The Journal of Mental Health Policy and Economics
J Ment Health Policy Econ **26**, 3-17 (2023)

Workplace Disclosure of Serious Mental Illness and Gainful Employment: Theory and Evidence

Marjorie L. Baldwin,[1]* Allan C. DeSerpa,[1] Steven C. Marcus

*[1]Ph.D., *Emeritus Professor of Economics, W.P. Carey School of Business, Arizona State University, Tempe, AZ, USA*
[2]Ph.D. Research Associate Professor, School of Social Policy and Practice, University of Pennsylvania

Abstract

Background: This study provides the first systematic analysis of the association between workplace disclosure of serious mental illness (SMI) and the probability of gainful employment, among workers employed in regular jobs. By *regular job,* we mean one that pays at least minimum wage, is not set aside for persons with disabilities, and was not obtained with assistance of mental health services. By *gainful employment,* we mean a regular job with monthly earnings that exceed the maximum allowable earned income for receipt of Social Security Disability Insurance.
Aims: Among persons with SMI who are capable of working in regular jobs, we aim to identify: (i) what individual and work-related factors are associated with the decision to disclose mental illness at work; and (ii) how the decision to disclose is related to the probability of gainful employment.
Methods: The analyses are based on a theoretical framework in which workers choose a level of disclosure to maximize utility from the benefits of employment, subject to constraints associated with mental illness-related stigma. We specify a bivariate probit regression in which the probabilities of disclosure and gainful employment are determined jointly. The model is estimated with data from a national survey of 602 workers, with schizophrenia, bipolar disorder, or major depression, who were employed in regular jobs post-onset of illness.
Results: The results identify individual (e.g. younger age, less self-stigma, more severe cognitive limitations) and work-related (e.g. longer job tenure, supportive firm, administrative support occupation) factors significantly associated with the probability of disclosure. The results also indicate that disclosure has a significant positive association with the probability of gainful employment, when the empirical model controls for the endogeneity of disclosure in the employment function. Other variables that have a significant positive association with gainful employment include education, job autonomy, and employment in a white-collar occupation.
Discussion: The data support the hypothesis that workers with SMI make the decision to disclose their condition based on the probability of a positive response from their employer, and this rational behavior is likely the reason for the strong correlation between disclosure and the probability of gainful employment. However, a limitation of the study is that our retrospective survey design cannot identify causal relationships.
Implications for Health Care Provision and Use: Work is an important recovery goal for many workers with SMI, so the disclosure decision is likely to be a significant topic of discussion between workers and their health care providers.
Implications for Health Policies: Amid the current focus on wellness in the workplace, policies aimed at reducing the stigma of mental illness at work, and promoting more tolerant and supportive workplace cultures, can improve the probability of gainful employment for workers with SMI.
Implications for Further Research: Further research is needed to design and implement workplace interventions that minimize the monetary/nonmonetary costs of disclosure for workers with SMI in regular jobs.

Received 25 January 2023; accepted 1 March 2023

Introduction

Among workers with disabilities, persons with serious mental illness (SMI) have some of the poorest outcomes in the labor market.[1-4] Their low employment rates are surely attributable, at least in part, to the impact of cognitive, emotional, and/or social limitations on worker productivity. Nevertheless, research suggests that some part of the labor market disadvantage experienced by workers with mental disorders is potentially attributable to disability-related stigma and discrimination.[5-7]

The stigma associated with mental illness is intense, pervasive, and persistent.[8,9] It is rooted in negative stereotypes of persons with mental disorders as dangerous, incompetent, unpredictable, hopelessly ill, and yet somehow responsible for their illness.[10] The behavioral response to such attributions is avoidance and punishment, that is, stigma and discrimination.[11] Qualitative evidence suggests that workers with mental illness are aware of the stigma associated with their disorder, and often anticipate that it will have negative consequences in the labor market: "I don't think you'd get a foot in through the door that way. You wouldn't get taken on in the first place if you told them you had a big mental history";[12] "if anybody at

*** Correspondence to:** Prof. Marjorie L. Baldwin, 501 East Orange Street, Tempe, AZ 85287-9801, USA.
Tel.: +1-480-577 2771
Fax: +1-480-965 0748
Source of Funding: National Institute of Mental Health [R01 MH111650] to Arizona State.

work or my professional body knew that I'd got schizo-anything I wouldn't be allowed to practice."[13]

Given the anticipation of discrimination, and the fact that mental illness is less visible than many physical disabilities, workers with SMI face a unique and impactful economic decision: whether or not to disclose their illness at work. Concealing their illness maintains their privacy, protects them from disability-related discrimination, and ensures that they will be treated like other workers,[14] but concealment can also be psychologically stressful and economically detrimental.[15] Nondisclosure is widespread, but costly, because suppressing information about mental illness can reduce a worker's productivity both directly (by mismatching workers and job tasks) and indirectly (by foregoing access to employer-provided job accommodations).

This article is the first systematic approach to analyzing the disclosure decision, and its association with *gainful employment*, among workers with SMI in *regular jobs* (defined as jobs that pay at least minimum wage; are not set aside for persons with disabilities; are not obtained with assistance of mental health services; and involve working a minimum of 20 hours per week). By *gainful employment*, we mean a regular job with monthly earnings greater than the maximum allowable earned income for receipt of Social Security Disability Insurance (SSDI). The objectives of the article are to identify: (i) among persons with SMI who are capable of working in regular jobs, what individual and work-related factors are associated with the decision to disclose mental illness in such a job; and (ii) how is the decision to disclose related to the probability of gainful employment.

We develop a theoretical framework in which the worker chooses a level of disclosure to maximize utility from the monetary and non-monetary benefits of employment, subject to constraints associated with mental illness-related stigma. Empirically, we specify a bivariate probit regression in which the probabilities of disclosure and gainful employment are determined jointly. Parameters of the model are estimated with unique data from 602 workers with serious mental illness (bipolar disorder, major depressive disorder, schizophrenia) who are working, or have worked, in regular jobs post-onset of mental illness. The data include a rich set of variables describing workers' job demands, workplace culture, current symptoms of mental illness, demographic and work-related characteristics, which enable us to include controls in our models for workers' preferences regarding disclosure vs. privacy, and for their reasonable expectations of stigma and discrimination if they choose to disclose.

The topic of gainful employment for workers with mental illness is important because, contrary to negative stereotypes, many persons with even the most serious mental illnesses are capable of holding well-paying jobs which provide financial security and stability.[16] Their human capital is an asset to society. Yet many persons with SMI fail to achieve gainful employment, in part because of the persistent stigma associated with their illness.[7] In the worst-case scenario, a worker may abandon the job market entirely, relying instead on public disability benefits for support. That scenario places an unnecessary burden on taxpayers, and is devastating for the worker with mental illness, for whom gainful employment is the pathway to financial independence.

Methods

Theory

Consumer choice theory provides the framework to model workplace disclosure of mental illness and its outcomes on employment. Consider an individual worker (i), with a diagnosis of serious mental illness at a measurable level m_i. The illness is unobservable at the time of hiring, so the worker may choose a level of disclosure ($d_i \in [0, 1]$) after they are employed. The level of disclosure may vary from 0 (no one knows), to degrees of selective disclosure (where some information is disclosed), to 1 (full disclosure of the worker's diagnosis and history of mental illness).*

Disclosure is the crucial decision variable in the model, with both direct and indirect effects on a worker's utility (U_i). Independent of other constraints, the worker has a preferred level of disclosure (d_i^*) which maximizes their utility. For most workers, $d_i^* < 1$ because they prefer to keep some details of their history of mental illness private. The worker may, however, deviate from their preferred level, because disclosure indirectly affects utility through its effects on acceptance in the workplace (a_i) and earnings (y_i). Thus,

$$U_i = U^i(d_i, a_i, y_i) \tag{1}$$

where utility is monotonically increasing with regard to acceptance and earnings ($U^i_a > 0, U^i_y > 0$), but the sign of U^i_d varies depending on the level of d_i, relative to d_i^*.

