NBER WORKING PAPER SERIES

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Working Paper 14404
http://www.nber.org/papers/w14404

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
October 2008

We acknowledge funding from the Robert Wood Johnson Foundation #1K23 DA018715-01A2 and from NIH Research Grant # 1P50 MHO 73469 funded by the National Institute of Mental Health. The project was supported by NIH Research Grant # U01 MH 06220-06A2 funded by the National Institute of Mental Health. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

Psychiatric Disorders and Labor Market Outcomes: Evidence from the National Comorbidity Survey - Replication

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NBER Working Paper No. 14404
October 2008, Revised December 2010
JEL No. I0

ABSTRACT

This paper uses the National Comorbidity Survey – Replication to estimate the effects of recent psychiatric disorder on employment, hours worked, and earnings. We employ methods proposed in Altonji, Elder and Taber (2005) which use selection on observable traits to provide information regarding selection along unobservable factors. Among males, disorder is associated with reductions of 13-17 percentage points in labor force participation and employment, depending on the sample and the model. Among females, we find smaller, less consistent associations between disorder and labor force participation and employment. There are no effects of disorder on earnings or hours worked among employed individuals.

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1.0 Introduction

Many studies have documented the economic burden of psychiatric disorders in the US and worldwide. Psychiatric disorders are highly prevalent, and there is significant co-morbidity within psychiatric disorders as well as between psychiatric disorders and other health problems (Kessler et al., 2005a). Despite recent progress, a high rate of unmet need for treatment persists in the US (Kessler et al., 2005b).[2] As a result, psychiatric disorders remain a leading cause of disability. As of 2000, depressive disorders alone were the fourth leading cause of disease burden worldwide, accounting for 4.4 percent of disability-adjusted life years (DALYs) and 12 percent of all total years lived with disability in the world (Ustun et al., 2004)..

This paper focuses on one disabling aspect of psychiatric disorder – we seek to estimate the effect of recent disorder on labor market outcomes. The central issue in estimating the causal effect of psychiatric disorder on labor market outcomes is that individuals may select into disorder along difficult-to-measure traits that also influence their labor market outcomes, such as self-esteem, motivation, and personality (Ettner et al., 1997; Marcotte & Wilcox-Gok, 2003). Prior researchers have addressed this issue using instrumental variables and other methods that rely on identifying exclusion restrictions (e.g. exogenous variables that are included in the psychiatric disorder equation but left out of the labor market outcome equation) (see Ettner et al., 1997 and

[2] Data from the National Comorbidity Study Replication (NCS-R) indicate 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 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 have two or more psychiatric disorders (Kessler, 2005a). 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).

Marcotte et al., 2000 for examples). These identifying assumptions frequently are hard to justify based on economic theory.

In this paper, we build on prior work by examining the effect of psychiatric disorder on labor market outcomes using methods recently proposed in Altonji, Elder and Taber (AET) (2005a). These methods do not rely on any identifying exclusion restrictions. Instead, the AET method uses observed differences between those with and without psychiatric disorder to provide information regarding the likely magnitude and direction of selection along unobserved characteristics.

We also build on prior research by using more recent data from the NCS-R. In addition to being more current, the NCS-R has two main advantages over its predecessor, the National Comorbidity Survey (NCS), that are relevant to the present study. First, the NCS-R includes assessments of psychiatric disorder that are based on the DSM-IV diagnostic system rather than the now dated DSM-III-R. The DSM-IV reflects psychiatric epidemiologists' increasing emphasis during the 1990's on requiring individuals to have significant distress or impairment in order to meet criteria for psychiatric disorder (Kessler & Merikangas, 2004). Second, the NCS-R includes somewhat more extensive information on correlates of psychiatric disorder than the NCS. For example, in the NCS-R, respondents provide not only information on whether their parents ever experienced psychiatric symptoms (which is also available in the NCS), but also about the duration of those symptoms specifically during the respondent's childhood.

Our results indicate that among males, having a psychiatric disorder in the past 12 months is associated with reductions of 13 to 17 percentage points in the likelihood of current labor force participation and in the likelihood of employment, depending on the

model and sample. 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

There is growing interest in 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.[3] Psychiatric disorders may affect labor market outcomes through several mechanisms. First, the symptoms of psychiatric illness can directly impair an individual's ability to obtain and maintain employment, and may detract from earnings, by affecting factors such as productivity, mood, energy level, memory, concentration, decisiveness, motivation, and social relations. Second, employers may be unable or unwilling to make any needed accommodations for an employee with mental 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

[3] In fact, the high proportion of YLDs attributed to psychiatric disorders is likely due to the early onset of many psychiatric disorders.

employment by lowering wages and thus lowering the likelihood of labor force participation (Currie & Madrian, 1999; Ettner et al., 1997).[4]

In prior literature, it has been acknowledged that in a model of labor market outcomes, psychiatric disorders may be endogenous in a structural sense (e.g., if mental health and labor market outcomes are determined simultaneously, reverse causality is possible) and/or in a statistical sense (e.g., unobserved heterogeneity). Researchers have addressed this problem using instrumental variables (IV) and bivariate probit methods.[5] For example, using NCS data and an IV approach, Ettner et al. (1997) report that past year mental disorder is associated with a reduction of about 11 percentage points in the probability of being employed, but there are less consistent effects on earnings and hours worked. Marcotte et al. (2000), also using the NCS and IV methods, report adverse effects of depression on earnings among females. In further work with the NCS, Marcotte & Wilcox-Gok (2003) use both IV and quantile regression models and report that psychiatric disorders have different effects across the earnings distribution, with the largest effects concentrated among the lowest-earners. Alexandre and French (2001), using bivariate probit and IV methods and data on low-income adults in Miami, find that self-rated depression is associated with adverse labor market outcomes, reducing the

[4] 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.

[5] There is a related economics literature that focuses specifically on the labor market consequences of substance use, and many of these studies also apply IV methods to address the potential endogeneity of substance use. Many of these studies do not use diagnostic measures of substance disorder and, in general, there is inconsistent 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)).

probability of being employed by about 19 percentage points and decreasing the number of weeks worked in the past year by 7-8 weeks. Chatterji et al. (2007), based on the National Latino and Asian American Study (NLAAS) and using a bivariate probit model, find that among Latinos, having 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).[6]

The challenge inherent in applying these empirical methods is finding a credible identification strategy; practical implementation of either the IV or the bivariate probit method requires the existence of at least one exogenous variable that affects psychiatric disorder 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 and substance problems (Ettner et al., 1997; Marcotte et al., 2000; Marcotte & Wilcox-Gok, 2003; Renna, 2008); early onset of psychiatric disorders or substance use (Ettner et al., 1997; Renna, 2008); 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 (Hamilton

[6] Other studies do not directly address the potential endogeneity of psychiatric disorder. In one of the first studies in this area using diagnostic criteria for psychiatric illness, Frank and Gertler (1991) use data on men from the Baltimore Epidemiologic Catchment Area study and find 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). Cowell et al. (2009), using the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), report that psychiatric disorders detract from employment among women and detract from full-time work among men. Tian et al. (2005), using data on older individuals from the Health and Retirement Survey (HRS), find that depression with comorbid pain is associated with worse labor market outcomes. Using data on employed respondents from the Ontario Health Survey's Mental Health Supplement, Dewa & Lin (2000) find that psychiatric illness, particularly affective disorders and comorbid conditions, are associated with increases in the number of days workers report that they are partially unable to function normally, or are able to function normally only with extreme effort (Dewa & Lin, 2000)

et al., 1997); availability of social support agencies (Alexandre and French, 2001); 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 and that they are not directly related to the outcome of interest. For example, when discussing religiosity as an identifying variable, Alexandre and French (2001) note that it is possible that religious beliefs directly affect or are correlated with unmeasured factors that affect 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 others 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. 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 NCS-R. Moreover, the predictive power of state policies frequently is poor, particularly when state fixed effects are included. This problem is likely to be particularly difficult in the context of psychiatric disorders (as opposed to measures of substance use), since it is difficult to identify a state-level policy or policy change that would be highly correlated with disorder at the individual level.

3.0 Methodological approach

The estimating equations are:

$$(1)\quad L = \alpha + P\delta + X\beta + \varepsilon$$

$$(2)\quad P = \theta + X\xi + \upsilon$$

where L is a labor market outcome, α and θ are intercepts, P is a binary measure of recent psychiatric disorder, X is a set of individual demographic, family background, and other characteristics that may affect labor market outcomes and psychiatric disorders, and ε and υ are error terms. (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 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.

