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PSYCHIATRIC DISORDERS AND EMPLOYMENT: NEW EVIDENCE FROM THE COLLABORATIVE PSYCHIATRIC EPIDEMIOLOGY SURVEYS

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ABSTRACT

This paper uses data from the NIMH Collaborative Psychiatric Epidemiology Surveys to estimate the effects of psychiatric disorder on employment. We model the employment and disorder outcomes jointly with a bivariate probit model using local availability of treatment resources and early onset of disorder as identifying variables. As a complement to our main findings, we apply methods proposed in Altonji, Elder and Taber (2005) that allow one to gauge the sensitivity of the estimated effect of disorder to various degrees of selection on unobserved variables, without relying on identifying exclusions. Among males, psychiatric disorder in the past 12 months is associated with a reduction of 9 to 11 percentage points in the likelihood of current labor force participation and a reduction of about 10 percentage points in the likelihood of employment. Among females, we also find negative, but less consistent, associations between recent disorder and labor force participation and employment.

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1.0 Introduction

Over the past two decades, there has been significant progress in society's recognition of the prevalence and disability burden of psychiatric disorders, and the need for accessible, effective treatment (USDHHS, 1999). Recent estimates based on the National Comorbidity Study Replication (NCS-R) suggest that in the US about 26 percent of adults meet diagnostic criteria for having any psychiatric disorder in the past 12 months (Kessler et al., 2005a). Psychiatric disorders are frequently co-morbid with each other as well as with medical conditions such as chronic pain, neurological disorders, circulatory disorders, and gynecological problems. About 45 percent of adults with any kind of psychiatric disorder in the past 12 months meet diagnostic criteria for two or more psychiatric disorders (Kessler, 2005a). Rates of treatment for psychiatric disorders have increased over the past decade, but most individuals who meet diagnostic criteria for disorders, even serious disorders, still do not receive any kind of treatment (Kessler, 2005b). In the early 1990's, 20 percent of adults with 12-month psychiatric disorder received some form of treatment in the past year -- as of the time period 2001 to 2003, this rate had increased to 33 percent (Kessler et al, 2005b).

Given the high prevalence of psychiatric disorders; the significant co-morbidity within psychiatric disorders as well as between psychiatric disorders and other health problems; and the continued limited utilization of treatment services, it is not surprising that psychiatric disorders are a leading cause of disability in the US and abroad. As of 2000, unipolar depressive disorders alone were the leading cause of years of life lived with disability (YLDs) worldwide, accounting for about 12 percent of YLDs. This disability loss associated with a single mental disorder – depression – is much higher than the losses associated with highly prevalent conditions like diabetes and arthritis, which accounted for 1.4 percent and 3.0 percent of YLDs respectively (Murray & Lopez 1996a, 1996b).

This paper focuses on one disabling aspect of psychiatric disorder – the effect of disorder on labor force participation and employment. We use new, pooled data from the NIMH Collaborative Psychiatric Epidemiology Surveys (CPES). The CPES offers the most recent, national diagnostic information on mental disorders and correlates of mental disorders, as well as the largest samples of racial/ethnic minorities and immigrants with information of mental disorders, currently available.

We build on recent research in this area in two ways. In their review of the literature on health and the labor market, Currie and Madrian (1999) note that most prior research focuses on elderly white men – these authors call for more research on health and labor market outcomes that is based on diverse samples. A major strength of the present study is we examine the relationship between disorder and employment for both males and females, and we use a racially and ethnically diverse sample which includes large numbers of Latinos, Asian-Americans, African-Americans, and immigrants. Very little is known about the effects of psychiatric illness on labor market outcomes in these populations. Another notable strength of our data is the inclusion of diagnostic information on psychiatric disorders based on measures that are grounded in psychiatric epidemiology. Compared to symptom checklists and measures of health-related work limitations that are frequently used to measure psychiatric illness in this literature, the use of diagnostic measures reduces the likelihood that respondents' self-reports and thus disorder status is influenced by their employment decisions, health services use, or public program participation.

The second contribution of this paper is we build on prior efforts by Ettner et al. (1997) and others to better understand the nature of the association between psychiatric disorders and labor market outcomes. We do so by modeling the employment outcomes and psychiatric disorder outcomes jointly, using the availability of community treatment resources and early onset of disorder as identifying variables. As a complement to our main findings, we also apply methods recently proposed in Altonji, Elder and Taber (2005) that allow one to gauge the sensitivity of the estimated effect of psychiatric disorders on employment to various degrees of selection on unobserved variables, without relying on any identifying exclusions.

Our results indicate that among males, having a psychiatric disorder in the past 12 months is associated with reduction of 9 to 11 percentage points in the likelihood of current labor force participation and a reduction of about 10 percentage points in the likelihood of employment. These findings are similar to those previously reported by Ettner et al. (1997), who use data from the National Comorbidity Survey and report that having a 12-month psychiatric disorder reduces the likelihood of employment among males by about 11 percentage points. Among females, we also find negative associations between recent disorder and labor force participation and employment. Compared to the findings for males, however, these effects for females are somewhat smaller in magnitude and are less consistent across models.

2.0 Psychiatric illness and labor market outcomes

Although there is a large body of evidence linking measures of physical health and medical conditions to wages, earnings, labor market participation, and other outcomes (see Currie & Madrian, 1999 for a review), much less is known about the impact of psychiatric conditions on labor market outcomes. Relative to other chronic illnesses, psychiatric disorders tend to have early onset in the lifespan, affecting individuals during their most productive working years. Psychiatric disorders may affect employment through several mechanisms. First, the symptoms of psychiatric illness can directly impair an individual's ability to obtain and maintain employment by affecting factors such as mood, energy level, memory, concentration, decisiveness, motivation, and social relations. Second, employers may be reluctant to hire an individual with a history of psychiatric disorders because they are unable or unwilling to make any needed accommodations for an employee with health problems. Third, individuals with psychiatric disorders may face outright discrimination if their symptoms or medical history are known to potential employers. In addition to these direct effects on employment outcomes, all of these issues can indirectly reduce the likelihood of employment by lowering wages and thus lowering the likelihood of labor force participation (Currie & Madrian, 1999; Ettner et al., 1997).[2]

There is a small but growing empirical literature in economics on the effects of psychiatric disorders on human capital outcomes. Some of this work specifically focuses on the contemporaneous association between current psychiatric diagnoses and labor market outcomes such as earnings, employment, and work hours. Frank and Gertler

[2] Although most empirical studies presume a detrimental effect of poor health on labor market participation, Currie & Madrian (1999) note that the effects of health on labor market participation are theoretically ambiguous.