Acceptance in the workplace ($a_i \in [0, 1]$) is a good, up to the point of full acceptance (a_i=1), where the worker with SMI is treated just like any other worker. Disclosure affects acceptance through a social constraint that depends on the "culture of tolerance" ($c_i \in [0, 1]$) in the workplace in which the worker is employed, and the extent to which supervisors and/or co-workers have knowledge (k_i) of the worker's level of mental illness (where $k_i \equiv d_i m_i$). The culture of tolerance represents the degree to which a workplace accepts a worker with mental illness, where $c_i = 0$ implies the worker is excluded from the workplace, and $c_i = 1$ implies the worker is treated just like any other employee. Thus, the social constraint is:

$$a_i = a(c_i, k_i), \text{ with partial derivatives}$$
$$a_c > 0 \text{ and } a_k < 0, \text{ for any } 0 < c_i < 1 \tag{2}$$

* Selective disclosure may mean, for example, that a worker tells their employer that they have "mental health issues," but does not reveal their specific diagnosis.

Full acceptance is possible if a workplace is wholly tolerant of workers with mental illness ($c_i = 1$) or if a worker is successful in concealing their mental illness ($d_i = 0$).

The culture of tolerance is typically not observable until after a worker is employed. Even then, the assessment of workplace culture may have to be gleaned from how differences among workers are tolerated in general, as opposed to mental illness in particular. If a worker perceives a culture of intolerance (*i.e.* stigma and discrimination) they are likely to reveal less about their mental illness than they would otherwise prefer ($d_i < d_i^*$) for fear of losing acceptance ($\partial a/\partial d_i = m_i a_k < 0$ for any $c_i < 1$).

So long as a worker's mental illness is unobservable and undisclosed, their earnings are market-determined, based solely on their productivity. Productivity is a function of the human capital, h_i, the worker i brings to a particular job. A worker may have functional limitations associated with their mental illness (such as difficulty completing tasks on time, difficulty getting along with co-workers, excessive stress associated with particular job tasks) that reduce their productivity at work. If supervisors can observe the limitations, or their impact on a worker's output, the limitations will translate into reduced earnings commensurate with below-average productivity. In this case, disclosure may have a positive effect on earnings, if it results in workplace modifications (e.g. extra time to complete tasks, permission to work from home, a shift in tasks to reduce stress) that mitigate some of the negative effects of functional limitations on productivity. The downside of disclosure is that it exposes the worker to stigma and discrimination (*e.g.* loss of opportunities for training or advancement, harassment that aggravates workplace stress) which can have a negative effect on earnings. Inasmuch as workplace culture, human capital, and illness (diagnosis and functional limitations) are exogenous to the worker, disclosure becomes the only choice variable that affects earnings.

It is useful to specify the budget constraint in terms of its three components:

$$y_i = y(d_i;\, h_i,\, m_i,\, c_i) = y(h_i) + f(m_i, d_i) + s(m_i d_i,\, c_i) \qquad (3)$$

where $f(m_i d_i)$ represents the income effects of reduced productivity, and $s(m_i d_i,\, c_i) = s(k_i,\, c_i)$ captures the income-reducing effects of stigma and discrimination. As long as there is a culture of less than full tolerance ($c_i < 1$), the discrimination factor, $s(k_i, c_i)$, is negative; and becomes increasingly negative ($s_k < 0$) as knowledge of the diagnosis and severity of illness increases through disclosure.

Clearly, $f(m_i, d_i) < 0$, for any $m_i > 0$. Partial derivatives are: $f_m < 0$ (the impact of limitations on earnings increases with severity of illness); and $f_d \geq 0$ (the impact of limitations on earnings is nondecreasing with disclosure). The extreme cases are complete concealment, $f(m_i, 0)$, and full disclosure $f(m_i, 1)$. Full disclosure achieves maximum net productivity, but workers generally trade off some of the positive effects of disclosure on productivity against the negative effects of disclosure on acceptance. Even with complete concealment of a serious mental illness, the income effects of reduced productivity, $f(m_i, 0)$, may be small, if the worker's functional limitations have little impact on the tasks associated with their job.

All factors considered, the first-order condition for maximum utility is:

$$U_d^i + U_y^i f_d = -m_i(U_a^i a_k + U_y^i s_k) \qquad (4)$$

In a climate of full tolerance, the right-hand side of (4) goes to zero ($a_k = s_k = 0$), inducing the worker to disclose beyond their preferred level ($d_i > d_i^*$ and $U_d^i < 0$). The more likely scenario finds the worker inhibited by fear of stigma to disclose less than d_i^* ($U_d^i > 0$).

In sum, the model suggests that the extent to which an individual is willing to disclose SMI at work is determined by their personal preferences regarding disclosure (d_i^*), as well as the anticipated impact of disclosure on earnings (y_i) and acceptance in the workplace (a_i). Earnings (and, therefore, the probability of gainful employment) are a function of the human capital (h_i) a worker brings to a particular job, the extent to which the worker discloses their mental illness (d_i), the impact of mental illness and disclosure on productivity $f(m_i, d_i)$, and the degree to which the chosen level of disclosure subjects the worker to stigma and discrimination $s(k_i, c_i)$. The relationship between disclosure and earnings is an empirical question, as it depends on the relative impacts of disclosure on productivity and stigma. In what follows, we examine the relationship between a worker's decision whether or not to disclose SMI and their probability of gainful employment, using data collected by the authors from 2017 to 2021.

Data

Worker Survey

Eligible participants were recruited through a large, privately funded, nationwide healthcare survey (the PULSE®) fielded by IBM.* The PULSE® was designed to collect information on health conditions, health insurance, and service utilization, for health providers, government agencies, and others. Over the period our data were collected, the PULSE® interviewed 7,250 households per month, 11 months per year. Subjects were recruited through random digit dialing of U.S. households, or invitation via internet. Interviews were conducted by land line (50%), cell phone (5%) and internet (45%). Interviewers asked all participants if they were willing to participate in other research; about 60% gave permission to be contacted again.

We contracted with IBM to add five screening questions to the PULSE® to identify households in which there was a working-age person with SMI who was employed in a regular job post-onset of mental illness. Over the four-year period, IBM provided our survey firm with contact information for 9,613 households that included a potentially eligible worker with SMI, and agreed to be re-contacted.

Our interviewers were able to contact and initiate the consent process with 2,735 workers, of whom 941 refused to particpate. An additional 973 workers were excluded because further screening revealed that they did not meet all eligibility criteria for the study, namely: diagnosis of bipolar disorder, major depressive disorder, or schizophrenia spectrum disor-

* Refer to https://www.ibm.com/watson-health/learn/pulse-health-polls.

der;* working age (18-65); employed in a job that qualifies as regular employment for six months or longer post-onset of SMI; and, if not currently employed in the qualifying job, that job ended within the last five years (to minimize recall bias).

The *Survey of the Decision to Disclose Mental Illness at Work* was completed by 821 participants, who were reimbused $30 for their time. Subsequently, 219 participants were dropped from these analyses because of missing data or other exclusion critieria, so the final study sample includes 602 workers.

Variable Definitions

The *Survey* was designed by the authors, but the majority of questions were taken verbatim from large national surveys, or other published sources. Many variables in the empirical model were derived from standardized scales with validated psychometric properties. Additional details on the construction of these variables are provided in the **Appendix**.

The outcome variables of interest are *disclosure* and *gainful employment,* with reference to the job that qualifes as regular employment. Disclosure equals one if a worker told their employer about their mental illness; zero if their employer did not know about their mental illness.† Gainful employment equals one if a worker's monthly earnings in the qualifying job (as reported on the survey) exceeded the Social Security Administration (SSA) definition of substantial gainful activity; *and* they were either currently employed in the job or had left the job for reasons unrelated to their mental illness. Gainful employment equals zero if a worker's earnings in the qualifying job were below the SSA definition of substantial gainful activity and/or they left the job for reasons related to their mental illness.‡ The SSA definition of substantial gainful activity increased from $1,180 (2018) to $1,310 (2021) per month over the period in which our data were collected. (See **Appendix** for details.)

Controls for personal preferences regarding disclosure (d_i^*) include demographic characteristics (age, gender, race, ethnicity), a measure of self-stigma, and a measure of a worker's willingness to associate with others who have mental illness. The self-stigma variable is a worker's score on the alienation subscale of the Internalized Stigma of Mental Illness Scale.[18] The subscale is a discrete, increasing measure of the degree to which an individual feels different, out of place, or disappointed in themselves, because of their mental illness. The willingness to associate variable is a binary that equals one if a worker strongly agrees with the statement "I feel comfortable being seen in public with an obviously mentally ill person" (other possible responses are agree, disagree, disagree strongly).