Below, as a supplementary analysis, we examine educational attainment as potential indirect channel by considering the effects of early onset of disorder on labor market outcomes with and without controls for educational attainment included in the model. However, we note that ideally a multi-period framework is needed to analyze lagged effects of psychiatric conditions. Our data are cross-sectional and thus do not

allow us to establish a temporal sequence of the effects of health on outcomes (Chirikos & Nestel, 1984). This limitation also applies to occupation as an indirect channel.[7]

Despite the inclusion of *X*, there is strong reason to remain concerned about the potential endogeneity of mental disorder in the labor market outcome equation; that is, it is not reasonable to assume that corr(ε, υ | *X*) = 0. First, in a complete model of health and labor market outcomes, mental health is endogenous in the sense that it is jointly determined with labor market outcomes (Currie & Madrian, 1999). Second, a reverse causal pathway is possible. Labor market status can directly affect mental health through mechanisms such as work-related stress, health behaviors (e.g., sedentary lifestyle), self-esteem, family dynamics, social networks, and role functioning (Ettner, 2000, Quesnel-Vallee & DeHaney, 2010; Zabkiewicz, 2010; Dziak et al., 2010; Joyce et al., 2010).[8] Some recent evidence for this reverse causal pathway is Kuhn et al. (2009), who report that job loss caused by an exogenous shock (the closing of a plant in Austria) is associated with increases in expenditures on mental health services.

Third, Grossman (1972) emphasizes that one's stock of health is an endogenous choice variable. Current mental health depends on initial health, depreciation of the health stock in all previous periods, and gross investment (and thus inputs used to produce investments) in all previous periods (Grossman, 1972). In *X*, we include controls for factors that may affect labor market outcomes directly and also may affect current mental disorder through prior health investments, such as family background. However,

[7] A related limitation regarding occupation is that it is potentially endogenous since psychiatric disorders can drive occupational choices. Also, unmeasured individual attributes can influence both psychiatric disorders and occupational decisions, as well as affect labor market outcomes.

[8] As Ettner (2000) reviews, these direct effects of labor market status on mental health may be positive or negative.

it is possible that we have not been able to completely account for such effects, and that these factors remain in the error terms of Equations 1 and 2.

In the case of binary labor market outcomes, we address the problem of correlated unobserved variables by estimating equations (1) and (2') with the bivariate probit model. This approach models the corr(ε, υ | X) explicitly using a full information maximum likelihood strategy. We take into account the complex survey design when estimating the bivariate probit model. The bivariate probit model assumes that the disturbance terms in equations (1) and (2') are jointly normally distributed, and the equations are estimated simultaneously using the maximum likelihood method.

$$(1) \quad L = \alpha + P\delta + X\beta + \varepsilon$$

$$(2') \quad P = \theta + X\xi + Z\xi + \upsilon$$

$$(3) \quad \begin{bmatrix} \varepsilon \\ \upsilon \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right)$$

Although the bivariate probit model can be identified without an exclusion restriction, this strategy is not considered credible in the empirical literature. Thus, as our initial approach, we follow prior research and include a set of variables Z in the psychiatric disorder equation but exclude them from the labor market equation. We note, however, that both the exclusion restrictions and the functional form restrictions of the model drive its identification. The identifying variables are early onset of disorder and whether the respondent has a parent who experienced psychiatric symptoms during most or all of the respondent's childhood.[9]

[9] 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,

For continuous labor market outcomes, we address the potential endogeneity of psychiatric disorder using two-stage least squares models, with the same identifying variables as instruments. That is, we estimate equation (4) below

$$(4)\ L = \alpha_1 + X\beta_1 + \hat{P}\delta + \varepsilon_{1i}$$

in which $\hat{P}$ is the predicted value from equation 2' in which psychiatric disorder is regressed on observable individual characteristics (*X*) and instrumental variables (*Z*).

Using these empirical methods to address the endogeneity of psychiatric conditions with respect to labor market outcomes may reduce the magnitude of the effect if the most important unobserved variables are factors that are positively correlated with psychiatric disorder and are negatively correlated with labor market outcomes such as stressful life events, adverse childhood circumstances, and low ability. However, the opposite may be true if the important unmeasured factors are traits which are positively correlated with both disorder and labor market outcomes. For example, there is evidence for self-selection into jobs by personality traits (Heineck, 2007), and some personality traits such as withdrawal and aggression may be positively associated with labor market outcomes (see Groves, 2005) as well as with disorder. In fact, Mueller and Plug (2006) provide support that antagonism in men (which is the negative counterpart of agreeableness), may be linked to an increase in wages of 4 to 6 percent for a one standard deviation increase in antagonism.

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marital status, and other possible mediating variables. Similarly, parental psychiatric symptoms during the respondent's childhood may be associated with respondent's psychiatric illness as an adult through genetic or environmental channels. However, after adjusting for education and other adult characteristics, it is unlikely that parental symptoms during the respondent's childhood directly affect the respondent's adult labor market outcomes.

In the case of the bivariate probit model, both the exclusion restrictions and the functional form assumption identify the model (Altonji et al., 2005b). Therefore, in order to determine whether it truly is the exclusion restrictions (and not the nonlinearity) that is driving the identification of the bivariate probit model, we re-estimate all bivariate probit models with 2SLS and compare the results. These analyses are presented in Appendix Tables 2a-b. Also, we gauge the power of our identifying variables and test the overidentifying assumptions.[10] These results indicate that our identifying variables do not perform well in the female samples, although they do perform well in the male samples. It is not clear why this should be the case. Moreover, one cannot make a strong case for these exclusion restrictions based on economic theory.

Under these circumstances, we prefer the approach described in AET (2005a). The AET approach is based on estimation of a bivariate probit model without any identifying restrictions but with a constrained correlation coefficient, ρ.[11] The primary advantage of this approach in our context is that it does not rely on questionable identifying variables. Identification comes from both the restriction on ρ as well as from functional form (Altonji et al., 2005). The methods proposed by AET utilize information on selection into psychiatric disorders and labor market outcomes along observed factors to gain information regarding the likely degree of selection along unobserved factors. Although one can never know for certain the degree of selection on unobserved variables, this approach is useful when used in conjunction with other information. The approach

[10] Based on the 2SLS models of all outcomes, we use the Durbin-Wu-Hausman to test the endogeneity of psychiatric disorder with respect to labor market outcomes. In addition, we test the null hypothesis that the excluded instruments are uncorrelated with the error term and appropriately excluded from the labor market equation using Hansen's *J* statistic, the minimized value of the GMM criterion. As suggested by Staiger & Stock (1997), we use the *F*-statistic of the joint significance of the identifying instruments to gauge their relevance.

[11] Altoni et al. (2002) present the formal econometric theory underlying this method.

demonstrates how sensitive the estimates are to what could be viewed as a relatively stringent assumption about the degree of selection on unobserved variables.

The first part of the AET method involves a robustness check to determine whether the effect of psychiatric disorder on labor market outcomes is sensitive to various levels of imposed correlation between the unobserved determinants of both outcomes. 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. In the present study, depending on the outcome and the sample, we find evidence of both positive and negative selection along measured factors. Thus, we impose on the model both negative and positive values of ρ ranging from -0.30 to 0.30 and examine whether or not the effect of psychiatric disorder on labor market outcomes is robust to such changes.[12]

The second part of the method uses the degree of selection on observed characteristics to set the degree of selection on unobserved characteristics at a level that could be considered to be conservative. AET (2005a) 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. That is, under certain assumptions,[13] the portion of the outcome variable that is associated with the observed variables has the same relationship

[12] We apply the AET (2005a) approach only to the two binary labor market outcomes – labor force participation and employment. The AET (2005a) approach can be applied in the setting of a continuous dependent variable as well by calculating a ratio of how large selection on unmeasured factors would need to be to relative to selection on measured factors to eliminate the causal effect. However, we did not apply it in our case because in our standard OLS and IV models, we had no evidence that psychiatric disorders were associated with the continuous outcomes we examined (earnings, hours worked).

[13] Briefly, the assumptions are that: (1) the observed variables are selected at random from the full set of variables that determine psychiatric disorders and labor market outcomes; and (2) the number of observed and unobserved factors is large enough so that no element dominates the distribution of the outcome. (AET, 2002a).

with psychiatric disorder as the portion that is related to the unmeasured factors. More formally, AET (2005a) show that this condition implies:

$$(5)\quad \text{cov}(L^*, X'\gamma)/\text{var}(X'\gamma) = \text{cov}(L^*, \varepsilon)/\text{var}(\varepsilon)$$

where L^* is an unobserved, continuous measure of the net benefits from the labor market outcome (e.g., employment), $X'\gamma$ is the vector of observed variables that affect L^* weighted by their corresponding coefficients, and ε is the unobserved determinants of variables that affect L^* weighted by their relevant coefficients. In words, imposing equation (5) on the bivariate probit model means that the data collected in a survey are just as relevant to the outcome being studied as the data that were not collected. In contrast, standard estimation methods, such as OLS and probit models, assume that the data that were not collected are not relevant to the outcome being studied.