(1991), for example, using data on men from the Baltimore Epidemiologic Catchment Area study, report that mental distress is associated with a 21 percent reduction in earnings. Mental distress in this study is captured by whether or not the individual has at least two of the following three indications of psychiatric disorder – last year DSM-III diagnosis, at least four symptoms of psychiatric distress as measured on the General Health Questionnaire, and at least one self-reported disability day (Frank and Gertler, 1991).

Similarly, Ettner et al. (1997) using the National Comorbidity Study, report that among both men and women, meeting diagnostic criteria for a mental disorder in the past 12 months is associated with a reduction of about 11 percentage points in the probability of being employed. These authors also report some less consistent effects of psychiatric disorders on earnings and hours worked. Alexandre and French (2001), based on data on low-income adults in Miami, find that self-rated depression is associated with adverse labor market outcomes, reducing the probability of being employed by about 19 percentage points and decreasing the number of weeks worked in the past year by 7-8 weeks. Most recently, Chatterji et al., (2007) based on the National Latino and Asian American Study, find that among Latinos, meeting diagnostic criteria for a mental disorder in the past 12 months reduces the likelihood of employment by about 11 percentage points for males, and by about 22 percentage points for females (Chatterji et al., 2007). In addition to these effects on earnings, labor supply, and employment, there also is evidence that current psychiatric disorders are associated with impaired productivity and work absences (Chatterji et al., 2007; Kouzis & Eaton, 1994; Kessler et al., 1999; Kessler & Frank, 1997; Berndt et al., 1998).

There is a related economics literature that focuses specifically on the labor market consequences of substance use. This literature differs from the work described above in that many studies do not use diagnostic measures and, in general, there is much less consistent evidence of negative effects on outcomes. For example, while Terza (2002), utilizing data from the 1988 Alcohol Supplement to the National Health Interview Survey, and MacDonald & Shields (2004), using data from the Health Survey of England, both find that measures of problem drinking are negatively associated with the likelihood of employment, Tekin (2004), using data from the Russian Longitudinal Monitoring Survey (RLMS), finds that alcohol consumption is not associated with employment. Also, many studies report that some forms of moderate drinking are actually associated with higher earnings (Berger & Leigh, 1988; Hamilton and Hamilton, 1997; Barrett (2002); Zarkin et al. (1998); Tekin (2004); van Ours (2004); Auld (2005)).

In the both the mental disorder and substance use literatures, there has been considerable attention to disentangling correlational from causal relationships between mental health/substance problems and labor market outcomes. It is widely recognized that mental health and substance problems may be endogenous, either in a structural sense (e.g., if mental health and labor market outcomes are determined simultaneously, reverse causality is possible) or in a statistical sense (e.g., unobserved heterogeneity). In many studies, researchers have addressed this problem with instrumental variables methods (Ettner et al., 1997, for example), or have estimated the mental disorder/substance use and labor market outcomes equations jointly, using methods that take into account the potential correlation in the error terms of the two equations (Chatterji et al., 2007, for example).

The challenge inherent in both of these strategies is finding a credible identification strategy; practical implementation of either of these methods requires the existence of at least one variable that affects mental disorders/substance use but that is not directly related to labor market outcomes as well. Some examples of identifying variables used in prior work are parental alcohol dependency (Mullahy and Sindelar, 1996) or parental history of mental health problems (Ettner et al., 1997); number of childhood psychiatric disorders (Ettner et al., 1997); long-term non-acute illnesses such as asthma or diabetes (McDonald and Shields, 2004, McCulloch, 2001); religiosity (Alexandre and French, 2001, McDonald and Shields, 2004, McCulloch, 2001, Heien, 1996, Hamilton and Hamilton, 1997); social support (Alexandre and French, 2001, Hamilton et al., 1997); and state-level alcohol and illicit drug policies and prices (Barrett, 2002, DeSimone, 2002).

These identifying variables have been controversial for both conceptual and empirical reasons. In the case of personal characteristics, it is difficult to make a strong theoretical argument that they are exogenous. For example, as Alexandre and French (2001) note when discussing religiosity as an identifying variable, it is possible that religious beliefs directly impact work habits, or that attending religious services is helpful to career networking. In the case of state-level policies, such as state-level alcohol taxes, it is perhaps more conceptually plausible that these variables may be related to disorder (alcohol disorder, for instance) but exogenous and not directly related to individual labor market outcomes. As Dee (1999) and other point out in the context of state alcohol use policies, however, state-level policies may be associated with unobserved state characteristics that are correlated with both disorder and labor market outcomes.[3]

In this paper, we examine the relationship between psychiatric disorder and employment using measures of community-level health resources and the number of disorders with onset during childhood as identifying variables. However, we complement this strategy with a new approach proposed by Altonji et al. (2005) that does not rely on identifying restrictions. These methods are described in further detail below.

3.0 Methodological approach

We begin by estimating the following baseline model (Eq. 1):

$$E = \alpha + P\delta + X\beta + \varepsilon \qquad \text{Equation 1}$$

where E is a binary measure of current employment, α is an intercept, P is a binary measure of recent psychiatric disorder, X is a detailed set of individual demographic, family background, and other characteristics that may affect employment, and ε is an error term. All measures are described in the next section. The coefficient δ represents the contemporaneous association between recent psychiatric disorder and outcomes. This association is contemporaneous in the sense that the model controls for any indirect effects of disorder that may operate through elements of X, such as marital status and educational attainment. Although our primary measure of P is an indicator of any psychiatric disorder in the past 12 months, in alternate models, we replace this single measure with three dichotomous indicators representing the following broad categories of

[3] Including state fixed effects is a potential solution to this problem, but this is not possible with a cross-sectional data set such as the CPES. Moreover, the predictive power of state policies frequently is poor, particularly when state fixed effects are included. This problem is likely to be particularly true in the context of psychiatric disorders, since it is difficult to identify a state-level policy or policy change that would be highly correlated with disorder at the individual level.

psychiatric illness: any affective disorder in the past 12 months; any anxiety disorder in the past 12 months; and any substance disorder in the past 12 months.

We initially estimate Equation 1 using a probit model, accounting for the complex survey design. This standard approach does not account for the possibility that psychiatric disorders may be associated with difficult-to-measure factors that also detract from labor market outcomes, such as stressful life events, family problems, or low ability. Using this baseline model, we address this problem in two ways. First, in addition to estimating Equation 1 using full samples of males and females, we also estimate this baseline model with samples that are limited to males with a lifetime history of any psychiatric illness and females with a lifetime history of any psychiatric illness. Limiting the samples to respondents with a lifetime diagnosis of at least one disorder reduces heterogeneity (since all individuals in the sample have experienced psychiatric illness in the past) and effectively limits our attention to the effect of onset of recent disorder, or a recurrence of illness, on current employment. Second, we use these baseline models to examine the degree of selection on observed characteristics by estimating models with a smaller and a larger set of covariates, and gauging how the addition of covariates affects the estimated coefficient on psychiatric disorder. Comparing estimates based on the full samples vs. the samples limited to respondents with lifetime disorder also is useful in gauging the importance of selection on observed characteristics.