With respect to acceptance in the workplace (a_i), we include binary indicators of a worker's diagnosis of mental illness and the culture of their workplace (supportive firm, supportive supervisor, supportive co-workers, public sector employment) in the empirical model. The three variables describing workplace culture correspond to factors from the Total Quality Management scale.[19] Each factor is a composite measure of multiple aspects of a firm's organizational culture. We define supportive firm equal to one if a worker indicates that their firm is "almost always" supportive, and likewise for supportive supervisor and co-workers.

With respect to earnings (y_i), the empirical model includes controls for workers' human capital (education, job tenure, functional limitations, co-morbidities) and job characteristics. Education dummies indicate the highest level of education attained (high school or less, some college, Bachelor's degree, post-graduate degree). Job tenure equals one if a worker's tenure in the qualifying job is greater than or equal to the sample median (3 years). Variables reflecting functional limitations associated with SMI come from questions on the National Co-Morbidity Survey-Replication, which ask about the severity of a worker's functional limitations across three domains (cognitive, social, emotional), in the 30-day period preceding the interview date. We construct three binary indicators of work limitations that equal one if a worker reports any moderate to severe limitations in a particular domain, and zero otherwise. Two additional binary variables identify workers who report a co-morbid physical or substance use disorder.

Variables defining job characteristics include three occupation dummies (white-collar, blue-collar, administrative support) and measures of job intensity and autonomy. The latter variables are derived from questions on the 4th European Working Conditions Survey, which was designed to capture workers' perceptions of their working conditions.[20] Job intensity is a binary that equals one if a worker indicates they are almost always under pressure to work quickly, or to meet deadlines. Job autonomy is derived from five questions asking workers whether or not they have control over various aspects of how and with whom they work. Job autonomy equals one if a worker indicates control over at least four aspects of their job.

Data Analytic Procedures

Empirical Model

The theoretical model implies that: (i) A worker's disclosure decision is influenced by their expectations regarding the impact of disclosure on earnings (y_i) and acceptance in the workplace (a_i). (ii) Disclosure may have a positive or negative impact on employment outcomes depending on the culture of the workplace (c_i) and what a worker chooses to reveal about their mental illness ($k_i = d_i m_i$). With respect to employment outcomes, we are interested in the association between probabilities of disclosure and gainful employment. Because the probability of disclosure depends, in part, on ex-

* Workers who said that they had been diagnosed with major depressive disorder completed a brief depression screener, the Patient Health Questionnaire-9 (PHQ-9), to verify diagnostic criteria for an episode of severe or moderately severe depression.[17]

† Workers whose employers know about their mental illness from another source (e.g., a co-worker) are excluded from the sample because disclosure was not the worker's decision.

‡ We include workers who left their jobs for reasons unrelated to mental illness with current workers because we aim to identify characteristics of workers who are/have been successful in a qualifying job despite their mental illness. Workers who left a qualifying job for other reasons (e.g., retirement) are considered successful in their qualifying job, because mental illness was not a factor in their departure.

pectations of its effect on earned income, disclosure is endogenous in the employment function. The endogeneity issue can be addressed by estimating the probabilities of disclosure and gainful employment jointly in a bivariate probit model, as specified below.[21-23]

A worker's probability of disclosure is not observable, instead we observe the binary outcome: $D_i = 1$ if the worker told their employer about their mental illness; $D_i = 0$ if their employer did not know about their illness. The probability of gainful employment is also unobservable. Instead, we observe: $Y_i = 1$ if a worker has been gainfully employed in a qualifying job for six months or longer, and is either currently employed in that job or has left that job for reasons unrelated to their mental illness; $Y_i = 0$ if a worker is currently employed in a job with earnings less than the SSDI cutoff for disability benefits, or if a worker left their most recent qualifying job for reasons related to their mental illness.

The model is specified as follows:

$$\dot{d}_i = \beta'_d \boldsymbol{X}_i + \delta t_i + \varepsilon_{di} \quad D_i = 1 \text{ if } \dot{d}_i > 0, 0 \text{ otherwise} \quad (5a)$$

$$\dot{y}_i = \beta'_y \boldsymbol{X}_i + \gamma D_i + \varepsilon_{yi} \quad Y_i = 1 \text{ if } \dot{y}_i > 0, 0 \text{ otherwise} \quad (5b)$$

where $\dot{d}_i$ and $\dot{y}_i$ are latent variables representing the probabilities of disclosure and gainful employment. $\boldsymbol{X}$ is a vector of variables correlated, in theory, with both the worker's disclosure decision and subsequent employment outcomes, and t is the measure of willingness to associate with others with mental illness. The error terms, ε_d and ε_y, are assumed to be distributed $N(0, 0, 1, 1, \rho)$ where ρ is the correlation coefficient between the errors in the two latent variable models, and variances are normalized to one.

Probabilities for each of the four possible outcomes of disclosure and employment are given by:

$$\begin{aligned} &Prob\,(d = D_i,\ y = Y_i) = \\ &= \Phi_2(q_{id}(\beta'_d \boldsymbol{X}_i + \delta t_i), q_{iy}(\beta'_y \boldsymbol{X}_i + \gamma D_i),\ q_{id} q_{iy} \rho), \end{aligned} \quad (6)$$

where: $q_{id} = 1$ if $D_i = 1$, and -1 if $D_i = 0$; $q_{iy} = 1$ if $Y_i = 1$, and -1 if $Y_i = 0$; and Φ_2 is the bivariate normal cumulative distribution function. Maximizing the likelihood function

$$\ln \mathcal{L} = \sum_i ln\ \Phi_2(q_{id}(\beta'_d \boldsymbol{X}_i + \delta s_i), q_{iy}(\beta'_y \boldsymbol{X}_i + \gamma D_i), q_{id} q_{iy} \rho) \quad (7)$$

yields the parameter estimates of interest.

Independent Variables

The vector $\boldsymbol{X}$ includes variables that affect a worker's: unconstrained preferences for disclosure (demographic characteristics, self-stigma); expectations regarding acceptance in the workplace (workplace culture, diagnosis of SMI); and expected earnings (human capital, job characteristics). Per the theoretical model, these variables are expected to influence employment outcomes both directly and indirectly (through their impact on the decision to disclose SMI).

Variables Reflecting Preferences for Disclosure

In the disclosure function, demographic characteristics (age, gender, race, ethnicity) are proxies for family and cultural norms regarding disclosing personal health information (d_i^* in the theoretical model).[24] In the employment function, the demographic variables control for potential sources of discrimination unrelated to disability, and for otherwise unexplained differences in employment outcomes associated with age, gender, race, or ethnicity.

Self-stigma is expected to have a negative association with disclosure, because workers who perceive mental illness as a source of shame or embarrassment are likely to conceal their illness to the extent that it is possible.[24-29] Self-stigma is also expected to be negatively correlated with the probability of gainful employment. Workers who feel inferior or out of place because of mental illness are likely to be less confident in their ability to maintain regular employment, and may also project this attitude to current or potential employers.

Variables Associated with Workplace Acceptance

Research indicates a hierarchy of stigma associated with diagnoses of mental illness such that bipolar disorder evokes more intense stigma than major depressive disorder, and schizophrenia evokes more intense stigma than bipolar disorder.[8, 30] Relative to workers with major depression, we expect workers with bipolar disorder or schizophrenia to be less likely to disclose, all else equal, because they *anticipate* greater stigma, and less likely to maintain gainful employment following disclosure, because they *experience* greater stigma.

Anecdotal evidence suggests that workers with mental illness are less likely to experience stigma and discrimination in more tolerant and supportive workplaces,[31,32] so we expect workplace culture variables (supportive firm, supervisor, co-workers) to be positively associated with both disclosure and gainful employment. To the extent that public sector jobs provide greater job security and greater tolerance, in general, than private sector jobs, we expect public sector employment also to have positive associations with disclosure and gainful employment.