This paper uses a highly specialized survey that was designed to study the prevalence and correlates of psychiatric disorders. In particular, the NCS-R is the result of three decades of research on the descriptive epidemiology of psychiatric disorders, and it builds on other large-scale efforts to collect data on the correlates of psychiatric disorder such as the Epidemiologic Catchment Area (ECA) surveys and the NCS (Kessler & Merikangas, 2004). In this sense, the estimate obtained under the assumption that selection on unobservable variables is equal to selection on observables could be considered unrealistically stringent, given the richness of these data and the targeted nature of the CPES survey.

Nevertheless, we acknowledge that important unmeasured factors may remain, even in the context of an extensive, targeted survey effort. Moreover, even observed correlates of psychiatric disorder will be measured imperfectly. Even so, these estimates

generated by imposing a likely – but not certainly - stringent degree of selection are useful. We gain new information about the relationship between psychiatric disorder and labor market outcomes by gauging whether this well-documented association persists when an explicit degree of selection along unmeasured factors is imposed on the model.

4.0 The NCS-R

The NCS-R is the most recent nationally representative survey available that includes diagnostic assessments of psychiatric disorders as well as rich data on the correlates of disorders. The study took place between February 2001 and April 2003 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 and 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 of psychiatric illness, other correlates of psychiatric illness and additional disorders. The survey was conducted in respondents' homes using laptop computer-assisted personal interview (CAPI) methods and professional interviewers (Kessler et al., 2004).

We use data from the 5,692 NCS-R respondents who participated in both Part I and Part II of the survey. Of the 5,692, we excluded from the sample persons over 64 years old and under 25 years old (n = 1,507), and those with missing outcome information (n = 339), leaving us with a full analytic sample of 4,137 respondents (1,751

males and 2,386 females).[14] Missing values for covariates were imputed with sample means. For most covariates, less than 1 percent of the sample had missing values. For two variables (religious frequency and father's psychiatric symptoms during the respondent's childhood), 11 percent and 16 percent had missing information.
We estimate all models separately by gender. In addition, we examine the robustness of our findings by estimating all models using samples limited to respondents with lifetime history of mental disorder.[15]

The dependent variables are measures of current labor market outcomes. We use two measures of current employment status: in labor force - a binary indicator of whether the respondent 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.

Among employed respondents, we examine the number of hours worked in the past year and yearly earnings. The number of hours worked is constructed by multiplying the average hours the respondent reports working in an average week by the

[14] 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. We considered an observation to have missing outcome data if either the constructed value for work status was missing (n = 13) OR the detailed underlying variable "your current employment" was missing (n =335). We took this conservative approach because we found that the constructed variable "work status" potentially misclassifies respondents who actually have missing data on work status by placing them in the "out of labor force" category. We compared the basic characteristics of the 339 respondents with missing outcome data to the rest of the sample. The respondents with missing outcome data were older than those with available data – the mean age of those with missing data was 50 vs. 42 in the remaining sample. They also are less likely to be college-educated, are less likely to be married, and have more chronic health conditions.

[15] Restricting the sample to those with history of disorder is intended to make respondents with and without recent disorder more similar along observable characteristics. However, we note that this approach is only helpful in implementing the AET method if making those with and without recent disorder more similar along measured characteristics also makes those with and without recent disorder more similar along unobservable characteristics.

number of weeks the respondent worked for pay in the past year. We measure earnings based on respondents' reports of own personal earnings before taxes in the past 12 months. Respondents were asked to indicate which of 36 categories represented their earnings in the past month. The lowest two categories were less than zero and zero. Up to $20,000, the categories were in $1,000 increments. After that point, the categories are set up in $5,000 increments until $50,000, $25,000 increments until $100,000, and larger increments at the highest income levels (with the highest category including $1,000,000 or higher income). Following Ettner et al. (1997), we used the midpoint of each category, and analyze earnings as a continuous variable. We use log earnings as the dependent variable in regression models.[16]

The presence of lifetime psychiatric disorder, 12-month psychiatric disorder, and subthreshold depressive disorder or minor depressive disorder 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 DSM-IV diagnostic criteria for any mental disorders in the past 12 months.[17] Any psychiatric disorder includes the following fourteen diagnoses: (1) major depressive episode (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)

[16] About 1 percent of employed respondents reported zero or less than zero earnings. These respondents were given a value of .5.
[17] Work-related criteria were excluded from the diagnostic alogorithms.

bulimia. We also consider an alternate set of models which include, in place of the any disorder measure, three dichotomous indicators of any affective disorder (major depressive episode or dysthymia) in the past 12 months, any anxiety disorder (agoraphobia, social phobia, generalized anxiety disorder, post traumatic stress 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, age squared, race/ethnicity (Latino, African-American, Asian vs. non-Latino white), 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/adopted children under age 5, 5-12 and 13-17; US citizen; nativity (immigrant); indicators for lifetime chronic illness (dichotomous indicators for asthma, diabetes, cardiovascular disease, ulcers, cancer); an indicator for current smoking;[18] number of moves to a new neighborhood or town when growing up; whether the respondent lived with both parents until age 16; whether the respondent's family received public assistance for 6 or more months during the respondent's youth; frequent attendance at religious services; and a set of indicators for current or former occupation.[19]

[18] Since smoking is a potentially endogenous variable, we excluded smoking and re-estimated all models using the full samples of males and females to gauge whether excluding this variable affected the findings. The estimates generated from these models are very similar to those presented in the paper.

[19] The ten indicators are: corporate/general managers, professionals, associate professionals, office clerks, customer service clerks, personal/protective service workers, trade workers, operators, perform routine tasks, and other. The corporate/general managers category is the baseline category in the regression models. Generally speaking, individuals who never worked should have missing values for current and former occupation. However, the skip pattern of the employment section of the survey is designed in a way that it makes it unlikely that respondents will not provide information on current or former occupation.

The standard bivariate probit and 2SLS models include the full list of covariates above in both equations. In addition, the labor market equation includes county level poverty and unemployment rates. The mental disorder equation additionally includes: (1) an indicator of whether the respondent's mother/mother figure experienced periods of sadness for 2+ weeks, or experienced periods of constant anxiety for a month or more, during most or all of the respondent's childhood; (2) an indicator of whether the respondent's father/father figure experienced periods of sadness for 2+ weeks, or experienced periods of constant anxiety for a month or more, during most or all of the respondent's childhood; and (3) the number of psychiatric disorders the respondent has experienced 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 for the respondent.

5.0 Results: Effects of psychiatric disorders on employment

5.1 Descriptive Statistics and Baseline Models

Table 1 shows weighted means for the male and female samples. Among males, 86 percent are currently in the labor force, and 85 percent are currently employed. Among employed males, mean work hours and earnings are 2,280 hours in the past year (about 43 hours per week) and $49,952 respectively. In the male sample, 18 percent of respondents meet diagnostic criteria for at least one psychiatric disorder in the past 12 months (Table 1). Among females, 77 percent are in the labor force, 71 percent are employed, and, among the employed, mean work hours and earnings are 1,909 hours per

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There are 216 observations with missing values for occupation. These missing values were imputed with sample means. We included a missing value indicator for occupation in the regression, but did not retain this variable in the final analysis because it was not statistically significant

year and $28,483 respectively. In the female sample, 25 percent have experienced a psychiatric disorder in the past 12 months (Table 1).

In Appendix Tables 3a-b, we also show: (1) weighted descriptive statistics for the samples limited to respondents with lifetime disorder; and (2) differences in observed characteristics between those with and without a recent psychiatric disorder for both the full samples and the samples limited to respondents with lifetime disorder. Two findings are notable. First, it appears that individuals select into disorder along factors that are negatively associated with labor market outcomes (such as chronic health conditions, lack of college education, and disadvantaged family backgrounds) as well as along factors that are positively associated with labor market outcomes (such as white race, US born, and divorced marital status for women). Second, while we see fewer striking observable differences in the samples limited to those with lifetime disorder, there are still important observable differences between those with and without disorder in the lifetime disorder samples.

Tables 2 and 3 summarize findings from baseline probit models of labor force participation and employment (Table 2), and baseline OLS models of work hours and earnings among currently employed respondents (Table 3). Estimates are shown for the four samples (all males, males with lifetime disorder, all females, females with lifetime disorder). The models include a full set of controls, as indicated in the tables.

