labor force have suffered from major depressive disorder at some time in their lives. These lifetime prevalence rates are not significantly different from those of men and women who do participate in the labor force ( $p$ -value = 0.197 for men and 0.516 for women).\*

As further evidence of the weak relationship between lifetime incidence of major depression and labor force participation for both men and women, notice that among those who have experienced depression in their lifetimes, 11.4 percent of men and 26.0 percent of women are not participating in the labor force. This compares to 13.6 percent of men and 27.1 percent of women who have never experienced depression and are not participating in the labor force.†

\* 11.44 percent of men and 20.07 percent of women in the labor force have experienced depression at some time in their lives.

† We can detect no significant difference between prevalence of lifetime depressive disorder and labor force participation ( $\chi^2 = 1.661$ ,  $p$ -value = 0.197 for men, and  $\chi^2 = 0.421$ ,  $p$ -value = 0.516 for women).

However, for both men and women, a stronger relationship exists between labor force participation and recent experiences with depression. Of men experiencing depression in the 12 months prior to interview, 16.6 percent were not participating in the labor force. This compares to 13.1 percent of men with no such recent experience with depression. For women, 30.3 percent of those who had experienced depression in the 12 months before interview were not participating in the labor force, compared to 26.5 percent of other women. Interestingly, while labor force participation rates are lower for women with 12-month depressive disorder, there is a proportionately larger difference between the behavior of recently depressed and healthy men. This suggests that depressed men are relatively likely to drop out of the labor force.

Another explanation for the relatively high rates at which men with recent experience with depression do not participate in the labor force is that lack of participation disproportionately increases the risk of depression for men, *ex ante*. This may arise if men who have dropped out of the labor force bear greater personal economic and social costs which increase the risk of depression. Among men who do not participate in the labor force, 8.2 percent have experienced a depressive episode in the 12 months prior to interview. This is significantly higher than the 5.9 percent of employed men who have experienced a recent depression. There is no such difference in lifetime depression prevalence among those out of the labor force and among those employed. This relatively strong relationship between lack of participation in the labor force and recent/current episodes of depression is consistent with an increased risk for depression among those not in the labor force.

We next turn our attention to the relationship between depression and unemployment and employment by gender. Among both men and women in the labor market, lifetime and 12-month prevalence rates of depression are much higher among the unemployed than the employed. Indeed, we find that the relationship between unemployment and depression dominates the interaction between depression and all labor market states. Among unemployed men, the lifetime prevalence rate of major depression is 18.3 percent, and the 12-month prevalence rate is 12.0 percent (compared with 11.4 percent of unemployed women have for employed men). Similarly, among women 25.6 percent of unemployed women have experienced depression in their lifetime, 21.0 percent in the 12 months prior to interview. This compares to 19.5 percent and 10.2 percent for employed women. Clearly, compared to all other states, depression is much more prevalent among the unemployed.

Taking a different tack on the problem, of people in the labor force who have experienced a depressive episode in the 12 months prior to interview, 12.3 percent of men were unemployed, and 11.7 percent of women were unemployed.‡

‡ Please note that this is not an unemployment rate in the manner which the US Bureau of Labor Statistics reports the official unemployment rate. That rate is the percentage of all workers who are participating in the labor force, and who are unemployed (with some stipulations).

Table 3. Bivariate relationship between depression and labor force status, by gender

Row percent Column percent	No major depressive disorder (ever)	Major depressive disorder (ever)	No major depressive disorder (12 month)	Major depressive disorder (12 month)
<b>Men</b>				
Out of the labor force	89.98	10.02	91.76	8.24
Unemployed	13.61	11.43	13.12	16.64
Employed	81.73	18.27	88.03	11.97
	6.29	10.60	6.41	12.30
	88.56	11.44	94.11	5.89
	80.10	77.97	80.47	71.06
<b>Women</b>				
Out of the labor force	80.85	19.15	86.81	13.19
Unemployed	27.14	26.00	26.46	30.37
Employed	74.43	25.57	78.97	21.03
	6.03	8.38	5.81	11.69
	80.47	19.53	89.83	10.17
	66.83	65.52	67.73	57.93