Variables Reflecting Expected Earnings

Education and job tenure are indicators of the acquisition of (general or job-specific) human capital. We expect a positive association between job tenure and disclosure because workers may take time to assess the culture of a workplace before disclosing, and because, even in workplaces where the culture of tolerance is low, job-specific human capital may protect a worker from some of the negative consequences of disclosure. Education, like tenure, tends to increase job security, potentially protecting a worker from discrimination if they choose to disclose. On the other hand, education may qualify a worker with SMI for jobs where their functional limitations are more manageable (*e.g.* working from home vs. working on a production line), so the worker has less need to disclose. Hence, the expected association between education and disclosure is ambiguous. Both education and job tenure are expected to have positive associations with gainful employment, because human capital mitigates, to some extent, the negative productivity effects of the loss of health capital associated with disability.[33]

Functional limitations reflect a worker's loss of health capital, likely increasing the need for workplace modifications and making disability more visible, so we expect the limitations variables to be positively associated with the probability

of disclosure. Co-morbid health conditions also reflect a loss of health capital, but workers with co-morbidities may also anticipate more negative consequences of disclosure, so the expected relationship between co-morbidities and disclosure is ambiguous. Functional limitations and co-morbidities are both expected to have a negative association with gainful employment, reflecting the productivity losses associated with diminished health capital.[34-36]

With respect to job characteristics, high-intensity (stressful) jobs may exacerbate the symptoms of SMI, so job intensity is expected to be positively associated with disclosure (illness becomes more visible) and negatively associated with gainful employment (productivity is lower). High-autonomy (flexible) jobs typically make it easier for workers with SMI to maintain productivity without workplace modifications, mitigating the need to disclose and increasing the likelihood of success in gainful employment.[14, 37] It is unclear whether particular occupations are more or less conducive to disclosure of SMI, but white-collar jobs are expected to be positively associated with gainful employment, because mean wages in these jobs are higher than in blue-collar or administrative support occupations.

Instrumental Variable

The analysis is predicated on an instrumental variable approach which assumes that the identifying variable in the model, willingness to associate with others with mental illness (t_i), is: (i) correlated with the endogenous variable in the employment function, that is, disclosure (relevance assumption); but (ii) not correlated with the probability of gainful employment, except through its impact on disclosure (validity assumption).[21-23, 39]

With respect to relevance, the fact that a worker has no reservations about associating with other persons with SMI suggests that the worker does not perceive mental illness as something that ought to be concealed or avoided. Hence, we expect a positive relationship between the association variable and the probability of disclosure. With respect to validity, the association variable represents a worker's perceptions of others rather than themselves, so there is no reason to believe that willingness to associate affects the worker's productivity. Nor is willingness to associate likely to be observable to an employer and, even if observed, there is no reason to believe that it would trigger employer discrimination. Hence, the association variable is not expected to have a direct effect on the likelihood of gainful employment, but may have an indirect effect through its relationship with disclosure.

Other Analyses

For purposes of comparison, we also estimate univariate probit models of the probabilities of disclosure and gainful employment. These models assume independence between the error terms in the specifications of the latent variables $\dot{d}_i$, and $\dot{y}_i$, (equations 5a and 5b).

Finally, we conducted sensitivity analyses to determine if our instrumental variable is consistent with the relevance and validity assumptions of the bivariate probit model.

Results

Descriptive Statistics

Table 1 (column 1) presents means of variables for the full sample. The age and gender distributions of our sample are similar to the age and gender distributions of the U.S. population with SMI, age 18 and older, in 2019 (36% vs. 35% male; 22% vs. 22% age 18-29, 47% vs. 52% age 30-49, 31% vs. 26% age 50-65).* The racial distribution is comparable to the U.S. population overall, but Hispanic individuals are under-represented (8% vs. 19%).

In general, workers in our sample are relatively high-functioning: 80 percent have a college degree or some college credit (vs. 61% in the U.S. population aged 18-64).[42] Still, the majority of workers report moderate to severe cognitive (75%), social (74%), or emotional (84%) limitations associated with SMI. Nearly half (49%) report a physical disorder in addition to their mental illness, while only five percent report a co-morbid substance use disorder.† Slightly more than half the sample (55%) have disclosed their mental illness to their employer, and more than two-thirds (69%) meet our criteria for gainful employment post-onset of SMI.

Columns 2 and 3 of **Table 1** present variable means by disclosure status. Comparing unadjusted means for workers who have/have not disclosed, we find significant differences across a number of individual and work-related characteristics. With respect to variables associated with preferences for disclosure, workers who disclosed are more likely to be White individuals, and less likely to be Black individuals, than workers who have not disclosed. Workers who disclosed are also younger, and report lower levels of self-stigma, on average. With respect to variables associated with workplace acceptance, those who disclosed are more likely to have a diagnosis of bipolar disorder, less likely to have a diagnosis of major depressive disorder, and report greater support and tolerance in their workplaces. With respect to variables associated with earnings, those who disclosed are more likely to report moderate-to-severe functional limitations associated with SMI, more likely to have worked three years or longer in the qualifying job, and less likely to have a post-graduate degree. The only significant difference in job characteristics is that those who disclosed are more likely to be employed in an administrative-support occupation.

Bivariate Probit Model

Table 2 reports estimated coefficients and marginal effects (ME) for the bivariate probit model. Although our theoretical framework predicts causal effects between the independent variables and probabilities of disclosure or gainful employ-

* Authors' calculations based on published data.[40,41]

† The prevalence of substance use disorders in our sample (5%) is well below the 25% co-morbidity rate estimated for the population with SMI.[43] The low prevalence could reflect the nature of our targeted (high-functioning) population, or possible under-reporting of substance use by our participants.

Table 1. Variable Means by Disclosure Status**.**

	Full sample N=602	Disclosed N=333	Not disclosed N=269	p-value
Disclosed	0.55	–	–	–
Gainful employment	0.69	0.68	0.69	0.94
Preferences for disclosure				
Age				
18-29	0.22	0.26	0.17	0.01*
30-49	0.47	0.47	0.46	0.81
50-65	0.31	0.27	0.36	0.01*
Male	0.36	0.36	0.35	0.85
Race				
White workers	0.76	0.79	0.72	0.05*
Black workers	0.13	0.10	0.17	0.02*
Workers of another race	0.11	0.11	0.11	0.89
Hispanic workers	0.08	0.08	0.09	0.85
Self-stigma	2.24	2.15	2.34	0.002**
Willing to associate with others with MI	0.42	0.50	0.32	<0.0001**
Workplace acceptance				
Diagnosis				
Bipolar disorder	0.45	0.48	0.41	0.05*
Schizophrenia	0.11	0.12	0.10	0.42
Major depression	0.44	0.40	0.50	0.02*
Supportive				
Firm	0.53	0.61	0.44	<0.0001**
Supervisor	0.56	0.63	0.47	<0.0001**
Co-workers	0.35	0.38	0.31	0.08
Public sector	0.11	0.10	0.13	0.19
Productivity				
Education				
High school or less	0.20	0.23	0.17	0.08
Some college	0.43	0.44	0.42	0.55
Bachelor's degree	0.22	0.21	0.23	0.49
Post-graduate degree	0.15	0.12	0.18	0.04*
Job tenure ≥ 3 years	0.45	0.50	0.38	0.006**
Limitations				
Cognitive	0.75	0.83	0.66	<0.0001**
Social	0.74	0.78	0.70	0.02*
Emotional	0.84	0.88	0.80	0.009**
Co-morbid				
Physical disorder	0.49	0.52	0.45	0.09
Substance use disorder	0.05	0.04	0.06	0.33
Job				
Autonomy	0.32	0.34	0.28	0.12
Intensity	0.55	0.55	0.56	0.84
Occupation				
White-collar	0.40	0.37	0.43	0.12
Administrative-support	0.21	0.25	0.17	0.02*
Blue-collar	0.39	0.38	0.40	0.68

Note: p-values refer to X^2 tests of significant differences in means for disclosed/not disclosed samples: * indicates significant at the .05 level or better, ** significant at the .01 level or better.

ment, we are unable to verify causality with our retrospective cohort data. Thus, the marginal effects should be interpreted as adjusted associations between a dependent variable (disclosure or gainful employment) and each independent variable, with all other independent variables held constant.

Disclosure Function

The results for variables that represent individual preferences for revealing or concealing a mental illness indicate that disclosure has a significant positive association with younger age (marginal effect is +18 percentage points (pp) for age

Table 2. Coefficient Estimates and Marginal Effects for Bivariate Probit Model.