In the male samples, the univariate probit results show that recent psychiatric disorder is associated with reductions of about 13 percentage points in the likelihood of current labor force participation and in the likelihood of current employment (Table 2, Panel A). These effects correspond to about 15 percent reductions in labor force

participation and employment, when evaluated at the sample means for the full sample of males. In the female samples, the univariate probit model findings indicate that recent disorder reduces the likelihood of employment and labor force participation by about 5-7 percentage points. At the mean employment and labor force participation levels in the full sample of females, these effects correspond to a 7 percent reduction in labor force participation and a 7 percent reduction in employment (Table 2, Panel B).

In the male samples, recent psychiatric disorder is associated with reductions in work hours, but these effects are not statistically significant in the OLS models (Table 3, Panel A). There is no consistent detrimental effect of recent disorder on earnings among employed males; in fact, among males with lifetime disorder, findings from the OLS models indicate that onset of a recent disorder is actually associated with a 13 percent increase in earnings (Table 3, Panel A). This finding raises concern about reverse causality in this model, which we attempt to address below using 2SLS methods. There are no statistically significant associations between recent disorder and earnings, or recent disorder and work hours, among employed females (Table 3).

We also use these baseline models to examine the degree of selection on observable characteristics. We do so 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, occupation, county unemployment and poverty, religious services attendance, family background). These findings are shown in Appendix Table 4. Here, we briefly summarize findings.

These models show that there is some degree of selection on observable characteristics in all four samples. For example, compared to a model with no controls, when a full set of controls is included, the magnitudes of the marginal effects are about 24 percent lower in the labor force participation and employment models based on the full male sample. However, we note the following: (1) selection on observed variables is weaker in the female samples compared to the male samples; and (2) selection on observable factors is stronger in the full samples compared to the lifetime disorder samples. Based on linear probability models adjusted for the survey design (not shown), the R-squared in the labor force participation model is .19 for males and .14 for females, and the R-squared in the employment model is .19 for males and .20 for females.

Appendix Table 1 shows findings from models in which we replace the single indicator of "any disorder" with three dichotomous indicators of whether the respondent met 12-month criteria for anxiety disorders, affective disorders, and substance 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. (1997), Mullahy & Sindelar (1996) and others. Among women, depressive disorders are negatively associated with employment and labor force participation in both samples, while anxiety disorder detracts from labor force participation in the females with lifetime disorder sample only. Ettner et al. (1997) 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. There are no consistent patterns in the effects of disorders on hours worked and earnings among employed individuals.

Our fully specified models include controls for education, occupation, and marital status, but these variables may capture a portion of the effect of disorder on labor market outcomes. For example, Breslau et al. (2008) using the NCS show that some psychiatric disorders (primarily externalizing disorders) are associated with termination of schooling; since schooling is an important determinant of labor market outcomes, it may act as a mechanism linking early onset of disorder to labor market outcomes.

To examine this possibility more closely, we estimated models in which the recent disorder indicator is replaced by an indicator of "onset of any disorder prior to age 18." We then estimated the fully specified model with and without controls for education, with and without controls for occupation, and with and without controls for marital status, to determine whether the effect of disorder on labor market outcomes is sensitive to the inclusion of these possible "mechanism" variables. We find no evidence that the inclusion of these sets of variables affects the estimated coefficient on "early onset" (results available upon request). In the case of education, the reason may be that depression and anxiety, the most prevalent adult disorders, do not appear to detract from educational outcomes (Breslau et al., 2008).

5.3 Standard Bivariate Probit and 2SLS Models

The second and fourth columns of Table 2 show the estimated coefficient on recent psychiatric disorder from a bivariate probit model. For males and females, the bivariate probit model results are consistent in sign with the univariate probit results, although the magnitudes of the effects are somewhat larger in the bivariate probit models

compared to the baseline models. In each of the four samples, we find that recent disorder is associated with a statistically significant reduction in the likelihood of labor force participation and employment. Note that the estimated correlation between the equations' error terms is positive but not statistically significant in any of the models, suggesting that there is no advantage in estimating the equations jointly.

Among employed males, the 2SLS models show inconsistent effects across the full and lifetime disorder samples. For males, there are negative effects of recent disorder on work hours in the lifetime disorder sample only, and negative effects on earnings in the full sample only (Table 3, Panel A). Among females (Table 3, Panel B), findings from the 2SLS models show no statistically significant associations between recent disorder and outcomes. As a group, the identifying variables are excellent predictors of recent psychiatric disorder, with a *F*-statistic ranging from 10 to 188 depending on the model (a summary of first stage results is available in Appendix Table 5). However, in two models based on the female sample, we reject the over-identification test statistic, indicating that our instruments are not appropriately left out of the labor market equations (results not shown).[20] This casts some doubt on the identification strategy as a whole, since we have no conceptual reason why these instruments would be appropriate for males but not females. As we have emphasized previously, in any case it is hard to provide a provide a strong case for these exclusion restrictions based on economic theory.

5.4 AET Models

Table 4 shows results from the empirical strategy proposed by Altonji et al., which does not rely on identifying assumptions that may be problematic. The middle

[20] When early onset of disorder is excluded, and only the parental psychiatric disorder variables are used as identifying instruments, we fail to reject the over-identification test statistic, and the F-statistic is about 31. However, in these models, the IV findings are positive in sign and statistically insignificant.

column (column 4) reproduces the standard univariate probit findings from Table 2, which is based on the assumption of no selection along unmeasured factors. The columns to the left of column 4 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 -.30 (Table 4, Columns 1-3). Columns 5-7 show results from the same exercise, but with the correlation coefficient set to increasingly stronger positive values ranging from .10 to .30 (Table 4, columns 5-7).

Finally, the bivariate probit model is estimated without identifying restrictions but subject to the stringent condition regarding selection on unobserved factors proposed by AET – selection on unobservables is set equal to selection on observables. Because this assumption is unlikely to hold in reality, we do not emphasize the magnitude of the estimated correlation coefficient in this model (although it is reported in column 8 of Table 4). However, the estimated coefficient on recent disorder in this model informally can be considered to be a conservative estimate of the true effect of psychiatric disorder on labor market outcomes (Altonji et al., 2005).

Among males, we see that the effects of recent disorder on labor force participation and employment remain statistically significant and negative even when moderate levels of either negative or positive selection along unobservables are imposed on the model. Only when ρ is set to -0.30 does the estimated effect of disorder on outcomes become statistically insignificant. Among females, the effect of disorder on outcomes is more sensitive to the imposed level of correlation. If the ρ is set to positive

values, the negative effects of disorder on outcomes persist. However, even small amounts of negative selection on unmeasured factors makes the effect of disorder on outcomes statistically insignificant. In the case of the labor force participation model, the predictive power of the model is better for males compared to females; thus, the same imposed level of selection on unmeasured factors would lead to more selection bias in the female sample. It is difficult, however, to intuitively interpret these imposed correlations on the model and assess whether they are realistic levels of correlation.

In Column (8) of Table 4, 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 collected is no more helpful in reducing bias in a univariate probit model than the data that were not collected (Altonji et al., 2005). In our case, however, since selection on observables is relatively modest, the correlation between unmeasured factors that we impose on the model also is relatively modest. In all four samples, the negative effects of recent disorder on labor force participation and employment persist when this condition is imposed. The findings as a whole (from both the full and lifetime disorder samples) suggest that recent disorder reduces labor force participation and employment by 9 to 15 percentage points among males and by 9 to 19 percentage points among females. For males, even if one believes that selection along unmeasured factors is more than twice as strong as selection along measured factors (if ρ is set at -.20 in the labor force participation model estimated using the full sample of males, for example), we still would see negative (albeit much smaller) effects of recent disorder on labor market participation. This appears to be true for females as well, although we find positive selection in the female samples.

The NCS-R reflects state-of-the-art measurement of the correlates of psychiatric disorder, and unlike many multi-purpose surveys (e.g., the National Longitudinal Survey of Youth), the NCS-R focuses on a single research area, psychiatric epidemiology. This fact suggests that selection on unmeasured factors should be less important than selection on measured factors. Thus, it may be appropriate to interpret the condition imposed in column (8) as a conservative estimate of the true effect. However, we acknowledge that the predictive power of our models is still modest, as usually is the case in social sciences, and much remains unexplained. Given the large unexplained portion of the model, even "small" amounts of selection on unmeasured factors can be large relative to the amount of selection on measured factors and potentially can affect the results. This turned out to be the case for the female samples, but not the male samples.