Despite the inclusion of a detailed set of covariates, and utilization of samples limited to those with lifetime illness, the observed correlation between psychiatric disorder and employment still may be influenced by selection bias. Accounting for selection bias empirically is likely to reduce the magnitude of the effect because most important unobserved factors, such as stressful life events, adverse childhood circumstances, and low ability, are likely to be positively correlated with psychiatric disorder and negatively correlated with employment. Therefore, the estimated coefficients on psychiatric disorder from the probit models that ignore endogeneity may be considered baseline estimates of the impact of psychiatric disorder on employment. In these baseline models, we implicitly assume that any unmeasured factors that are correlated with having a recent psychiatric disorder are unrelated to current employment.

One approach to empirically addressing the problem of correlated unobserved variables is to model this correlation explicitly using a full information maximum likelihood strategy. Since both the employment outcome and psychiatric disorder variables are binary, we use a bivariate probit model (Equations 2-3). We take into account the complex survey design when estimating the bivariate probit model.

$$E = \alpha + P\delta + X\beta + \varepsilon \qquad \text{Equation 2}$$

$$P = \theta + X\beta + Z_i\xi + \upsilon \qquad \text{Equation 3}$$

The bivariate probit model assumes that the disturbance terms in equations (2) and (3) are jointly normally distributed, and the equations are estimated simultaneously using maximum likelihood. We use measures of local treatment access (e.g. physician density, quality of hospitals, and the availability of a local mental health clinic) as well as the number of disorders with onset during childhood as identifying variables. These variables, described further in the next section, are included in the psychiatric disorders equation but are excluded from the employment equation. As a specification check, we also estimate the bivariate probit models with county level poverty and unemployment rates included in both equations. These findings were qualitatively similar to those presented in the paper and are available upon request.

Conceptually, we argue that access to mental health services may reduce the number of psychiatric symptoms individuals experience and thus may reduce the likelihood of meeting clinical criteria for disorder. Given the racial/ethnic diversity of our sample, the proven effectiveness of psychiatric treatments for minority populations (Miranda et al, 2003; Wells et al, 2000), and the well-documented low rates of mental health services utilization among minorities (Stockdale, Tang, Zhang et al., 2007; Alegria et al., 2006; Abe-Kim et al., 2006), we hypothesize that availability of services in a community may make a difference and reduce the likelihood of disorder in our sample.[4] This is particularly true for our samples that are limited to respondents with lifetime disorder. Since psychiatric disorders tend to be chronic and often require lifetime maintenance treatment, having access to such treatment in the community would be expected to reduce the likelihood of having a recent recurrence among respondents with a lifetime history of disorder. Following Ettner et al. (1997), we also include the number of disorders with onset during childhood as an identifying variable. Onset of disorder before adulthood is likely to be highly correlated with recent disorder as an adult, but it is unlikely to directly affect adult work outcomes, as long as the model includes controls for education, marital status, and other possible mediating variables.

As a complement to our main approach, we also implement a method proposed by Altonji et al. (2005) that does not rely on identifying exclusions but that does allow an evaluation of how sensitive the psychiatric disorder estimates are to correlations between

[4] Since minorities and immigrants have low rates of utilization of services, the marginal impact of additional services on psychiatric disorders may be particularly large for these groups.

unobserved factors. Altonji et al. propose an approach to the problem of questionable identifying variables that is based on constrained bivariate probit models.[5] The method is based on estimation of a bivariate probit model without any identifying restrictions but with a constrained correlation coefficient, ρ. In the present study, ρ is set at -0.10 initially and then the absolute value of ρ is increased in increments of 0.10 to -0.20, -0.30, and -0.40. In this way, increasingly stronger, negative correlation between the unobservables is imposed on the model, which allows one to examine whether or not the effect of psychiatric disorder on employment is robust to such changes. This analysis can uncover the threshold of selection on unobservables, if any, at which psychiatric disorder no longer has a statistically significant effect on employment. The correlation between the unobserved determinants of psychiatric disorder and employment is constrained to negative, rather than positive, values based on prior research on risk factors for psychiatric illness.[6]

Altonji et al. (2005) argue that if the observable determinants of an outcome are truly just a random sub-set of the complete set of determinants, selection on observable characteristics must be equal to selection on unobservable characteristics. Altonji et al. (2005) show that this condition implies:

$$\mathrm{cov}(E^*, X'\gamma)/\mathrm{var}(X'\gamma) = \mathrm{cov}(E^*, \varepsilon)/\mathrm{var}(\varepsilon), \quad \text{Equation 4}$$

where E* is an unobserved, continuous measure of the net benefits from

[5] Grossman, Kaestner, and Markowitz (2002) use this approach to study the relationship between adolescent alcohol use and sexual behavior. Altonji et al. (2008) use this approach to examine whether Swan-Ganz catheterization affects mortality in intensive care patients.

[6] For example, the 1999 Surgeon General's report on mental health states that some of the individual-level risk factors for psychiatric illness include neurophysiological deficits, difficult temperament, chronic physical illness, and lower than average intelligence. These factors all would be expected to reduce the likelihood of employment

employment, $X'\gamma$ is the vector of observed variables that affect E* weighted by their corresponding coefficients, and ε is the unobserved determinants of variables that affect E* weighted by their relevant coefficients. In words, imposing Equation 4 on the bivariate probit model means that the data collected in a survey are no more relevant to the outcome being studied than the data that were not collected. We show bivariate probit estimates with this condition imposed, as a supplement to our main findings.

This paper uses a highly specialized survey that was designed to study the prevalence and correlates of psychiatric disorders. It seems very unlikely, therefore, that selection on observable factors is equal to selection on unobservable factors in this case; on the contrary, one would expect that selection on observable factors would be more important than selection on unobservable factors. Therefore, this estimate obtained under the assumption that selection on unobservable variables is equal to selection on observables is considered to be conservative. This estimate can be compared to the baseline estimate, which is the estimate from the single equation probit model which assumes no selection on unobservable variables. Although one can never know for certain the degree of selection on unobserved variables, this approach demonstrates how sensitive the baseline estimates are to a relatively stringent assumption about the degree of selection on unobserved variables. As Altonji et al. emphasize, estimates generated from this approach are a useful complement for standard analyses, and are not intended to replace standard analyses (Altonji et al., 2005).

4.0 The CPES Data

The CPES Combined Sample

The University of Michigan Survey Research Center (SRC) collected data for the National Latino and Asian American Study (NLAAS; Alegria et al., 2004), the National Comorbidity Survey Replication (NCS-R; Kessler & Merikangas, 2004) and the National Survey of African American Life (NSAL; Jackson et al., 2004) known as CPES studies using an adaptation of a multiple-frame approach to estimation and inference for population characteristics (Hartley 1962, 1974). This allows integration of design-based analysis weights to combine datasets as though they were a single, nationally-representative study (NIMH, 2007). Design and methodological information can be found at the CPES website (https://www.icpsr.umich.edu/CPES/index.html).