	Disclosed		Gainful employment	
	Coefficient[a]	Marginal effect	Coefficient[a]	Marginal effect
Disclosed	–	–	1.05 (0.37)	0.306**
Preferences for disclosure				
Age				
18-29	0.55 (0.17)	0.180**	0.25 (0.22)	0.073
30-49	0.20 (0.14)	0.065	0.06 (0.14)	0.017
Male	0.07 (0.12)	0.021	0.10 (0.12)	0.030
Race				
Black workers	–0.45 (0.17)	–0.147**	0.36 (0.17)	0.105*
Workers of another race	–0.16 (0.20)	–0.052	0.56 (0.22)	0.165*
Hispanic workers	–0.15 (0.22)	–0.049	0.27 (0.23)	0.078
Self-stigma	–0.23 (0.08)	–0.076**	0.01 (0.09)	0.004
Willingness to associate with others with MI	0.34 (0.11)	0.110**	–	–
Workplace acceptance				
Diagnosis				
Bipolar disorder	0.32 (0.12)	0.104**	–0.32 (0.12)	–0.094**
Schizophrenia	0.40 (0.20)	0.130*	–0.45 (0.19)	–0.130*
Supportive				
Firm	0.31 (0.14)	0.103**	0.12 (0.15)	0.036
Supervisor	0.23 (0.13)	0.076	–0.10 (0.13)	–0.029
Co-workers	–0.04 (0.12)	–0.014	0.04 (0.12)	0.011
Public sector	–0.07 (0.18)	–0.024	0.29 (0.19)	0.085
Productivity				
Education				
Some college	–0.20 (0.15)	–0.065	0.06 (0.15)	0.017
Bachelor's degree	–0.18 (0.19)	–0.058	0.42 (0.19)	0.122*
Post-graduate degree	–0.30 (0.21)	–0.097	0.48 (0.22)	0.140*
Job tenure ≥ 3 years	0.69 (0.12)	0.225**	0.08 (0.17)	0.024
Limitations				
Cognitive	0.72 (0.17)	0.237**	–0.50 (0.18)	–0.145**
Social	0.16 (0.16)	0.054	0.07 (0.16)	0.019
Emotional	–0.10 (0.20)	–0.031	–0.02 (0.20)	–0.007
Co-morbid				
Physical disorder	0.24 (0.12)	0.079*	–0.28 (0.12)	–0.081*
Substance use disorder	–0.44 (0.25)	–0.145	0.06 (0.26)	0.019
Job				
Autonomy	0.08 (0.13)	0.027	0.37 (0.14)	0.108**
Intensity	–0.16 (0.12)	–0.052	0.11 (0.12)	0.032
Occupation				
White-collar	–0.03 (0.14)	–0.009	0.40 (0.15)	0.118**
Administrative support	0.34 (0.16)	0.111*	0.04 (0.16)	0.012
ρ	–0.68** (0.22)			

Note: N=602. Standard errors in parentheses. Reference groups for categorical variables are: age=50-65, race=White worker, education=high school or less, occupation=blue-collar. *indicates estimated coefficient is significant at the .05 level or better, **significant at the .01 level or better.

18-29, relative to age 50-64), and a significant negative association with being a Black individual (-14.7 pp). Intensity of self-stigma has a significant negative association with disclosure (marginal effect of −7.6 pp per one-unit increase in the alienation scale), while positive attitudes toward others with SMI has a significant positive association (+11 pp).

Among the variables influencing workplace acceptance, both bipolar disorder and schizophrenia have a significant positive association with disclosure (+10.4 and +13 pp relative to major depressive disorder). A supportive firm culture also has a significant positive association with disclosure (+10.3 pp).

With respect to earnings-related variables, several measures of human capital are significant in the disclosure function,

but only one job characteristic (occupation). We find positive associations between disclosure and job tenure (+22.5 pp), cognitive limitations (+23.7 pp), and co-morbid physical disorders (+7.9 pp). Employment in an administrative-support occupation also has a significant positive association with disclosure (+11.1 pp relative to employment in a blue-collar occupation).

Gainful Employment

The key finding from the employment function is that disclosure has a positive and significant association with the probability of gainful employment, and the marginal effect (+30.6 pp) is large. Otherwise, it is race, diagnosis, and productivity-related variables that are significant in the employment function.

Being a non-White worker has a positive association with gainful employment (+10.5 pp for Black workers, +16.5 pp for workers of another race, relative to White workers), whereas a diagnosis of bipolar disorder or schizophrenia has a negative association (−9.4 pp and −13.0 pp relative to a diagnosis of major depressive disorder). Workplace culture variables are not significant in the employment function.

Gainful employment has a significant positive association with: higher levels of education (+12.2 pp for a Bachelor's degree and +14.0 pp for a post-graduate degree, relative to a high school education or less); employment in a job with high levels of autonomy (+10.8 pp); and employment in a white-collar occupation (+11.8 pp relative to blue-collar occupations). Gainful employment has a significant negative association with moderate to severe cognitive limitations (−14.5 pp) or co-morbid physical disorders (−8.1 pp). Job tenure and workplace culture variables are not significant in the employment function.

The estimated correlation coefficient ($\rho = -0.68$) is significant, consistent with our assumption that the probabilities of disclosure and gainful employment are interrelated. The negative sign suggests that unobserved characteristics which are positively (negatively) associated with disclosure are negatively (positively) associated with the probability of gainful employment. We cannot, for example, observe the myriad physical or social aspects of the workplace that create stress (e.g. noise, constant interruptions, difficult customers). Such stressors may trigger symptoms of SMI which make the illness more observable and reduce a worker's productivity, suggesting a positive association with the probability of disclosure and a negative association with the probability of gainful employment. The fact that these variables are unobserved, however, does not detract from the reality that our data control for an array of variables which are significantly associated with the outcomes of interest (e.g. workplace culture, functional limitations, self-stigma), and are not available together on any other data set.

Univariate Probit Models

Table 3 presents estimates from univariate probit models of the probabilities of disclosure and gainful employment. The univariate disclosure model produces essentially the same results as the disclosure function in the bivariate model, but there are notable differences in the univariate model for gainful employment. Most important, the naïve results imply that there is no significant association between disclosure and the probability of gainful employment, contrary to the large, positive, and highly significant association (+30.6 pp) we find in the bivariate model.

Three variables (age 18-29, supportive firm, job tenure) have a significant association with gainful employment in the univariate model, but are not significant in the employment function of the bivariate model. In the disclosure function of the bivariate model, however, all three variables have a significant positive sign, suggesting that the positive association between each variable and gainful employment operates indirectly through its positive association with disclosure.

Three variables (Black workers, cognitive limitations, co-morbid physical disorder) have no significant association with gainful employment in the univariate model, but are significant in the employment function of the bivariate model. In that model, being a Black worker has a significant positive association with gainful employment (although Black workers are less likely to disclose and to benefit from the positive association between disclosure and employment). In the bivariate model, moderate to severe cognitive limitations and co-morbid physical disorders have significant negative associations with gainful employment (but these workers are also more likely to disclose and to benefit from the positive association between disclosure and employment).

Sensitivity Analyses of the Instrumental Variable

Descriptive statistics and estimates of the univariate disclosure model are consistent with the relevance assumption (i.e. that the instrument, willingness to associate with others with SMI, is correlated with disclosure, the endogenous variable in the employment function). According to the unadjusted means (**Table 1**), 50 percent of workers who disclosed strongly agree that they "feel comfortable being seen in public with an obviously mentally i1ll person," compared to only 32 percent of workers who had not disclosed. The difference in means is in the expected direction and highly significant (X^2=20.84, p<0.0001). When we adjust for other correlates of disclosure in the univariate probit (**Table 3**), the association variable still has a highly significant, positive relationship with the probability of disclosure (ME=10.4 pp, p<0.01).

The validity assumption (that willingness to associate has no direct correlation with the probability of gainful employment) cannot be directly tested.[44] We did, however, run alternate models with: (i) the association variable included in the univariate employment function; and (ii) the association variable included in the employment function of the bivariate probit. In each case, the estimated coefficient is not significant at the .05 level of confidence (p=0.08, p=0.50 respectively). These results lend credence to the assumption that willingness to associate with others with mental illness does not have an independent association with the probability of gainful employment.

Table 3. Coefficient Estimates and Marginal Effects for Univariate Probit Models.