6.0 Discussion and 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 about 13 to 17 percentage point reductions in employment and labor force participation. These findings persist across: various specifications; estimation with both the full and lifetime disorder samples; and a strong assumption regarding selection that is imposed on the model.

The magnitudes of the effects that we find for males are reasonably close to the 11 percentage point reduction in employment associated with recent psychiatric disorder that Ettner et al. report for males based on the National Cormorbidity Survey (NCS). However, it is puzzling that unlike Ettner et al. (1997), Marcotte et al. (2000) and others,

we find no effects of recent disorder on work hours and earnings. This may be due to the somewhat stronger economy of the early 2000's – during the time period when the NCS data were collected (1990-1992) overall unemployment rates ranged from 5.6 to 7.5 percent, while these rates were 4.7 to 6.0 percent during the time period when the NCS-R were collected (2001 to 2003) (Bureau of Labor Statistics, 2010). Moreover, 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.[21]

Compared to our results for males, our findings based on the female samples are less consistent. As we found in the male samples, the baseline results for females show a negative association between recent disorder and labor force participation/employment, and no consistent association between disorder and work hours and earnings. The magnitudes of the associations, however, are smaller than those for males, and the negative effects are eliminated when low amounts of negative selection are imposed in the bivariate probit models. Females appear to have some more complex selection issues compared to males in the sense that there is negative selection as well strong positive selection along some measured characteristics such as divorce and prior disorder.

Using longitudinal data to study indirect effects may be a useful way to shed light on the economic implications of negative and positive selection. In the case of negative

[21] According to a Letter to the Editor in the *Archives of General Psychiatry* (Grant et al., 2007), a limitation of the World Mental Health–Composite International Diagnostic Interview (WMH-CIDI) used by Kessler and colleagues in the NCS-R, is that it skips all respondents' past questions on *DSM-IV* dependence if they do not respond positively to questions on *DSM-IV* abuse. As a result, the last year rates of alcohol and drug dependence are noticeably lower in the NCS-R (1.3% and 0.4%) than in the NESARC (3.8% and 0.6%).

selection, individuals may have unmeasured personal attributes (e.g., low self-esteem , poor interpersonal skills) that increase risk for psychiatric disorder and directly detract from labor market outcomes. However, in addition to these direct effects, these attributes also may indirectly affect labor market outcomes by interfering with human capital development earlier in life. Similarly, the strong degree of positive selection we find among females requires further study of indirect effects. Certain personality traits and behaviors may increase risk of psychiatric disorder and also directly improve labor market outcomes for women. However, it seems likely that indirect channels also will be important. Future research should consider these potential indirect effects of psychiatric disorder using longitudinal data.

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Table 1: Weighted means		
	Males (n = 1,751)	Females (n = 2,386)
Employment outcomes		
In labor force	0.86	0.77
Employed	0.85	0.71
Earnings among employed	48,952 (2,130.7)	28,482.6 (641.7)
Work hours among employed	2,280 (25.0)	1,909 (17.06)
Psychiatric disorders		
Any disorder in past 12 months	0.18	0.25
Affective disorder in past 12 months	0.07	0.12
Anxiety disorder in past 12 months	0.12	0.19
Substance disorder in past 12 months	0.05	0.02
Number of disorders with onset prior to age 18	0.37 (0.02)	0.41 (0.02)
Mother anxious and/or depressed during respondent's childhood	0.07	0.11
Father anxious and/or depressed during respondent's childhood	0.03	0.05
Chronic physical illnesses		
Arthritis or rheumatism	0.22	0.28
Stroke	0.02	0.02
Heart attack	0.03	0.01
Diabetes	0.07	0.07
Ulcer	0.10	0.10
Cancer	0.04	0.06
Demographic, SES, and family background characteristics		
Latino	0.11	0.11
African-American	0.12	0.13

Asian	0.02	0.01
US Citizen	0.92	0.97
Immigrant	0.14	0.09
Age	43.2 (0.40)	43.4 (0.34)
Midwest	0.25	0.23
South	0.35	0.36
West	0.22	0.23
Married	0.68	0.63
Divorced or widowed	0.16	0.22
Number of children aged under 5 years	0.20 (0.02)	0.19 (0.01)
Number of children aged 5-12 years	0.44 (0.03)	0.42 (0.02)
Number of children aged 13-17 years	0.32 (0.02)	0.30 (0.02)
12 years of education	0.32	0.31
13-15 years of education	0.27	0.29
16+ years of education	0.27	0.28
Lived with both parents until age 16	0.70	0.70
Number of geographic moves during childhood	2.2 (0.11)	2.0 (0.08)
Family received welfare during childhood	0.10	0.09
Smoker	0.29	0.25
Attends religious services frequently	0.33	0.40

Notes: All statistics are adjusted for complex survey design. For brevity, the occupational categories and the county-level unemployment and poverty measures are not shown in the table.

Table 2: Standard probit and bivariate probit models of labor force participation and employment				
Panel A	**I. All males (N = 1,751)**		**II. Males with lifetime disorder (N = 1,051)**	
Coeff on Recent Disorder (T-stat) [Marginal effect] ρ (p-value)	(1) Univariate probit	(2) Bivariate probit	(3) Univariate probit	(4) Bivariate probit
In labor force	-0.635 (-6.58) [-0.132]	-0.749 (-3.27) [-0.160] 0.080 (0.124)	-0.561 (-5.63) [-0.128]	-1.21 (-2.28) [-0.293] 0.432 (0.343)
Employed	-0.605 (-6.74) [-0.132]	-0.687 (-3.34) [-0.153] 0.060 (0.114)	-0.558 (-5.87) [-0.133]	-1.14 (-2.12) [-0.282] 0.385 (0.345)
Panel B	**I. All females (N = 2,386)**		**II. Females with lifetime disorder (N = 1,514)**	
In labor force	-0.181 (-2.64) [-0.048]	-0.358 (-2.13) [-0.098] 0.127 (0.113)	-0.277 (-3.41) [-0.069]	-0.829 (-1.88) [-0.207] 0.366 (0.288)
Employed	-0.160 (-2.94) [-0.046]	-0.321 (-2.04) [-0.093] 0.116 (0.104)	-0.177 (-2.56) [-0.069]	-0.548 (-1.14) [-0.151] 0.243 (0.310)

Notes: Table 2 summarizes results from probit and bivariate probit models adjusted for complex survey design. Each cell comes from a separate model. Table shows coefficient, T-statistic (in parentheses), average marginal effect (in brackets) for the recent mental disorder measure only – other coefficients not shown. The controls in the employment/labor force participation equations are: race, age, age squared, region, education, marital status, number of children under age 5, number of children 5-12, number of children 13-17, citizen, immigrant, smoker, chronic physical illness indicators, county unemployment and poverty rates, 11 occupational categories, number of moves during childhood, received welfare during childhood, lived with both parents until age 16, and frequent religious attendance. In the bivariate probit models, the psychiatric disorder equation uses the same set of covariates but omits county level poverty and employment and additionally includes the identifying variables (early onset of disorder and parental psychiatric symptoms during respondent's childhood). Estimated ρ and p-value in parentheses are shown.

Table 3: OLS and 2SLS models of work hours and log earnings								
	(1)		(2)		(3)		(4)	
	Panel A: Males							
	All males				Males with lifetime disorder			
	Work hours n = 1,422		Log earnings n =1,339		Work hours n = 827		Log earnings n = 773	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	-48.3 (-1.06)	-139.95 (-1.48)	-63.00 (-1.46)	-348.95 (-1.97)	-63.00 (-1.46)	-348.95 (-1.97)	0.133 (2.07)	0.209 (0.68)
R2	0.14	0.14	0.15	0.11	0.15	0.11	0.15	0.15
First stage R2		0.23		0.14		0.14		0.11
F test on identifying instruments (p-value)		98.37 (0.00)		10.98 (0.00)		10.98 (0.00)		9.65 (0.00)
Over identification test statistic (p-value)		4.12 (0.127)		4.63 (0.09)		4.63 (0.09)		2.29 (0.32)
Wu-Hausman test statistic (p-value)		1.21 (0.729)		2.76 (0.904)		2.76 (0.904)		0.064 (0.200)
	Panel B: Females							
	All females				Females with lifetime disorder			
	Work hours n = 1,678		Log earnings n = 1,551		Work hours n = 1,051		Log earnings n = 976	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	-3.30 (-0.08)	-12.08 (-0.13)	0.103 (1.28)	-0.146 (-0.76)	43.39 (0.90)	236.6 (1.03)	0.018 (0.20)	-0.589 (-1.27)
R2	0.11	0.11	0.10	0.09	0.15	0.13	0.11	0.07
First stage R2		0.25		0.26		0.15		0.15
F test on identifying instruments (p-value)		123.9 (0.00)		114.36 (0.00)		15.78 (0.00)		13.21 (0.00)
Over identification test statistic (p-value)		0.711 (0.70)		1.06 (0.58)		0.124 (0.940)		2.78 (0.249)
Wu-Hausman test statistic (p-value)		0.011 (0.083)		2.01 (0.843)		0.746 (0.612)		1.78 (0.817)

Notes: Table shows coefficient and T-statistic (in parentheses) for the recent mental disorder measure only – other coefficients not shown. Each column in each panel comes from a separate model. All models adjusted for complex survey design. The controls are listed in Table 2.