The CPES studies all focused on collection of epidemiological information on mental disorders and service usage among the general population with special emphasis on minority groups (Colpe et al., 2004). Interviews for the studies were conducted by professional interviewers from the SRC. As described in detail elsewhere (Heeringa et al., 2004), the NLAAS is a nationally-representative survey of household residents [18 and older] in the non-institutionalized Latino and Asian populations of the coterminous United States. The final sample included 2,554 Latinos and 2,095 Asian Americans. The weighted response rates were: 73.2% for the total sample; 75.5% for the Latinos; and 65.6% for the Asians (Alegria et al., 2004).

The NCS-R is a nationally representative sample with a response rate of 70.9%. Eligible respondents were English-speaking, non-institutionalized adults ages 18 or older living in civilian housing in the coterminous United States. The NCS-R was administered in two parts: [1] Part I was administered to all respondents that included core diagnostic assessments; [2] a subset of Part I respondents also completed Part II of the survey which included additional batteries of questions addressing service use, consequences, other correlates of psychiatric illness and additional disorders, with measures identical to those in the NLAAS. The NSAL is also a nationally-representative survey of household residents in the non-institutionalized Black population that included 3,570 African Americans and 1,621 Black respondents of Caribbean descent. The NSAL had a response rate of 70.9% for the African American sample (Neighbors et al., 2007).

Analytic Samples and Measures

In the present study, we use a pooled NLAAS/NCS-R /NSAL sample which includes Asians and Latinos from the NLAAS, non-Latino whites from the NCS-R Part II, and African-Americans from the NSAL. Race/ethnicity categories were based on respondents' self-reports to questions based on U.S. Census categories. Of the 13,837 respondents in this sample, we excluded from the sample persons over 65 years old (n = 1,474), respondents with missing psychiatric disorder information (n = 179), and those with missing outcome information (n = 1206), leaving us with an analytic sample of 11,813 respondents (6,824 females and 4,989 males).[7]

We use two measures of current employment status: in labor force - a binary indicator of whether the employment is in the labor force (either employed or unemployed vs. neither); and employed - a binary indicator of whether the respondent is currently employed for pay, either full-time or part-time. These indicators were created from a question about the respondent's current work situation, as of the day of the survey.

In the NLAAS, NSAL and NCS-R, the presence of lifetime, 12-month psychiatric disorders and subthreshold depressive disorder or minor depressive disorder

[7] Note that there are some respondents who have missing values for more than one of these categories. For this reason, the sum of the categories is greater than the total number of respondents excluded from the sample.

was evaluated via the World Health Organization Composite International Diagnostic Interview (WMH-CIDI) (Kessler & Ustun, 2004). Diagnoses are based on DSM-IV diagnostic systems. Findings of the instrument show good concordance between DSM-IV diagnoses based on the WMH-CIDI and the SCID (Haro et al., 2006). Our main covariate of interest is a dummy variable indicating whether or not the respondent meets DSMIV diagnostic criteria for any mental disorders in the past year. Any psychiatric disorder includes the following fourteen diagnoses: (1) major depression; (2) dysthymia; (3) agoraphobia; (4) generalized anxiety disorder (GAD); (5) panic attack; (6) panic disorder; (7) social phobia; (8) alcohol abuse; (9) alcohol dependence; (10) illicit drug abuse; (11) illicit drug dependence; (12) post-traumatic stress disorder; (13) anorexia; and (14) bulimia. We also consider an alternate set of models which, in place of the any disorder measure, include three dichotomous indicators of any affective disorder (major depression or dysthymia) in the past 12 months, any anxiety disorder (agoraphobia, social phobia, generalized anxiety disorder, panic disorder) in the past 12 months, and any substance disorder (alcohol abuse or dependence, drug abuse or dependence) in the past 12 months.

We begin with models that only include controls for age and region (Midwest, South, West, with Northeast as the reference category). We then estimate more fully specified models that additionally include controls for: marital status (married, widowed/divorced/separated with single as the baseline); education (12 years, 13-15 years, 16+ years with less than 12 years as the baseline); number of living biological children, region; US citizen; nativity (immigrant); and indicators for lifetime chronic illness (dichotomous indicators for asthma, diabetes, cardiovascular disease, ulcers, cancer). The standard bivariate probit models include the full list of covariates above and are identified by: (1) whether there was at least one community mental health clinic in 2002 located in the respondent's county of residence; (2) the number of primary care physicians (MDs/DOs) per 100,000 residents in 2001 in the respondent's county of residence; (3) number of hospitals with residency training and medical school affiliation per 100,000 residents in 2000 in the respondent's county of residence; and (4) continuous measure of the number of psychiatric disorders with onset prior to age 18. The number of childhood onset disorders variable was constructed based on information available in the CPES regarding the age of onset of each adult disorder. The medical resource variables were obtained from the 2004 Area Resource File and merged into the CPES data by respondents' counties of residence through a restricted data use agreement with the Inter-University Consortium for Political and Social Research (ICPSR).

5.0 Results: Effects of psychiatric disorders on employment

Tables 1 and 2 show weighted descriptive statistics by recent mental disorder status for the full samples (all males, all females) and for the samples limited to respondents with lifetime disorder (males with lifetime disorder, females with lifetime disorder). Among all males, 87 percent are currently in the labor force, 84 percent are currently employed, and 18 percent meet diagnostic criteria for at least one psychiatric disorder in the past 12 months (Table 1). These rates are 82 percent, 79 percent, and 47 percent respectively for males with lifetime disorder (Table 1). Among females, 78 percent are in the labor force, 71 percent are employed, and 24 percent have experienced a psychiatric disorder in the past 12 months (Table 2). Among females with lifetime disorder, these rates are 77 percent, 70 percent, and 56 percent respectively (Table 2).

Tables 1 and 2 show the appreciable differences in observed characteristics between those with and without a recent psychiatric disorder. Males with a recent disorder are less likely than males without a recent disorder to be in the labor force (77 percent vs. 90 percent) and employed (73 percent versus 86 percent), and they are more likely than males without a recent disorder to be US born, non-Latino white, and divorced or widowed. These differences exist among females as well – females with a recent mental disorder have labor force participation and employment rates that are 3 to 4 percentage points lower than the rates for females without a recent mental disorder. Among both males and females, those with a recent psychiatric disorder are more likely than those without a recent disorder to have chronic health conditions, lower levels of education, a childhood history of mental disorders, and current smoking. In the male and female samples that are limited to those with lifetime disorder, these observable differences by recent psychiatric disorder status generally become less striking. In the lifetime disorder samples, those with and without a recent mental disorder appear to be more comparable, compared to the differences by recent disorder that we observe in the full samples.