	Disclosed		Gainful employment	
	Coefficient[a]	Marginal effect	Coefficient[a]	Marginal effect
Preferences for disclosure				
Age				
18-29	0.55 (0.17)	0.182**	0.54 (0.18)	0.161**
30-49	0.19 (0.14)	0.061	0.17 (0.14)	0.051
Male	0.06 (0.12)	0.019	0.13 (0.13)	0.040
Race				
Black workers	–0.42 (0.17)	–0.138*	0.23 (0.17)	0.068
Workers of another race	–0.13 (0.20)	–0.043	0.59 (0.24)	0.174*
Hispanic workers	–0.18 (0.22)	–0.058	0.24 (0.25)	0.072
Self-stigma	–0.24 (0.09)	–0.080**	–0.11 (0.08)	–0.032
Willing to associate with others with MI	0.32 (0.12)	0.104**	–	–
Workplace acceptance				
Diagnosis				
Bipolar disorder	0.30 (0.12)	0.099*	–0.24 (0.13)	–0.070
Schizophrenia	0.39 (0.21)	0.128	–0.36 (0.20)	–0.107
Supportive				
Firm	0.32 (0.13)	0.107**	0.28 (0.14)	0.084*
Supervisor	0.23 (0.13)	0.074	–0.01 (0.14)	–0.004
Co-workers	–0.03 (0.12)	–0.010	0.03 (0.13)	0.008
Public sector	–0.12 (0.18)	–0.040	0.26 (0.20)	0.077
Productivity				
Education				
Some college	–0.18 (0.16)	–0.058	–0.02 (0.15)	–0.006
Bachelor's degree	–0.16 (0.19)	–0.052	0.39 (0.20)	0.116*
Post-graduate degree	–0.26 (0.21)	–0.084	0.43 (0.23)	0.127
Job tenure ≥ 3 years	0.67 (0.12)	0.221**	0.38 (0.13)	0.113**
Limitations				
Cognitive	0.71 (0.17)	0.232**	–0.27 (0.18)	–0.078
Social	0.17 (0.16)	0.056	0.16 (0.17)	0.048
Emotional	–0.11 (0.20)	–0.037	–0.09 (0.22)	–0.025
Co-morbid				
Physical disorder	0.25 (0.12)	0.084*	–0.21 (0.12)	–0.062
Substance use disorder	–0.46 (0.26)	–0.152	–0.11 (0.27)	–0.032
Job				
Autonomy	0.06 (0.13)	0.020	0.44 (0.14)	0.130**
Intensity	–0.15 (0.12)	–0.049	0.06 (0.12)	0.018
Occupation				
White-collar	–0.02 (0.14)	–0.005	0.47 (0.15)	0.139**
Administrative support	0.35 (0.16)	0.116**	0.20 (0.16)	0.060
Disclosed	–	–	–0.06 (0.13)	–0.018

Note: N=602. Standard errors in parentheses. Reference groups for categorical variables are: age=50-65, race=White worker, education=high school or less, occupation=blue-collar. *indicates estimated coefficient is significant at.05 level or better, ** significant at .01 level or better.

Discussion

Disclosure and Gainful Employment

The key result from the bivariate model is that disclosure has a large, positive, and highly significant association with the probability of gainful employment. At least two possible mechanisms may explain this finding. Although we are unable to measure causality in this analysis, it is possible that disclosure increases the likelihood of gainful employment by providing access to employer-provided job accommodations and other workplace supports, or by alleviating the stress of concealment.

Alternatively, the relationship between disclosure and employment may reflect selectivity in workers' decisions to disclose. Our theory predicts that workers evaluate the relative risks of disclosure based on their assessments of workplace culture, job security, etc. Those who expect their employ-

ers to respond to disclosure with acceptance and support are more likely to disclose, hence the positive association between disclosure and gainful employment may affirm the workers' judgements. We cannot distinguish between explanations, and both may be at play.

In related work, Russinova *et al*. estimate the relationship between disclosure of mental illness and sustained competitive employment among a sample of workers with serious mental illness (defined as a lifetime history of at least one psychiatric hospitalization, or lifetime receipt of disability benefits because of mental illness).[45] The authors find no significant relationship between disclosure and sustained employment over their five-year observation period, in contrast to our finding of a large, significant, and positive association between disclosure and the probability of gainful employment. The difference in results may reflect differences in the outcome variables (duration of employment vs. earnings that qualify as gainful employment), differences in the nature of study samples (their sample includes workers who obtain jobs through rehabilitation services, or who are employed in jobs set aside for workers with disabilities); as well as differences in estimation methods (univariate vs. bivariate models).

Variables Reflecting Individual Preferences for Disclosure

Our theory predicts that Black workers will have lower preferences for disclosure than White workers, because Black workers anticipate greater costs (racial- and disability-related discrimination) to disclosure. Being a Black worker is significant with the expected negative sign in the disclosure function, so its indirect association with gainful employment is negative. Holding disclosure constant, however, being a Black worker is associated with a higher probability of gainful employment relative to being a White worker, which may appear to be a counter-intuitive result. One possible explanation is that Black workers are more cautious in disclosing mental illness to their employer than are White workers (because Black workers anticipate more severe penalties if their assessment of workplace culture is incorrect). If this is the case, the positive, significant association with gainful employment may reflect greater selectivity in disclosure among Black workers.

Being male has no significant association with disclosure or gainful employment in our estimates. The insignificance of gender in the employment function is consistent with some prior research indicating that among workers with SMI, males do not have an advantage in the labor market.[7,36,37]

Consistent with our theoretical model, self-stigma has a negative and highly significant association with the probability of disclosure in our estimates. Self-stigma is not significant in the employment function, but the results suggest a possible causal relationship between self-stigma and poor employment outcomes, operating through the lower probability of disclosure among workers who feel ashamed, embarrassed, or inferior because of their mental illness. If so, policies designed to reduce mental illness-related stigma have the potential to improve employment outcomes for this population both by reducing discrimination in the workplace, and by changing the way workers with mental illness perceive themselves.

Variables Reflecting Workplace Acceptance

We find that diagnoses of bipolar disorder or schizophrenia are associated with a higher probability of disclosure, and lower probability of gainful employment, relative to a diagnosis of major depressive disorder. The results for employment are consistent with our predictions based on the hierarchy of stigma associated with mental disorders (i.e. all else equal, workers with bipolar disorder or schizophrenia experience greater stigma and discrimination in the workplace than do workers with major depression). However, we also predicted that workers with bipolar disorder or schizophrenia would be less likely to disclose their illness, because of greater anticipated stigma and discrimination. One possible explanation for the contrary findings is that our functional limitation variables are imperfect controls for the visibility/severity of mental illness, so the diagnosis variables capture, in part, the tendency of persons with schizophrenia or bipolar disorder to disclose more than they would otherwise prefer ($d_i > d_i^*$), either to explain observable symptoms of SMI, or to obtain adjustments in the workplace.

With respect to workplace culture, our results show a significant positive association between workers' disclosure decisions and human resource policies and practices of the firm. Again, we cannot assume a causal relationship. It is possible that, following disclosure, workers assess their workplace cultures more positively than they would have prior to disclosure. Indeed, there is some support for the idea that workers who have told their employers about their mental illness experience less discrimination than they anticipated before disclosure.[15] On the other hand, it may be as our theory predicts, that workers' assessments of a culture of tolerance in the workplace increase the likelihood of disclosure. The relationships among workplace culture, disclosure of mental illness, and gainful employment deserve further investigation. If culture does influence disclosure, our findings have important implications for employers regarding integration of persons with mental illness in regular jobs, namely that employment outcomes for this population could be improved by providing safe opportunities for workers to disclose their illness if they choose to do so.

Variables Reflecting Worker Productivity

Our results indicate a direct, positive, and significant association between education and gainful employment that arguably reflects a causal relationship. For most workers in our sample, educational outcomes were determined prior to the qualifying employment spell, suggesting that education influenced their probability of gainful employment. The gradient in marginal effects (+12.2 pp for college degree, +14.0 pp for post-graduate degree) is also consistent with a causal relationship. Finally, the result is consistent with a considerable literature showing that education can mitigate, to some extent, the loss of health capital associated with a disability.[16,33,46]

The relationship between education and gainful employ-

ment has particular import for our target population because the onset of schizophrenia or bipolar disorder often occurs in late adolescence, frequently up-ending a college career.[47] Students with SMI who are unable to complete their education face a dual disadvantage in the labor market: the loss of human capital associated with a mental illness, and the foregone human capital associated with dropping out of school.

The fact that job tenure is not significant in the employment model is unexpected. As with human capital acquired through education, human capital acquired through job-specific experience has a well-established, positive relationship with employment outcomes. In our model, the positive association between job tenure and gainful employment is indirect, through the large, positive, and significant association between job tenure and the probability of disclosure.

Our finding that job autonomy has a positive, significant association with gainful employment is consistent with much prior research demonstrating the importance of flexible job demands for workers with SMI.[14,38] Job autonomy is not, however, significant in the disclosure function. Flexible job demands make it relatively easy for an employer to comply with requests for workplace adjustments, suggesting that workers in autonomous jobs would be more likely to disclose because they anticipate a positive response to their requests. On the other hand, flexible job demands also make it relatively easy for a worker to adapt their work to meet the needs of their mental illness, without approval from a supervisor, suggesting that workers in autonomous jobs would be less likely to disclose. The two effects may offset one another, possibly explaining the insignificant results for job autonomy in the disclosure function.