Table 4: Constrained Bivariate Probit Models – Male and Female Samples								
Coeff on Disorder (T-statistic) [Marginal effect]	(1) ρ = -0.3	(2) ρ = -0.2	(3) ρ = -0.1	(4) ρ = 0 (Duplicated from Table 2)	(5) ρ = 0.1	(6) ρ = 0.2	(7) ρ = 0.3	(8) ρ set such that selection on observables = selection on unobservables
	A. Males (n = 1,750)							
In labor force	-0.056 (-0.61) [-0.010]	-0.235 (-2.54) [-0.044]	-0.415 (-4.44) [-0.081]	-0.635 (-6.58) [-0.132]	-0.773 (-8.29) [-0.166]	-0.952 (-10.28) [-0.214]	-1.13 (-12.36) [-0.267]	-0.451 (-4.83) [-0.089] ρ = -0.08
Employed	-0.010 (-0.032) [-0.37]	-0.212 (-2.40) [-0.042]	-0.391 (-4.39) [-0.081]	-0.605 (-6.74) [-0.132]	-0.749 (-8.41) [-0.169]	-0.928 (-10.48) [-0.219]	-1.10 (-12.65) [-0.273]	-0.644 (-7.21) [-0.141] ρ = 0.04
	B. Males with lifetime disorder (n = 1,051)							
In labor force	-0.017 (-0.18) [-0.004]	-0.188 (-1.99) [-0.046]	-0.356 (-3.74) [-0.079]	-0.561 (-5.63) [-0.128]	-0.686 (-7.23) [-0.155]	-0.847 (-9.03) [-0.195]	-1.00 (-10.91) [-0.235]	-0.543 (-5.71) [-0.122] ρ = 0.01
Employed	-0.016 (-0.18) [-0.004]	-0.187 (-2.09) [-0.044]	-0.355 (-3.94) [-0.083]	-0.558 (-5.87) [-0.133]	-0.684 (-7.61) [-0.162]	-0.845 (-9.50) [-0.203]	-1.00 (-11.48) [-0.245]	-0.627 (-6.96) [-0.148] ρ = 0.06
	C. Females (n = 2,385)							
In labor force	0.379 (4.70) [0.093]	0.209 (2.45) [0.052]	0.038 (0.46) [0.010]	-0.181 (-2.64) [-0.048]	-0.309 (-3.75) [-0.084]	-0.484 (-5.91) [-0.136]	-0.661 (-8.16) [-0.190]	-0.673 (-8.32) [-0.194] ρ = 0.30
Employed	0.342	0.177	0.012	-0.160	-0.315	-0.476	-0.637	-0.315

	(4.75) [0.095]	(2.42) [0.049]	(0.16) [0.003]	(-2.94) [-0.046]	(-4.27) [-0.086]	(-6.54) [-0.131]	(-8.88) [-0.175]	(-4.28) [-0.086] ρ = 0.10
	D. Females with lifetime disorder (n = 1,514)							
In labor force	0.256 (3.02) [0.065]	0.089 (1.03) [0.022]	-0.077 (-0.89) [-0.019]	-0.277 (-3.41) [-0.069]	-0.404 (-4.68) [-0.100]	-0.565 (-6.62) [-0.139]	-0.724 (-8.63) [-0.179]	-0.448 (-5.21) [-0.110] ρ = 0.13
Employed	0.342 (4.75) [0.095]	0.177 (2.42) [0.049]	0.012 (0.16) [0.003]	-0.177 (-2.56) [-0.069]	-0.315 (-4.27) [-0.086]	-0.477 (-6.54) [-0.131]	-0.637 (-8.88) [-0.175]	-0.315 (-4.28) [-0.086] ρ = 0.10

Notes: Table shows coefficient, T-statistic (in parentheses), average 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 equations include controls listed in notes to Table 2, as well as early onset of disorder and parental psychiatric symptoms. Psychiatric disorder equation omits county level poverty and employment and includes early onset of disorder and parental psychiatric symptoms. The estimated ρ that is imposed in column 8 is listed in each cell in column 8.

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

	Females	Females with lifetime disorder	Males	Males with lifetime disorder
	Panel A: In Labor Force (Probit Model)			
	n = 2,386	n = 1,514	n = 1,751	n = 1,051
Anxiety disorder	-0.096 (-1.26) [-0.029]	-0.194 (-2.25) [-0.064]	-0.493 (-4.44) [-0.135]	-0.436 (-3.25) [-0.115]
Affective disorder	-0.303 (-3.78) [-0.099]	-0.331 (-4.27) [-0.114]	-0.585 (-4.62) [-0.168]	-0.550 (-4.27) [-0.115]
Substance disorder	-0.211 (-1.19) [-0.068]	-0.221 (-1.07) [-0.075]	0.130 (0.57) [0.028]	0.107 (0.49) [0.023]
	Panel B: Employed (Probit Model)			
	n = 2,386	n = 1,514	n = 1,751	n = 1,051
Anxiety disorder	-0.070 (-1.01) [-0.026]	-0.104 (-1.31) [-0.040]	-0.517 (-4.09) [-0.127]	-0.446 (-3.41) [-0.129]
Affective disorder	-0.270 (-2.91) [-0.102]	-0.269 (-3.47) [-0.106]	-0.565 (-4.29) [-0.145]	-0.571 (-4.64) [-0.174]
Substance disorder	-0.181 (-1.13) [-.068]	-0.174 (-0.95) [-0.068]	0.117 (0.50) [0.022]	0.121 (0.220) [0.029]
	Panel C: Hours Worked (OLS)			
	n = 1,678	n = 1,051	n = 1,422	n = 827
Anxiety disorder	-14.51 (-0.37)	25.13 (0.64)	-59.9 (-1.05)	-86.73 (-1.44)
Affective disorder	15.26 (0.29)	34.98 (0.65)	-92.5 (-1.35)	-119.84 (-1.89)
Substance disorder	-13.6 (-0.11)	-20.13 (-0.18)	-19.5 (-0.24)	-12.71 (-0.17)
	Panel D: Log earnings (OLS)			

	n = 1,551	n = 976	n = 1,339	n = 773
Anxiety disorder	0.038 (0.46)	-0.039 (-0.46)	0.066 (0.70)	0.110 (1.20)
Affective disorder	0.044 (0.59)	0.041 (0.62)	-0.109 (-1.04)	-0.107 (-1.04)
Substance disorder	0.304 (1.36)	0.200 (0.91)	0.038 (0.32)	0.115 (1.08)

Notes: Table shows coefficients, T-statistics (in parentheses), and marginal effects (in brackets for probit models only) for the recent mental disorder measures only – other coefficients not shown. The three disorders (anxiety, affective, substance) are included in the same model. Results generated from probit and OLS models that take into account the complex survey design. Models include full set of controls listed in Table 2.