Table 3 summarizes findings from baseline probit models of labor force participation and employment. For each of these two outcomes, we examine the degree of selection on observable characteristics by successively estimating models with no controls, demographic controls only (race, age, region), and a full set of controls (race, age, region, education, family structure, US citizen, immigrant, smoker, chronic physical illnesses). For males and females, we estimate each model with a full sample and with a sample limited to those with a lifetime history of psychiatric illness. Table 3 shows the estimated coefficient for the recent mental disorder indicator only, with each cell representing a different model.

In the male samples, recent psychiatric disorder is associated with reductions of 9 to 12 percentage points in the likelihood of current labor force participation, and reductions of 10 to 14 percentage points in the likelihood of current employment (Table 3, Panel A). These effects correspond to about 10 to 14 percent reductions in the likelihood of labor force participation, and 12 to 17 percent reductions in the likelihood of employment, evaluated at the sample means for males. Overall, there appears to be relatively low levels of selection on observable characteristics. The magnitudes of the effects in models with no controls added are similar to the magnitudes when a full set of controls is included. For example, recent disorder is associated with a 10.5 percentage point reduction in labor force participation when no controls are included in the model, and a 9.1 percentage point reduction when a full set of controls is included in the model. In addition, when the models are estimated on the sample of males with lifetime disorder, the results are somewhat smaller in magnitude but still statistically significant and similar to those from the full sample of males.

Similarly, in the female samples, having a recent psychiatric disorder is associated with reductions in the probability of current labor force participation and employment. These results persist across all specifications, as well as across the two female samples (all females, females with lifetime disorder). In the full sample of females, recent psychiatric disorder is associated with 4 to 7 percentage point reductions in the likelihoods of both labor force participation and employment.

Appendix Table 1 shows findings from the fully specified baseline probit models for males and females, but in these models we examine the effects of three classes of disorders – anxiety disorders, affective disorders (e.g., major depression), and substance disorders. These models replace the single indicator of "any disorder" with three dichotomous indicators of whether the respondent met 12-month criteria for each of these classes of disorders. In the two male samples, we observe that both anxiety and depressive disorders detract from labor market outcomes, but substance disorder is not associated with employment and labor force participation. The lack of a detrimental effect of substance use on employment is surprising, and inconsistent with Ettner et al., Mullahy & Sindelar (1996) and others. Among women, only depressive disorders are negatively associated with employment and labor force participation. Ettner et al. report similar findings for women, although they find agoraphobia and drug dependence (which are specific disorders within the anxiety and substance classes) are negatively associated with employment for females.

Table 4 shows results from bivariate probit models, which estimate the labor force participation/employment and psychiatric disorder equations jointly. Panel A shows findings for males while Panel B shows findings for females. The first column of Table 5 shows the univariate probit coefficient on psychiatric disorder from Table 3, reproduced here for comparison purposes. The second column shows the estimated coefficient on recent psychiatric disorder from a bivariate probit model identified by two variables – community health resources and the number of early onset disorders. The third column shows the same model, but identified this time by only the number of early onset variable. The subsequent three columns show results from the same models estimated using the lifetime disorder sample.

For males, the bivariate probit model results are very consistent with the univariate probit results. Regardless of which identification strategy is used, results based on the full male sample indicate that recent psychiatric disorder is associated with a statistically significant, 11 percentage point reduction in the probability of labor force participation and a statistically significant, 10 percentage point reduction in the probability of employment. The same models estimated using the males with lifetime disorder sample are qualitatively very similar, but precision is lost in the bivariate probit models. In the bivariate probit models, the estimated correlation between the disturbances in the two equations is positive in all but one case, small in magnitude, and not statistically significant at conventional levels.

As a group, the identifying variables appear to perform adequately in both male samples. Although the estimated coefficients on the community health resource variables are not consistent in sign or statistical significance across models, the number of early onset disorders measure is an excellent predictor of recent psychiatric disorder, with a *t*-statistic ranging from 7 to 12 depending on the model. We informally test the validity of the identifying restrictions by including the community health resources and number of early onset disorders measures in both the labor market and recent disorder equations. These variables are not statistically significant predictors of labor force participation or employment in any of the models. Thus, in the male samples, it appears that the identifying variables are appropriately left out of the employment and labor force participation equations.

Among females, the bivariate probit models indicate that recent psychiatric disorder is associated with a negative, but not statistically significant effect on labor force participation and employment. As was the case for males, the estimated rho is not statistically significant, indicating that there is no advantage of estimating the equations jointly. When we included the identifying variables in both equations, these variables are never statistically significant predictors of employment. However, in the labor force participation models, the number of early onset disorders and the existence of a local mental health clinic are statistically significant predictors of labor force participation in one case each. We note that including the mental health clinic variable in both models does not appreciably change our results. Nevertheless, this informal test casts some doubt on whether our identifying assumptions are appropriate for the female sample.

Table 5 shows results from the empirical strategy proposed by Altonji et al., which does not rely on identifying assumptions that may be problematic. The first column reproduces the standard univariate probit findings from Table 3, which we consider to be our upper bound estimate of the true effect. The subsequent columns show estimates of the effect of recent disorder on labor force participation and employment from bivariate probit models without any identifying exclusions restrictions (that is, the same set of covariates is included in both equations) but with the correlation between the error terms in the two equations set at increasingly stronger, negative levels, ranging from -.10 to -.40 (Table 6, Columns 2-5). Finally, the bivariate probit model is estimated without identifying restrictions but subject to the stringent condition regarding selection on unobserved factors proposed by Altonji et al – selection on unobservables is set equal to selection on observables. This estimate informally can be considered to be a lower bound estimate of the true effect of psychiatric disorder on these labor market outcomes (Altonji et al., 2005).

In all four samples, we see that the estimates are sensitive to strong levels of correlation between unmeasured factors that we impose on the model. In both male samples, the negative effect of psychiatric disorder on labor market participation and employment persists until the correlation is set at -0.3. In the female samples, the effect dissipates at or after a correlation of -0.1 is imposed. It is difficult, however, to intuitively interpret these imposed correlations on the model and assess whether they are realistic levels of correlation.

In Column (6), we show estimates in which selection into recent disorder along observables is set equal to the degree of selection on unobservable factors; intuitively, this represents the stringent case in which the data we have collected is no more helpful in reducing bias in a univariate probit that the data that were not collected (Altonji et al., 2005). Among males, the negative effects of recent disorder on labor force participation and employment persist when this condition is imposed. These effects are small and statistically insignificant in the all males sample, but in the male sample limited to those with lifetime disorder, we see statistically significant effects that are very similar in magnitude to standard probit and bivariate probit results.