Working in an administrative support occupation has an indirect positive relationship with gainful employment, through its positive association with disclosure. One possible explanation is that workers in administrative jobs perceive greater benefits associated with disclosure relative to workers in other occupations. The workplace adjustments for SMI (e.g., permission to take unscheduled breaks, written checklists of job tasks) may, for example, be more amenable to the demands of administrative jobs (e.g. administrative assistant, clerk), than to the demands of white-collar (e.g. data analyst, teacher) or blue-collar (e.g. machine operator, sales associate) jobs commonly represented in our data. On the other hand, disclosure may create opportunities for some workers with mental illness to move from more stressful occupations (e.g. sales) to less stressful administrative-support positions (e.g. purchasing) within the same firm, thus accounting for the positive association between disclosure and administrative-support occupations.

Limitations

Our data, which represent an under-studied segment of the population with SMI, still have some limitations, including the potential for measurement error. For example, we rely on self-reported diagnoses of SMI (with the exception of major depressive disorder), which may not be concordant with medical records. Nevertheless, the fact that more than 80 percent of respondents report moderate to severe functional limitations associated with mental illness suggests that the self-reported diagnoses are mostly accurate.

Our retrospective study design means that information relevant to different time periods was collected at one point in time, which may also introduce measurement error. The functional limitations variables, for example, reflect respondents' limitations in the 30 days prior to the survey, not necessarily during their employment in the qualifying job or, more specifically, at the time of disclosure. Our data may also be subject to recall bias, although we try to minimize this source of error by excluding workers whose most recent qualifying job ended more than five years before the interview date.

The fact that we do not have longitudinal data also means that we cannot draw conclusions regarding causality for most of the associations we report. We cannot conclude that disclosure will improve employment outcomes for a given worker with SMI, or that a worker should (or should not) disclose mental illness to their employer.

Finally, although ours is the only national sample of the target population, it is not necessarily nationally representative. It is, however, demographically and occupationally diverse, with age and gender distributions similar to those of the U.S. population with SMI.

Conclusions

This study provides the first systematic analysis of the decision to disclose serious mental illness at work, among workers employed in regular, mainstream jobs. Data come from a large, national survey of workers with SMI, all of whom were employed in regular jobs post-onset of mental illness. Many workers were gainfully employed at the time of the survey, belying the stereotype that persons with serious mental illness are incapable of holding more than menial jobs. The workers have higher mean wages, longer average job tenure, and greater representation in managerial/professional occupations, than is typical of employment studies of persons with SMI. As such, the sample represents a segment of the population that has been largely unstudied.

The analyses are grounded in a novel theoretical model in which workers with SMI choose a level of disclosure after they are hired. Their objective is to maximize utility from earned income and acceptance in the workplace, subject to constraints imposed by mental illness-related stigma. Workers anticipate the effect of disclosure on employment outcomes in choosing what to reveal about their mental illness, so disclosure and gainful employment are interdependent. Thus, another important contribution of the study is the joint estimation of disclosure and employment functions in a bivariate probit model, which controls for the endogeneity of disclosure in the employment function.

The results are consistent with the assumption that workers with serious mental illness behave rationally in conditioning their disclosure decision on the likelihood of a positive response from their employer. This behavior may explain the large, positive, and highly significant association we find between probabilities of disclosure and gainful employment.

Further research is needed to identify workplace interventions that minimize the costs of disclosure, with the ultimate objective of improving employment outcomes for workers with SMI who are capable of gainful employment.

Acknowledgements

This research was supported by a grant from the National Institute of Mental Health [R01 MH111650] to Arizona State University. The worker survey was conducted via telephone by WestGroup Research of Phoenix, AZ (www.westgroupresearch.com). The authors gratefully acknowledge the computer programming assistance of Xie Ming, as well as helpful comments from Paul Allison, Morgan C. Shields, and Rebecca M. B. White.

References

1. Banerjee S, Chatterji P, Lahiri K. Identifying the mechanisms for workplace burden of psychiatric illness. *Med Care* 2014; **52**: 112-120.
2. Bouwmans C, de Sonneville C, Mulder CL, Hakkaart-van Roijen L. Employment and the Associated impact on quality of life in people diagnosed with schizophrenia. *Neuropsychiatr Dis Treat* 2015; **11**: 2125-2142.
3. Luciano A, Meara E. 2014. Employment status of people with mental illness: National survey data from 2009 and 2010. *Psychiatr Serv* 2014; **65**: 1201-1209.
4. Cornwell K, Forbes C, Inder B, Meadows G. Mental illness and its effects on labour market outcomes. *J Ment Health Policy Econ* 2009; **12**: 107-118.
5. Hipes C, Lucas J, Phelan JC, White RC. The stigma of mental illness in the labor market. *Soc Sci Res* 2016; **56**: 16-25.
6. Baldwin ML, Marcus SC. Perceived and measured stigma among workers with serious mental illness. *Psychiatr Serv* 2006; **57**: 388-392.
7. Baldwin ML, Marcus SC. Labor market outcomes of persons with mental disorders. *Ind Relat* 2007: **46**: 481-510.
8. Choe C, Baldwin ML, Song H. A hierarchy of stigma associated with mental disorders. *J Ment Health Policy Econ* 2020; **23**: 43-54.
9. Schomerus, G, Schwahn C, Holzinger A, Corrigan PW, Grabe HJ, Carta MG, Angermeyer MC. Evolution of public attitudes about mental illness: A systematic review and meta analysis. *Acta Psychiatr Scand* 2012; **125**: 440-452.
10. Krupa T, Kirsh B, Cockburn L, Gewurtz R. Understanding the stigma of mental illness in employment. *Work* 2009: **33**: 413-425.
11. Corrigan P, Markowitz FE, Watson A, Rowan D, Kubiak MA. An Attribution model of public discrimination towards persons with mental illness. *J Health Soc Behav* 2003; **44**: 162-179.
12. Marwaha S, Johnson S. Views and experiences of employment among people with psychosis: A qualitative descriptive study. *Int J Soc Psychiatry* 2005; **51**: 302-316.
13. Dinos S, Stevens S, Serfaty M, Weich S, King M. Stigma: The feelings and experiences of 46 people with mental illness: Qualitative study. *Br J Psychiatry* 2004; **184**: 176-181.
14. Brohan E, Henderson C, Wheat K, Malcolm E, Clement S, Barley EA, Slade M, Thornicroft G. Systematic review of beliefs, behaviours and influencing factors associated with disclosure of a mental health problem in the workplace. *BMC Psychiatry* 2012; **12**: 1-14.
15. Yoshimura Y, Bakolis I, Henderson C. Psychiatric diagnosis and other predictors of experienced and anticipated workplace discrimination and concealment of mental illness among mental health service users in England. *Soc psychiatry psychiatr epidemiol* 2018; **53**: 1099-1109.
16. Mechanic D, Bilder S, McAlpine DD. Employing persons with serious mental illness. *Health Aff* 2002; **21**: 242-253.
17. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med* 2001; **16:** 606-613.
18. Ritsher JB, Otilingam PG, Grajales M. Internalized stigma of mental illness: Psychometric properties of a new measure. *Psychiatry Res* 2003; **121**: 31-49.
19. Zeitz G, Johannesson R, Ritchie Jr JE. An employee survey measuring total quality management practices and culture. *Group Organiz Manage* 1997; **22**: 414-444.
20. Parent-Thirion A, Fernández Macías E, Hurley J, Vermeylen G. *Fourth European Working Conditions Survey*. Dublin: European Foundation for the Improvement of Living and Working Conditions, 2007.
21. Barnay T, Defebvre E. Gender differences in the influence of mental health on job retention. *Labour* 2019; **33**: 507-532.
22. Chatterji P, Alegria M, Takeuchi D. Psychiatric disorders and labor market outcomes: evidence from the National Comorbidity Survey-Replication. *J Health Econ* 2011; **30**: 858-868.
23. Brown III, HS, Pagán JA, Bastida E. The impact of diabetes on employment: Genetic IVs in a bivariate probit. *Health Econ* 2005; **14**: 537-544.
24. Bril-Barniv S, Moran GS, Naaman A, Roe D, Karnieli-Miller O. A Qualitative study examining experiences and dilemmas in concealment and disclosure of people living with serious mental illness. *Qual Hlth Res* 2017; **27**: 573-583.
25. Corrigan PW, Rao D. On the self-stigma of mental illness: Stages, disclosure, and strategies for change. *Can J Psychiatry* 2012; **57**: 464-469.
26. Pahwa R, Fulginiti A, Brekke JS, Rice E. Mental illness disclosure decision making. *Am J Orthopsychiatry* 2017; **87**: 575-584.
27. Peterson D, Currey N, Collings S. "You don't look like one of them": Disclosure of mental illness in the workplace as an ongoing dilemma. *Psychiatr Rehabil J* 2011; **35**: 145-147.
28. Ridge D, Broom A, Kokanović R, Ziebland S, Hill N. Depression at work, authenticity in question: Experiencing, concealing and revealing. *Health* 2019; **23**: 344-361.
29. Toth, KE, Dewa, CS. Employee decision-making about disclosure of a mental disorder at work. *J Occup Rehabil* 2014; **24**: 732-746.
30. Wood L, Birtel M, Alsawy S, Pyle M, Morrison A. Public perceptions of stigma toward people with schizophrenia, depression, and anxiety. *Psychiatry Res* 2014; **220**: 604-608.
31. Joyce T, McMillan M, Hazelton M. The workplace and nurses with a mental illness. *Int J Ment Health Nurs* 2009; **18**: 391-397.
32. Peterson D, Gordon S, Neale J. It can work: Open employment for people with experience of mental illness. *Work* 2017; **56**: 443-454.
33. Hollenbeck K, Kimmel J. Differences in the returns to education for males by disability status and age of disability onset. *Southern Econ J* 2008; **74**:707-724.
34. Kaneda Y, Jayathilak H, Meltzer HY. Determinants of work outcome in schizophrenia and schizoaffective disorder: Role of cognitive function. *Psychiatry Res* 2009; **169**: 178-179.
35. Dickerson FB, Boronow JJ, Stallings CR, Origoni AE, Cole S, Yolken RH. Association between cognitive functioning and employment status of persons with bipolar disorder. *Psychiatr Serv* 2004; **55**: 54-58.
36. Ojeda VD, Frank RG, McGuire TG, Gilmer TP. Mental illness, nativity, gender and labor supply. *Health Econ* 2010; **19**: 396-421.
37. Banerjee S, Chatterji P, Lahiri K. Effects of psychiatric disorders on labor market outcomes: A latent variable approach using multiple clinical indicators. *Health Econ* 2017; **26:** 184-205.
38. Bubonya M, Cobb-Clark DA, Wooden M. Mental health and productivity at work: Does what you do matter? *Labour Econ* 2017; **46**: 150-165.
39. Kafali N, Cook B, Wang S, Martinez PG, Selke Z, Blanco C. Impact of mental disorders on employment and receipt of public assistance: An instrumental variables approach. *J Ment Health Policy Econ* 2015 **18**: 137-145.
40. National Institute of Mental Health. Past-year prevalence of serious mental illness among U.S. adults. U.S. Department of Health and Human Services, 2019. https://www.nimh.nih.gov/health/statistics/mental-illness. Accessed September 5, 2021.
41. Census Bureau. U.S. population estimates. U.S. Department of Commerce, 2019. https://www.census.gov/quickfacts/fact/table/US/PST045219. Accessed Sept 5, 2021.
42. Census Bureau. Educational atainment in the United States: 2019. U.S. Department of Commerce, 2020. https://www.census.gov/data/tables/2019/demo/educational-attainment/cps-detailed-tables.html. Accessed September 5, 2021.