Tests of differences in patterns of employment status (employed/unemployed) and depression

	Chi-square	p-value
Employment status and depressive disorder, lifetime (men)	12.672	0.002
Employment status and depressive disorder, 12 month (men)	17.216	0.001
Employment status and depressive disorder, lifetime (women)	5.846	0.054
Employment status and depressive disorder, 12 month (women)	30.242	0.001

This is significantly higher than the 6.4 percent of men and 5.8 percent of women without a recent depression who were unemployed. This pattern provides further evidence of a strong relationship between unemployment and depression.

### Life-Cycle Differences

In **Figure 1**, we illustrate the pattern of the lifetime prevalence rates of major depressive disorder by labor force and employment status and by age group. Among the very young, there is no higher prevalence of major depressive disorder among those not in the labor force compared to labor force participants, or among those unemployed compared to the employed. However, among those in middle age ranges, prevalence of depression is significantly higher for those out of the labor force or unemployed. During these age ranges, in which people are at the prime of their working lives, depression is associated with the negative employment states of being out of the labor force or unemployed if in the labor force.

Interestingly, however, the relatively high levels of depression among those out of the labor force and unemployed often observed in the age ranges between 20 and 50 do not show up among those over 50. In fact, depression is mildly more common in the labor market than out, and among the employed for this oldest group.

Together, these findings suggest depression is associated with poorer labor market outcomes for middle-aged persons. This conclusion is somewhat complicated by potential cohort

effects, however. Particularly, the growing openness to mental health issues and the recent boom in use of serotonin selective reuptake inhibitors (e.g. Prozac and Zoloft) may be associated with an increased propensity to self-report depressive symptoms for young cohorts. However, the present findings suggest the highest prevalence in the labor force is not among the youngest cohorts, leading us to believe that the observed patterns for middle-aged workers are not due to systematic effects.

### Multivariate Models

In **Table 4**, we present the results of multivariate logistic regressions for three groups: the entire sample and separate subsamples of men and women. In all three, we include several predictors of labor market outcomes: the individual's age and gender; experience with depression (yes/no); the number of episodes experienced; the age at which the first episode was experienced and the number of years since the last episode. For the sample including both men and women, we also include an interaction between the depression and female dummy variables, to pick up any unique effects of depression for women. The first three columns present the marginal effects of depression and its course, as well as basic personal characteristics, on labor force participation;\*

\* These marginal effects are the partial derivatives of the probability of labor force participation, with respect to a particular explanatory variable. These marginals for independent variable  $k$  are calculated based on logit coefficient estimates as:

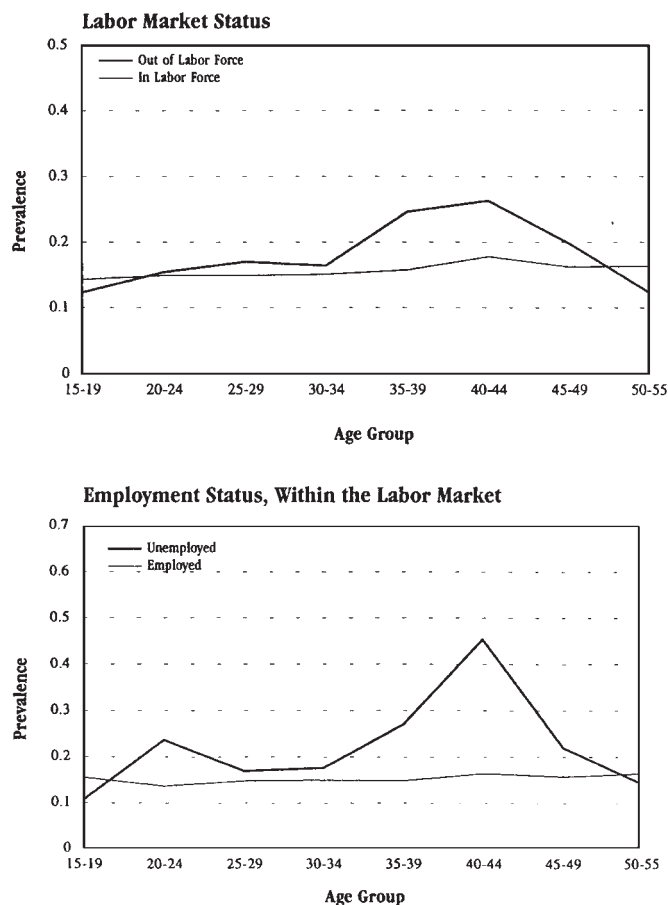


Figure 1. Major depressive disorder by age and labor market/employment status

the associated odds ratio and the chi-square test statistic for the significance of each factor in determining labor force participation. The final three columns present the marginal effects on employment (conditional on labor force participation), and the associated odds ratios and chi-square statistics.

In the top panel of **Table 4** are the estimates for the sample containing men and women. These estimates illustrate that the relationship between depression and labor market outcomes is not homogeneous. If a person has ever experienced a major depressive episode, we estimate that there is no significant effect on his or her propensity to participate in the labor force. However, we estimate that workers with a history of depression are 4.8 percentage points less likely to be employed.<sup>†</sup> The negligible marginal effect of the number of episodes indicates that numerous episodes of depression do not further impact labor market

$$\frac{\delta}{\delta x_{ik}} L(x'_i \beta) = \frac{\exp(x'_i \beta)}{[1 + \exp(x'_i \beta)]^2} \beta_k$$

where  $i$  indexes individuals. For this purpose, all independent variables were evaluated at their means.

<sup>†</sup> Alternatively, interpreting the odds ratio, workers with a history of depression are about half as likely as their healthy counterparts to avoid unemployment.

outcomes.<sup>‡</sup> However, workers with a history of depression are more likely to be employed the longer is the elapsed time since the last episode. For each year that passes since the last episode, the chance of being employed increases by 0.6 percentage points. As a result, we predict that, on average, people who have suffered from an episode of major depression can expect employment rates comparable to those without a history of major depression 8 years post-onset, in the absence of further episodes.

While women are less likely to be in the labor force, the estimates for the combined sample of men and women indicates that the relationships between depression and labor force participation and employment do not vary significantly by gender. However, to allow all three aspects of depression, as well as age, to vary by gender, we report estimates from separate multivariate logistic regressions for men and women in the bottom two panels of **Table 4**. These findings indicate that there are important differences between men and women in the effects of depression, number of episodes and time since last episode on labor force participation and employment.

Depression significantly reduces the likelihood that a man will be in the labor force (2.7 percentage points), but does not have a significant effect on the likelihood that a woman will participate in the labor force. However, for both men and women in the labor force, depression significantly reduces the likelihood of employment. A man who has a history of depression is 4.6 percentage points less likely to be employed than a man without a history of depression. Similarly, a woman with a history of depression is 3.9 percentage points less likely to be employed.

The number of episodes of depression has a very different effect on labor market outcomes for men and women. As the number of episodes rises, the likelihood of a woman being in the labor force falls. Further, among women in the labor force, the likelihood of employment falls as the number of episodes rises. These effects are statistically significant, although relatively small in magnitude. For men, however, the number of episodes is significantly related to neither labor force participation nor employment.

The number of years since the last episode also has a strikingly different effect for men and women. For men, each year since the last episode is associated with a 1.6 percentage point increase in the likelihood of being in the labor force. For women, we find no significant association between the time since the last episode and labor force participation. However, among women in the labor force, each year since the last episode is associated with a 1.5 percentage point increase in the likelihood of employment, while we find no significant association between time since the last episode and employment for men.

## Conclusions and Implications

The findings reported in this paper are drawn from a study of the relationship between major depressive disorder and

<sup>‡</sup> We also tried a quadratic specification between the number of episodes and labor market outcomes. However, statistical tests indicated that the linear specification sufficiently describes the relationship.