Among females, when this condition regarding selection is imposed, we find statistically significant effects of recent disorder on both labor force participation and employment. The magnitude of these effects is larger than those in the standard probit and bivariate probit models. Imposing a stringent level of selection on the model appears to make the association between disorder and labor market outcomes stronger. This finding is unexpected, if we expect that unmeasured factors that are positively related to psychiatric disorder (e.g., stressful life events) are likely to be negatively related to employment. In addition, this finding for females differs from the case of males, where we saw similar or smaller effects of psychiatric disorder on employment when a stringent assumption about selection is imposed on the model.

6.0 Conclusions

This study demonstrates that psychiatric disorders detract significantly from labor force participation and employment. Among males, we find consistent evidence that recent disorder is associated with 9 to 11 percentage point reductions in employment and labor force participation (depending on the model). These findings persist across: various specifications; estimation with both the full and lifetime disorder samples; alternative identifying assumptions; and a strong assumption regarding selection that is imposed on the model. The magnitude of the effect that we find for males is very close to the 11 percentage point reduction in employment that Ettner et al. report for males based on the National Cormorbidity Survey (NCS). It is interesting that the size of the effect is similar across the present study and Ettner et al., given that the NCS was conducted about ten years prior to the CPES and did not include the large samples of racial/ethnic minorities and immigrants that the CPES data include. The findings that substance disorders appear to have limited impact on labor market burden is not consistent with prior research and might be related to the way the CIDI appears to underestimate the prevalence of substance disorders (Grant et al., 2007) and/or the social desirability of self-reporting substance use in a face to face interview.

Compared to our results for males, our findings based on the female samples are less consistent. The baseline results show a negative association between recent disorder and labor market outcomes. The magnitudes of the associations, however, are smaller than those for males, our identifying assumptions were potentially problematic in the labor force participation models, and the relationships are not statistically significant in the bivariate probit models. Also, the strength and magnitude of the association for females becomes stronger when a stringent assumption regarding selection is imposed on the model, which is inconsistent with the findings for males. It is likely that compared to males, female labor force participation and employment decisions are more complex in terms of the unmeasured factors that come into play, since difficult-to-measure family responsibilities and cultural beliefs are likely to be important. In addition, occupation may play a role in explaining these differences by gender. Although we have limited information on occupation, females may be more likely than males to work in the informal sector (e.g., babysitting, housekeeping) and in the service sector, particularly in the immigrant and racial/ethnic minority groups represented in the CPES. It is possible that these types of jobs allow for intermittent work or some more flexibility and latitude in dealing with the symptoms of a psychiatric illness.

Overall, these findings highlight just a portion of the appreciable labor market burden of psychiatric illness. It is likely that in addition to employment outcomes, psychiatric conditions also have direct, negative effects on other labor market outcomes such as earnings, absenteeism, job mobility, and work performance. Future research should consider these outcomes, as well as potential indirect effects of psychiatric disorder that may operate through education and work experience.

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Table 1: Weighted Means by Recent Psychiatric Disorder - Male Samples

	I. Males (n = 4,989)			I. Males with lifetime disorder (n = 1,840)		
	All (n = 4,989)	Recent disorder (n = 876)	No recent disorder (n = 4,113)	All (n = 1,840)	Recent disorder (n = 876)	No recent disorder (n = 964)
Employment outcomes						
In labor force	0.87	0.77	0.90***	0.82	0.77	0.86***
Employed	0.84	0.73	0.86***	0.79	0.73	0.84***
Psychiatric disorders						
Any disorder in past 12 months	0.18	1.00	0.00	0.47	1.00	0.00
Affective disorder in past 12 months	0.07	0.40	0.00	0.28	0.40	0.00
Anxiety disorder in past 12 months	0.11	0.61	0.00	0.19	0.61	0.00
Substance disorder in past 12 months	0.06	0.32	0.00	0.15	0.32	0.00
Any lifetime disorder	0.39	1.00	0.251	1.00	1.00	1.00
Number of disorders with onset prior to age 18	0.37	1.31	0.16***	0.95	1.31	0.63***
Chronic physical illnesses						
Arthritis	0.17	0.21	0.16***	0.21	0.21	0.21
Stroke	0.02	0.03	0.01***	0.02	0.03	0.01**
Heart attack	0.03	0.06	0.03***	0.05	0.06	0.04
Diabetes	0.06	0.06	0.06	0.06	0.06	0.06
Ulcer	0.09	0.14	0.08***	0.12	0.14	0.11
Cancer	0.03	0.02	0.03	0.03	0.02	0.04
Demographic and SES Characteristics						
Latino	0.14	0.12	0.15**	0.11	0.12	0.10
African-American	0.12	0.09	0.12***	0.10	0.09	0.10
Asian	0.04	0.02	0.05***	0.02	0.02	0.02
Caribbean	0.01	0.01	0.01	0.01	0.01	0.01
US Citizen	0.92	0.96	0.91***	0.096	0.96	0.96
Immigrant	0.14	0.09	0.16***	0.08	0.09	0.07

Age	39.8 (.407)	37.2 (0.579)	40.4*** (0.460)	40.0 (.417)	37.2 (0.579)	42.4*** (.548)
Midwest	0.24	0.27	0.24	0.27	0.27	0.27
South	0.32	0.26	0.33***	0.27	0.26	0.29
West	0.24	0.25	0.24	0.26	0.25	0.25
Married	0.63	0.46	0.67***	0.55	0.46	0.64***
Divorced or widowed	0.24	0.36	0.22***	0.26	0.36	0.18***
Number of children	1.59 (0.036)	1.29 (0.066)	1.65*** (0.036)	1.52 (0.06)	1.29 (0.066)	1.71*** (0.062)
12 years of education	0.32	0.35	0.31	0.33	0.35	0.30
13-15 years of education	0.27	0.26	0.27	0.27	0.26	0.29
16+ years of education	0.25	0.20	0.26***	0.22	0.20	0.25*
Smoker	0.30	0.45	0.27***	0.40	0.45	0.36***
Community Health Resources						
At least 1 MH clinic in county	0.46	0.45	0.46	0.433	0.45	0.42
# PCPs per 100,000 in county	10.9 (0.23)	11.2 (0.27)	10.9 (0.23)	11.1 (0.28)	11.2 (0.27)	11.0 (0.33)
# hospitals w/ residency prog. per 100,000	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)
# hospitals w/med school affil. per 100,000	0.05 (0.01)	0.05 (0.02)	0.04 (0.01)	0.05 (0.02)	0.05 (0.02)	0.05 (0.01)

Notes: All statistics shown are adjusted for complex survey design. * indicates difference by psychiatric disorder status is statistically significant at the .10 level; ** indicates difference by psychiatric disorder status is statistically significant at the .05 level; *** indicates difference by psychiatric disorder status is statistically significant at the .01 level