Appendix Table 2a: 2SLS Models – Male Samples								
	Panel A: Males							
	In labor force n = 1,751		Employed n = 1,751		Work hours n = 1,422		Log earnings n =1,339	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	-0.138 (-6.10)	-0.169 (-3.22)	-0.138 (-6.19)	-0.165 (-3.27)	-48.3 (-1.06)	-139.95 (-1.48)	0.044 (0.83)	-0.004 (-0.03)
R2	0.19	0.19	0.19	0.19	0.14	0.14	0.14	0.14
First stage R2		0.26		0.26		0.23		0.24
F test on identifying instruments (p-value)		138.81 (0.00)		138.81 (0.00)		98.37 (0.00)		93.57 (0.00)
Over identification test statistic (p-value)		2.95 (0.229)		1.93 (0.38)		4.12 (0.127)		1.83 (0.400)
Wu-Hausman test statistic (p-value)		0.425 (0.485)		0.343 (0.442)		1.21 (0.729)		0.164 (0.314)
	Panel B: Males with lifetime disorder							
	In labor force n = 1,051		Employed n = 1,051		Work hours n = 827		Log earnings n = 773	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	-0.130 (-5.59)	-0.286 (-2.40)	-0.123 (-5.29)	-0.288 (-2.45)	-63.00 (-1.46)	-348.95 (-1.97)	0.133 (2.07)	0.209 (0.68)
R2	0.20	0.16	0.19	0.16	0.15	0.11	0.15	0.15
First stage R2		0.16		0.16		0.14		0.11
F test on identifying instruments (p-value)		20.70 (0.00)		20.70 (0.00)		10.98 (0.00)		9.65 (0.00)
Over identification test statistic (p-value)		4.66 (0.10)		5.75 (0.06)		4.63 (0.09)		2.29 (0.32)
Wu-Hausman test statistic (p-value)		1.83 (0.83)		2.05 (0.848)		2.76 (0.904)		0.064 (0.200)

Notes: Table shows coefficient and T-statistic (in parentheses) for the recent mental disorder measure only – other coefficients not shown. Each column in each panel comes from a separate model. IV coefficient estimates generated from 2SLS models adjusted for complex survey design. Employment equations include controls listed in notes to Table 2. Psychiatric disorder equation omits county level poverty and employment. The variables identifying the labor market equation are early onset of disorder and parental psychiatric symptoms.

Appendix Table 2b: 2SLS Models – Female Samples								
	Panel A: Females							
	In labor force n = 2,386		Employed n = 2,386		Work hours n = 1,678		Log earnings n = 1,551	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	-0.04 (-2.43)	-0.09 (-2.17)	-0.04 (-2.90)	-0.09 (-2.03)	-3.30 (-0.08)	-12.08 (-0.13)	0.103 (1.28)	-0.146 (-0.76)
R2	0.14	0.13	0.20	0.19	0.11	0.11	0.10	0.09
First stage R2		0.27		0.27		0.25		0.26
F test on identifying instruments (p-value)		187.5 (0.00)		187.5 (0.00)		123.9 (0.00)		114.36 (0.00)
Over identification test statistic (p-value)		5.91 (0.05)		7.67 (0.02)		0.711 (0.70)		1.06 (0.58)
Wu-Hausman test statistic (p-value)		1.54 (0.794)		1.35 (0.750)		0.011 (0.083)		2.01 (0.843)
	Panel B: Females with lifetime disorder							
	In labor force n = 1,514		Employed n = 1,514		Work hours n = 1,051		Log earnings n = 976	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	-0.065 (-3.34)	-0.224 (-1.58)	-0.044 (-2.35)	-0.163 (-1.16)	43.39 (0.90)	236.6 (1.03)	0.018 (0.20)	-0.589 (-1.27)
R2	0.18	0.15	0.21	0.20	0.15	0.13	0.11	0.07
First stage R2		0.13		0.13		0.15		0.15
F test on identifying instruments (p-value)		26.2 (0.00)		26.2 (0.00)		15.78 (0.00)		13.21 (0.00)
Over identification test statistic (p-value)		5.08 (0.08)		3.58 (0.167)		0.124 (0.940)		2.78 (0.249)
Wu-Hausman test statistic (p-value)		1.30 (0.75)		0.725 (0.605)		0.746 (0.612)		1.78 (0.817)

Notes: Table shows coefficient and T-statistic (in parentheses) for the recent mental disorder measure only – other coefficients not shown. Each column in each panel comes from a separate model. IV coefficient estimates generated from 2SLS models adjusted for complex survey design. Employment equations include controls listed in notes to Table 2. Psychiatric disorder equation omits county level poverty and employment. The variables identifying the labor market equation are early onset of disorder and parental psychiatric symptoms.

Appendix Table 3a: Weighted Means by Recent Psychiatric Disorder - Male Samples

	I. Males (n = 1,751)			I. Males with lifetime disorder (n = 1,051)		
	All (n = 1,751)	Recent disorder (n = 489)	No recent disorder (n = 1262)	All (n = 1,051)	Recent disorder (n = 489)	No recent disorder (n = 562)
Employment outcomes						
In labor force	0.86	0.72	0.89***	0.80	0.72	0.86***
Employed	0.85	0.71	0.88***	0.79	0.71	0.85***
Earnings among employed	48,952 (2,130.7)	45,515.7 (2,542.1)	49,560.0 (2,526.8)	44,731 (1,315.3)	45,515.7 (2,542.1)	44,216.5 (1,605.8)
Work hours among employed	2,280 (25.0)	2204.7 (43.2)	2,294.2 (29.2)	2,243.7 (25.8)	2,204.7 (43.2)	2,269.3 (31.3)
Psychiatric disorders						
Any disorder in past 12 months	0.18	1.00	0.00***	0.43	1.00	0.00***
Affective disorder in past 12 months	0.07	0.41	0.00***	0.18	0.41	0.00***
Anxiety disorder in past 12 months	0.12	0.68	0.00***	0.30	0.68	0.00***
Substance disorder in past 12 months	0.05	0.26	0.00***	0.11	0.26	0.00***
Any lifetime disorder	0.41	1.00	0.28***	1.00	1.00	1.00
Number of disorders with onset prior to age 18	0.37 (0.02)	1.30 (0.08)	0.17*** (0.02)	0.90 (0.04)	1.30 (0.08)	0.59*** (0.04)
Mother anxious and/or depressed	0.07	0.15	0.05***	0.12	0.15	0.09***
Father anxious and/or depressed	0.03	0.08	0.02***	0.06	0.05	0.08**
Chronic physical illnesses						
Arthritis	0.22	0.28	0.21***	0.27	0.29	0.25
Stroke	0.02	0.04	0.02**	0.02	0.04	0.01***
Heart attack	0.03	0.06	0.03**	0.05	0.06	0.04
Diabetes	0.07	0.09	0.06	0.07	0.09	0.06
Ulcer	0.10	0.16	0.09***	0.13	0.16	0.11**
Cancer	0.04	0.03	0.04	0.04	0.03	0.04
Demographic, SES, and family						

background characteristics						
Latino	0.11	0.12	0.11	0.11	0.12	0.10
African-American	0.12	0.09	0.12*	0.09	0.09	0.09
Asian	0.02	0.02	0.02	0.02	0.02	0.02
US Citizen	0.92	0.98	0.97	0.98	0.98	0.98
Immigrant	0.14	0.05	0.09**	0.05	0.05	0.05
Age	43.2 (.400)	42.0 (0.53)	43.4* (0.47)	43.5 (.35)	42.0 (0.53)	44.7*** (.38)
Midwest	0.25	0.27	0.24	0.26	0.27	0.25
South	0.35	0.28	0.36***	0.30	0.28	0.32
West	0.22	0.21	0.24*	0.25	0.24	0.26
Married	0.68	0.55	0.71***	0.61	0.55	0.66***
Divorced or widowed	0.16	0.22	0.15***	0.22	0.22	0.22
Number of children aged under 5 years	0.20 (.015)	0.18 (0.02)	0.21 (0.02)	0.19 (0.02)	0.18 (0.02)	0.19 (0.03)
Number of children aged 5-12 years	0.44 (.03)	0.46 (0.05)	0.43 (0.04)	0.41 (0.03)	0.46 (0.05)	0.36** (0.03)
Number of children aged 13-17 years	0.32 (.02)	0.32 (0.05)	0.33 (0.02)	0.35 (0.03)	0.32 (0.05)	0.39 (0.04)
12 years of education	0.32	0.35	0.31	0.33	0.35	0.30
13-15 years of education	0.27	0.28	0.27	0.29	0.28	0.29
16+ years of education	0.27	0.22	0.28	0.24	0.22	0.25*
Lived with both parents until age 16	0.70	0.67	0.71	0.69	0.66	0.70
Number of geographic moves during childhood	2.2 (0.11)	2.3 (0.16)	2.1 (0.13)	2.3 (0.13)	2.3 (0.16)	2.3 (0.18)
Family received welfare during childhood	0.10	0.15	0.09	0.11	0.15	0.08
Smoker	0.29	0.44	0.25***	0.40	0.44	0.36**
Attends religious services frequently	0.33	0.22	0.35***	0.27	0.22	0.30***

Notes: All statistics shown adjusted for complex survey design. * indicates difference by psychiatric disorder status is statistically significant at the .10 level; ** indicates difference is statistically significant at the .05 level; *** indicates difference is statistically significant at the .01 level. For brevity, the occupational categories and the county-level unemployment and poverty measures are not shown in the table.