Table 4. Logit-estimated relationship between the history and course of depressive illness and labor force status: by gender

Independent variables	Dependent variable: labor force participation dummy			Dependent variable: employment dummy		
	Marginal effect on labor force participation	Odds ratio	Chi-square test statistic	Marginal effect on employment in the labor force	Odds ratio	Chi-square test statistic
<b>Men and women</b>						
Intercept	0.259		237.44**	0.089		44.30**
Depression (ever)	-0.009	0.918	0.15	-0.048	0.475	13.27**
Number of episodes	-0.001	0.995	2.18	0.000	0.993	2.75**
Time since last episode	0.004	1.036	2.49	0.006	1.098	5.53**
Female (1 = female, 0 = male)	-0.158	0.236	275.33**	-0.010	0.856	1.90
Female depression	0.008	1.077	0.10	0.013	1.227	0.70
Age	0.001	1.009	5.69**	0.002	1.039	43.52**
<b>Men only</b>						
Intercept	0.082		29.30**	0.087		25.65**
Depression (ever)	-0.027	0.612	3.62*	-0.046	0.467	11.23**
Number of episodes	0.000	1.006	0.35	0.000	1.008	0.74
Time since last episode	0.016	1.327	4.80**	0.001	1.019	0.17
Age	0.002	1.036	19.94**	0.002	1.037	19.57**
<b>Women only</b>						
Intercept	0.213		58.48**	0.079		17.87**
Depression (ever)	0.010	1.057	0.20	-0.039	0.557	8.99**
Number of episodes	-0.001	0.993	3.64*	-0.001	0.988	6.95**
Time since last episode	0.003	1.019	0.73	0.015	1.253	7.78**
Age	0.000	1.000	0.01	0.003	1.040	23.58**

\*\* Significant at 5% level.

\* Significant at 10% level.

labor market outcomes. Using data from the National Comorbidity Survey, we find depression to be just as prevalent among individuals within the labor force as among those not in the labor force. Not surprisingly, among people in the labor force, major depression is more prevalent among the unemployed than among the employed.

The relationship between depression and the labor market varies over the life cycle. Depression tends to have a significant negative relationship with labor force participation and employment during the ages in which individuals are in the middle years of their careers. There are no significant negative effects of depression on labor force participation among the very young and among people in their fifties. The lack of a strong relationship between depression and labor force participation among the young may stem from teenagers' participation in both schooling and work. Depression may either increase the chance that a teenager drops out of school and enters the labor force or that a teenager drops out of the part-time labor force but stays in school. For older persons, if episodes of depression are substantially debilitating, a history of major depression may be associated with lower earnings throughout the career and consequently may affect work decisions late in life as workers save for retirement.

Finally, we find that prevalence is uniformly higher for women than men. However, it is disproportionately higher among unemployed men than among unemployed women. Further, our results indicate that the impact of depression,

number of episodes, and time since the last episode differ strikingly between men and women. Depression has a negative effect on labor force participation only for men, while it reduces the likelihood of employment for both men and women. Multiple episodes have a negative effect on labor market outcomes only for women, but for both men and women we find evidence that individuals with a history of depression may be able to recover from their illness to some degree. As time since the last depressive episode passes, the labor market prospects of the ill approach those of individuals who do not suffer from depression. This suggests that effective treatment for depression may have significant long-term economic benefits.

The aim of our research has been to describe the parameters of the relationship between major depression and labor force status. These results present a basic set of facts about the relationship between major depressive disorder and labor market outcomes. We have not, however, attempted to sort out the complexities of this relationship here. These complexities arise at almost every turn. For instance, the high level of prevalence of depression among the unemployed may be due to the possibility that the stresses associated with unemployment trigger depressive episodes or to the possibility that workers who are depressed are more likely to be fired or quit. Our continuing research attempts to address these problems. Understanding when and how depression affects labor market outcomes and when and how labor market outcomes affect depression is an



important endeavor for those interested in treating the disease and understanding its consequences.

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