Table 2: Weighted Means by Recent Psychiatric Disorder - Female Samples

	I. Females (n = 6,824)			I. Females with lifetime disorder (n = 2,718)		
	All (n = 6,824)	Recent disorder (n = 1,573)	No recent disorder (n = 5,251)	All (n = 2,718)	Recent disorder (n = 1,145)	No recent disorder (n = 1,573)
Employment outcomes						
In labor force	0.78	0.75	0.79**	0.77	0.75	0.80***
Employed	0.71	0.68	0.71*	0.70	0.68	0.74***
Psychiatric disorders						
Any disorder in past 12 months	0.24	1.00	0.00	0.56	1.00	0.00
Affective disorder in past 12 months	0.12	0.49	0.00	0.27	0.49	0.00
Anxiety disorder in past 12 months	0.17	0.72	0.00	0.40	0.72	0.00
Substance disorder in past 12 months	0.02	0.10	0.00	0.06	0.10	0.00
Any lifetime disorder		1.00	0.247	1.00	1.00	1.00
Number of disorders with onset prior to age 18	0.41	1.22	0.15***	0.95	1.22	0.62***
Chronic physical illnesses						
Arthritis	0.24	0.28	0.23***	0.27	0.28	0.27
Stroke	0.02	0.03	0.01***	0.02	0.03	0.01*
Heart attack	0.02	0.03	0.01***	0.02	0.03	0.01**
Diabetes	0.06	0.06	0.06	0.06	0.06	0.06
Ulcer	0.09	0.16	0.07***	0.14	0.16	0.11***
Cancer	0.05	0.07	0.05*	0.06	0.07	0.06
Demographic and SES Characteristics						
Latino	.12	0.09	0.13***	0.09	0.09	0.09
African-American	.13	0.11	0.14***	0.11	0.11	0.11
Asian	.05	0.02	0.05***	0.02	0.02	0.02
Caribbean	.01	0.00	0.01***	0.01	0.00	0.00
US Citizen	.93	0.96	0.92***	0.96	0.96	0.96
Immigrant	.14	0.09	0.15***	0.08	0.09	0.08
Age	40.7	38.5	41.4***	40.34	38.5	42.7***

	(.43)	(0.43)	(0.51)	(0.35)	(0.43)	(0.42)
Midwest	0.23	0.23	0.23	0.24	0.23	0.25
South	0.34	0.33	0.34	0.32	0.33	0.29
West	0.24	0.22	0.24	0.25	0.22	0.27
Married	0.60	0.49	0.63	0.55	0.49	0.61
Divorced or widowed	0.21	0.24	0.20	0.21	0.24	0.18
Number of children	1.81 (0.04)	1.62 (0.05)	1.88 (0.05)	1.73 (.04)	1.62 (0.05)	1.88 (0.62)
12 years of education	0.29	0.28	0.30	0.29	0.28	0.30
13-15 years of education	0.30	0.31	0.30	0.31	0.31	0.30
16+ years of education	0.26	0.24	0.27	0.26	0.24	0.28
Smoker	0.24	0.34	0.20	0.32	0.34	0.28
Community Health Resources						
At least 1 MH clinic in county	0.45	0.45	0.44	0.42	0.44	0.41
# PCPs per 100,000 in county	10.9 (0.24)	11.0 (0.23)	11.0 (0.31)	11.0 (0.27)	11.0 (0.27)	11.0 (0.33)
# hospitals w/ residency prog. per 100,000	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)
# hospitals w/med school affil. per 100,000	0.04 (0.01)	0.05 (0.01)	0.04 (0.01)	0.04 (0.01)	0.05 (0.02)	0.05 (0.01)

Notes: All statistics shown are adjusted for complex survey design. * indicates difference by psychiatric disorder status is statistically significant at the .10 level; ** indicates difference by psychiatric disorder status is statistically significant at the .05 level; *** indicates difference by psychiatric disorder status is statistically significant at the .01 level

Table 3: Baseline Probit Models – Male and Female Samples						
Coeff on Recent Disorder (T-stat) [Marginal effect]	(1) No controls	(2) Race, age, region	(3) Column (2) plus education, family structure, citizen, immigrant, smoker, chronic physical illness	(4) No controls	(5) Race, age, region	(6) Column (4) plus education, family structure, citizen, immigrant, smoker, chronic physical illness
	Panel A: Male Samples					
	I. All males (N = 4,989)			II. Males with lifetime disorder (N=1,840)		
In labor force	-0.518 (-7.28) [-0.105]	-0.602 (-8.53) [-0.130]	-0.439 (-6.05) [-0.091]	-0.332 (-4.12) [-0.079]	-0.439 (-5.11) [-0.09]	-0.319 (-3.30) [-0.073]
Employed	-0.462 (-6.74) [-0.112]	-0.562 (-8.09) [-0.143]	-0.397 (-5.75) [-0.099]	-0.359 (-4.59) [-0.094]	-0.459 (-5.45) [-0.127]	-0.346 (-3.76) [-0.090]
Panel B: Female Samples						
	I. All females (N = 6,824)			II. Females with lifetime disorder (N = 2,718)		
In labor force	-0.130 (-2.31) [-0.039]	-0.213 (-3.37) [-0.065]	-0.154 (-2.51) [-0.046]	-0.196 (-3.84) [-0.056]	-0.289 (-4.44) [-0.086]	-0.215 (-2.94) [-0.061]
Employed	-0.102 (-1.72) [-0.035]	-0.188 (-3.27) [-0.066]	-0.147 (-2.71) [-0.051]	-0.163 (-2.82) [-0.054]	-0.240 (-3.76) [-0.084]	-0.179 (-2.63) [-0.061]

Notes: Table shows coefficient, T-statistic (in parentheses), and marginal effect (in brackets) for the recent mental disorder measure only – other coefficients not shown. Each cell in the tables comes from a separate model. Results generated from probit models that take into account the complex survey design.