Appendix Table 3b: Weighted Means by Recent Psychiatric Disorder - Female Samples

	I. Females (n = 2,386)			I. Females with lifetime disorder (n = 1,514)		
	All (n = 2,386)	Recent disorder (n = 869)	No recent disorder (n = 1,517)	All (n = 1,514)	Recent disorder (n = 869)	No recent disorder (n = 645)
Employment outcomes						
In labor force	0.77	0.73	0.79***	0.77	0.73	0.82***
Employed	0.71	0.67	0.72**	0.71	0.67	0.75***
Earnings among employed	28,482.6 (641.7)	28,330.9 (875.2)	28,532.5 (729.1)	29,133.7 (785.0)	28,330.9 (875.2)	30,085.3 (1,021.5)
Hours among employed	1,909 (17.06)	1,908.9 (34.2)	1,910.0 (22.9)	1,892.6 (21.2)	1,908.9 (34.2)	1,873.3 (32.6)
Psychiatric disorders						
Any disorder in past 12 months	0.25	1.00	0.00***	0.56	1.00	0.00***
Affective disorder in past 12 months	0.12	0.47	0.00***	0.26	0.47	0.00***
Anxiety disorder in past 12 months	0.19	0.76	0.00***	0.42	0.76	0.00***
Substance disorder in past 12 months	0.02	0.08	0.00***	0.04	0.08	0.00***
Any lifetime disorder	0.45	1.00	0.27***	1.00	1.00	1.00
Number of disorders with onset prior to age 18	0.41	1.17 (0.04)	0.15*** (0.01)	0.90 (0.03)	1.17 (0.04)	0.55*** (0.04)
Mother anxious and/or depressed	0.11	0.21	0.08***	0.18	0.21	0.13***
Father anxious and/or depressed	0.05	0.09	0.04***	0.07	0.09	0.05**
Chronic physical illnesses						
Arthritis	0.28	0.33	0.26***	0.31	0.33	0.29
Stroke	0.02	0.03	0.01**	0.03	0.03	0.02
Heart attack	0.01	0.02	0.01	0.02	0.02	0.02
Diabetes	0.07	0.06	0.07	0.06	0.06	0.06
Ulcer	0.10	0.16	0.07***	0.14	0.17	0.11***
Cancer	0.06	0.09	0.04***	0.07	0.09	0.06**
Demographic, SES, and family						

background characteristics						
Latino	0.11	0.11	0.11	0.09	0.08	0.11*
African-American	0.13	0.11	0.13	0.10	0.08	0.11**
Asian	0.01	0.01	0.01	0.01	0.01	0.02
US Citizen	0.97	0.98	0.97	0.98	0.98	0.98
Immigrant	0.09	0.06	0.10***	0.06	0.06	0.05
Age	43.4 (.34)	41.8 (0.36)	44.0*** (0.42)	42.8 (0.29)	42.0 (0.36)	44.2*** (.41)
Midwest	0.23	0.22	0.23	0.24	0.22	0.25
South	0.36	0.33	0.37***	0.32	0.33	0.31
West	0.23	0.22	0.24*	0.24	0.25	0.24
Married	0.63	0.54	0.66***	0.59	0.55	0.64***
Divorced or widowed	0.22	0.29	0.20***	0.27	0.29	0.24**
Number of children aged under 5 years	0.19 (.013)	0.17 (0.17)	0.20 (0.16)	0.17 (0.01)	0.17 (0.02)	0.16 (0.02)
Number of children aged 5-12 years	0.42 (.02)	0.47 (0.03)	0.40 (0.03)	0.43 (0.02)	0.47 (0.03)	0.38* (0.04)
Number of children aged 13-17 years	0.30 (.02)	0.33 (0.02)	0.28 (0.02)	0.35 (0.02)	0.33 (0.02)	0.38 (0.05)
12 years of education	0.31	0.30	0.32	0.30	0.30	0.30
13-15 years of education	0.29	0.31	0.28	0.31	0.31	0.31
16+ years of education	0.28	0.23	0.29***	0.27	0.24	0.30*
Lived with both parents until age 16	0.70	0.65	0.72**	0.69	0.65	0.74***
Number of geographic moves during childhood	2.0 (0.08)	2.8 (0.22)	1.7*** (0.09)	2.4 (0.13)	2.8 (0.22)	1.8*** (0.12)
Family received welfare during childhood	0.09	0.12	0.08**	0.11	0.12	0.11
Smoker	0.25	0.34	0.22***	0.32	0.34	0.28**
Attends religious services frequently	0.40	0.31	0.43***	0.35	0.31	0.39**

Notes: All statistics shown adjusted for complex survey design. * indicates difference by psychiatric disorder status is statistically significant at the .10 level; ** indicates difference is statistically significant at the .05 level; *** indicates difference is statistically significant at the .01 level. For brevity, the occupational categories and the county-level unemployment and poverty measures are not shown in the table.

Appendix Table 4: Baseline Probit and OLS Models – Male and Female Samples						
Coeff on Recent Disorder (T-stat) [Marginal effect]	(1) No controls	(2) Race, age, region	(3) Full set of controls	(4) No controls	(5) Race, age, region	(6) Full set of controls
	I. All males (N = 1,751)			II. Males with lifetime disorder (N=1,051)		
In labor force (Probit)	-0.645 (-6.85) [-0.167]	-0.765 (-8.64) [-0.187]	-0.635 (-6.58) [-0.132]	-0.502 (-5.33) [-0.140]	-0.649 (-7.49) [-0.167]	-0.561 (-5.63) [-0.128]
Employed (Probit)	-0.617 (-7.02) [-0.168]	-0.745 (-9.10) [-0.188]	-0.605 (-6.74) [-0.132]	-0.491 (-5.72) [-0.141]	-0.639 (-7.78) [-0.170]	-0.558 (-5.87) [-0.133]
Work hours (OLS)	-81.50 (-1.54) n = 1,423	-79.23 (-1.55) n = 1,423	-48.31 (-1.06) n = 1,422	-50.60 (-1.01) n = 827	-41.86 (-0.85) n = 827	-63.00 (-1.49) n = 827
Log earnings (OLS)	-0.015 (-0.18) n = 1,339	-0.016 (-0.18) n = 1,339	0.044 (0.83) n = 1,339	0.108 (1.32) n = 773	0.144 (1.75) n = 773	0.134 (2.07) n = 773
	III. All females (N = 2,386)			IV. Females with lifetime disorder (N = 1,514)		
In labor force (Probit)	-0.187 (-2.72) [-0.058]	-0.250 (-3.27) [-0.075]	-0.181 (-2.64) [-0.048]	-0.294 (-4.32) [-0.038]	-0.345 (-4.54) [-0.099]	-0.277 (-3.41) [-0.069]
Employed (Probit)	-0.058 (-1.35) [-0.047]	-0.208 (-3.10) [-0.068]	-0.160 (-2.94) [-0.046]	-0.230 (-3.34) [-0.078]	-0.264 (-3.69) [-0.086]	-0.177 (-2.56) [-0.069]
Work hours (OLS)	11.04 (0.26) n = 1,679	23.79 (0.53) n = 1,679	-3.30 (-0.08) n = 1,679	53.11 (1.09) n = 1,051	63.42 (1.21) n = 1,051	43.39 (0.90) n = 1.051
Log earnings (OLS)	0.06 (0.76) n = 1,551	0.05 (0.67) n = 1,551	0.103 (1.28) n = 1,551	-0.063 (-0.78) n = 976	-0.059 (-0.76) n = 976	0.018 (0.20) n = 976

Notes: Table shows coefficient, T-statistic (in parentheses), and average marginal effect (in brackets for probit models only) 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 OLS models that take into account the complex survey design. Models of work hours and earnings are limited to employed individuals with available data on outcome. Full set of controls includes: race, age, age squared, region, education, marital status, number of children under age 5, number of children 5-12, number of children 13-17, citizen, immigrant, smoker, chronic physical illness indicators, county unemployment and poverty rates, 11 occupational categories, number of moves during childhood, received welfare during childhood, lived with both parents until age 16, and frequent religious attendance.

Appendix Table 5: Summary of first stage results

	Males	Males with lifetime disorder	Females	Females with lifetime disorder
Number of disorders with onset prior to age 18	0.18 (13.24)	0.09 (6.06)	0.20 (21.63)	0.08 (9.79)
Mother was sad or anxious during respondent's childhood	0.09 (1.57)	0.07 (1.05)	0.08 (2.72)	0.05 (1.42)
Father was sad or anxious during respondent's childhood	0.04 (0.70)	0.01 (0.09)	0.03 (0.79)	0.09 (1.92)

Notes: The dependent variable in each model is "any disorder in past 12 months." Table shows coefficients and T-statistics (in parentheses) for the identifying instruments only – other coefficients not shown. Models include set of controls listed in Table 2.