Table 4: Standard Bivariate Probit Models – Male and Female Samples						
Panel A	**I. All males (N = 4,989)**			**II. Males with lifetime disorder (N = 1,840)**		
Coeff on Recent Disorder (T-stat) [Marginal effect] Rho (SE)	(1) Univariate probit (duplicated from Table 3, Col 3)	(2) Identified by: Community health resources and number of early onset disorders	(3) Identified by: Number of early onset disorders only	(4) Univariate probit (duplicated from Table 3, Col 6)	(5) Identified by: Community health resources and number of early onset disorders	(6) Identified by: Number of early onset disorders only
In labor force	-0.439 (-6.05) [-0.091]	-0.519 (-3.40) [-0.108] 0.057 (0.099)	-0.529 (-3.50) [-0.110] 0.063 (0.099)	-0.319 (-3.30) [-0.073]	-0.490 (-1.11) [-0.109] 0.113 (0.282)	-0.504 (-1.15) [-0.111] 0.122 (0.284)
Employed	-0.397 (-5.75) [-0.099]	-0.406 (-2.98) [-0.101] -0.006 (0.093)	-0.416 (-3.09) [-0.104] 0.013 (0.093)	-0.346 (-3.76) [-0.090]	-0.485 (-1.19) [-0.123] 0.091 (0.263)	-0.470 (-1.18) [-0.120] 0.083 (0.260)
Panel B	**I. All females (N = 6,824)**			**II. Females with lifetime disorder (N = 2,718)**		
In labor force	-0.154 (-2.51) [-0.046]	-0.217 (-1.50) [-0.065] 0.045 (0.089)	-0.211 (-1.49) [-0.063] 0.042 (0.087)	-0.215 (-2.94) [-0.061]	-0.563 (-1.23) [-0.146] 0.228 (0.295)	-0.424 (-0.910) [-0.113] 0.141 (0.294)
Employed	-0.147 (-2.71) [-0.051]	-0.136 (-1.14) [-0.047] -0.008 (0.080)	-0.137 (-1.20) [-0.048] -0.008 (0.077)	-0.179 (-2.63) [-0.061]	-0.147 (-0.360) [-0.050] -0.021 (0.263)	-0.089 (-0.230) [-0.031] -0.056 (0.252)

Notes: Table shows coefficient, T-statistic (in parentheses), marginal effect (in brackets) for the recent mental disorder measure only – other coefficients not shown. Estimated rho and p-value in parentheses are shown. Each cell in the tables comes from a separate model. Results generated from probit and bivariate probit models adjusted for complex survey design. Employment and psychiatric disorder equations both include controls for race, age, region, education, family structure, citizen, immigrant, smoker, chronic physical illness. Psychiatric disorder equation also includes identifying variables as indicated in the table.

Table 5: Constrained Bivariate Probit Models – Male and Female Samples						
	Panel A: Male Samples					
	I. All males (n = 4,989)					
Coeff on Disorder (SE) [Marginal effect]	(1) ρ = 0 (Duplicated from Table 3)	(2) ρ = -.1	(3) ρ = -.2	(4) ρ = -.3	(5) ρ = -.4	(6) ρ set such that selection on observables = selection on unobservables
In labor force	-0.439 (-6.05) [-0.091]	-0.263 (-3.64) [-0.055]	-0.088 (-1.23) [-0.018]	0.086 (1.22) [0.018]	0.260 (3.79) [0.056]	-0.120 (-1.64) [-0.025]
Employed	-0.397 (-5.75) [-0.099]	-0.221 (-3.21) [-0.055]	-0.046 (-0.670) [-0.011]	0.129 (1.93) [0.033]	0.303 (4.65) [0.077]	-0.055 (-0.800) [-0.014]
	II. Males with lifetime disorder (n = 1,840)					
In labor force	-0.319 (-3.30) [-0.073]	-0.155 (-1.61) [-0.037]	-0.010 (0.100) [0.003]	0.177 (1.88) [0.047]	0.346 (3.75) [0.096]	-0.510 (-5.30) [-0.112]
Employed	-0.346 (-3.76) [-0.090]	-0.182 (-1.99) [-0.049]	-0.017 (-0.180) [-0.005]	0.150 (1.68) [0.044]	0.319 (3.65) [0.098]	-0.540 (-5.90) [-0.136]
	Panel B: Female Samples					
	I. All females (n = 6,824)					
In labor force	-0.154 (-2.51) [-0.046]	0.017 (0.029) [0.005]	0.187 (3.12) [0.057]	0.357 (6.04) [0.110]	0.524 (9.12) [0.164]	-0.253 (-4.14) [-0.076]
Employed	-0.147 (-2.71) [-0.051]	0.025 (1.47) [0.009]	0.196 (3.69) [0.069]	0.366 (7.02) [0.130]	0.534 (10.53) [0.191]	-0.389 (-7.19) [-0.135]
II. Females with lifetime disorder (n = 2,718)						
In labor force	-0.215 (-2.94) [-0.061]	-0.051 (-0.710) [-0.015]	0.113 (1.56) [0.035]	0.279 (3.92) [0.090]	0.447 (6.44) [0.151]	-0.378 (-5.19) [-0.102]
Employed	-0.179 (-2.63) [-0.061]	-0.016 (-0.230) [-0.006]	0.148 (2.21) [0.053]	0.313 (4.75) [0.116]	0.479 (7.44) [0.181]	-0.347 (-5.14) [-0.114]

Notes: Table shows coefficient, T-statistic (in parentheses), marginal effect (in brackets) for the recent mental disorder measure only – other coefficients not shown. Each cell in the tables comes from a separate model. Results generated from probit and bivariate probit models adjusted for complex survey design. Employment and psychiatric disorder equations both include controls for race, age, region, education, family structure, citizen, immigrant, smoker, chronic physical illness.

Appendix Table 1: Effect of recent affective, anxiety, and substance use disorders on employment outcomes

	Females n = 6,824	Females with lifetime disorder n = 2,718	Males n =4,989	Males with lifetime disorder n = 1,840
	Panel A: In Labor Force			
	(1)	(2)	(3)	(4)
Anxiety disorder	-0.057 (-.83) [-0.017]	-0.091 (-1.21) [-0.026]	-0.392 (-4.08) [-0.082]	-0.294 (-2.80) [-0.067]
Affective disorder	-0.235 (-3.31) [-0.071]	-0.263 (-3.42) [-0.074]	-0.413 (-3.33) [-0.086]	-0.368 (-2.69) [-0.084]
Substance disorder	-0.175 (-0.810) [-0.053]	-0.217 (-1.01) [-0.062]	0.048 (0.290) [0.010]	0.124 (0.650) [0.028]
	Panel B: Employed			
Anxiety disorder	-0.065 (-1.08) [-0.023]	-0.078 (-1.16) [-0.026]	-0.302 (-3.33) [-0.075]	-0.253 (-2.46) [-0.066]
Affective disorder	-0.192 (-2.91) [-0.067]	-0.203 (-2.96) [-0.069]	-0.470 (-3.92) [-0.120]	-0.452 (-3.50) [-0.118]
Substance disorder	-0.167 (-0.880) [-0.058]	-0.190 (-1.01) [-0.065]	0.040 (0.270) [0.010]	0.083 (0.480) [0.022]

Notes: Table shows coefficients, T-statistics (in parentheses), and marginal effects (in brackets) for the recent mental disorder measures only – other coefficients not shown. The three disorders (anxiety, affective, substance) are included in the same model (for example, column 1 in Panel A comes from a single model). Results generated from probit models that take into account the complex survey design. Models include controls for race, age, region, education, family structure, citizen, immigrant, smoker, chronic physical illness.