43. National Institute on Drug Abuse. Common comorbidities with substance use disorders research report. U.S. Department of Health and Human Services, 2020. https://www.drugabuse.gov/publications/research-reports/common-comorbidities-substance-use-disorders/part-1-connection-between-substance-use-disorders-mental-illness. Accessed September 27, 2021.
44. Goldman DP, Bhattacharya J, McCaffrey DF, Duan N, Liebowitz AA, Joyce GF, Morton SC. Effect of insurance on mortality in an hiv-positive population in care. *J Am Statistical Assoc* 2001; **96**: 883-894.
45. Russinova Z, Bloch P, Wewiorski N, Shappell H, Rogers ES. Predictors of sustained employment among individuals with severe mental illness: Findings from a 5-year naturalistic longitudinal study. *J Nerv Ment Dis* 2018; **206**: 669-679.
46. Henderson DJ, Houtenville A, Wang L. The distribution of returns to education for people with disabilities. *J Labor Res* 2017; **38**: 261-282.
47. Hunt J, Eisenberg D, Kilbourne AM. 2010. Consequences of receipt of a psychiatric diagnosis for completion of college. *Psychiatr Serv* 2010; **61**: 399-404.
48. Social Security Administration. Monthly substantial gainful activity amounts by disability type, 2018-2021. https://www.ssa.gov/oact/cola/sga.html. Accessed September 5, 2021.
49. Employment and Training Administration. O*Net code connector. U.S. Department of Labor, 2021, https://www.onetcodeconnector.org/. Accessed September 5, 2021.

Appendix

Details on Construction of Variables

Gainful Employment

The earnings criterion for gainful employment is monthly earnings in excess of the Social Security Administration cut-off for substantial gainful activity (SGA). The SSA updates the definition of substantial gainful activity annually. In constructing the gainful employment variable, we used the SGA definition that applied in the year a worker was interviewed. Over the period our data were collected, the limits on monthly earnings were: $1,180 in 2018, $1,220 in 2019, $1,260 in 2020, and $1,310 in 2021.[48]

Self-stigma

The measure of self-stigma is a worker's score on the alienation sub-scale of the Internalized Stigma of Mental Illness Scale.[18] The sub-scale consists of six statements: "I feel out of place in the world because I have a mental illness"; "I feel inferior to others who don't have a mental illness"; "I am embarrassed or ashamed that I have a mental illness"; "I am disappointed in myself for having a mental illness"; "People without mental illness could not possibly understand me"; "Having a mental illness has spoiled my life." Responses are on a Likert-scale from strongly disagree=1 to strongly agree=4. A worker's score is the mean across the six items.

Workplace Culture

Variables describing supportive aspects of a firm's culture are derived from factors of the Total Quality Management Scale (TQM).[19] Supportive firm is derived from four statements that comprise the *trust* factor on the TQM ("I know exactly what is expected of me"; "Within reason, people in this organization can say what they want without fear of punishment"; "My supervisor shows complete trust in his/her employees' ability to do well"; "I feel free to discuss problems or negative feelings with my supervisor." Supportive supervisor is derived from three statements that comprise the *supervision* factor: "My supervisor gives credit to people when they do a good job"; "My supervisor rewards being cooperative and a good team player"; My supervisor gives me feedback on work I have done." Having supportive co-workers is derived from four statements that comprise the *social cohesion* factor: "People in my work unit enjoy their co-workers"; "Coworkers in my work unit are like a family"; "Problems exist here between co-workers"; "I trust my co-workers to do what is in the best interests of the organization." Responses are on a 5-point Likert scale from 1 ("never") to 5 ("always"). We define supportive firm equals one if a worker's mean score on the *trust* factor is greater than or equal to 4 ("almost always"), and similarly for supportive supervisor (*supervision* factor) and co-workers (*social support* factor).

Functional Limitations

Using National Co-Morbidity Survey-Replication (NCS-R Section 21: 30-Day Functioning, https://www.hcp.med.harvard.edu/ncs/replication.php) questions, we derive binary variables reflecting a worker's functional limitations across three domains: cognitive (e.g., "concentrating on doing something for 10 minutes," "remembering to do important things"); social (e.g., "starting and /maintaining a conversation," "dealing with people you do not know well"); and emotional (e.g., whether "your mental illness affects you emotionally," "makes it difficult to control your emotions around people"). Responses are on a Likert scale from 0 ("no difficulties") to 3 ("severe difficulties"). We define the binary variables for each functional domain equal to one if a worker reports any moderate to severe limitations in that domain.

Job Characteristics

Variables describing job characteristics are derived from questions on the 4th European Working Conditions Survey.[20] Job intensity is derived from two questions asking workers how often their job involved "working at very high speed," or "working to tight deadlines." Responses are on a 5-point Likert scale from 1 ("never") to 5 ("always"). We define job intensity = 1 if a worker's mean response is ≥ 4 ("almost always"). Job autonomy is derived from 5 questions asking workers if they could change their "order of tasks," "methods of work," "speed of work," or could "take breaks when they chose," or "influence the choice of work partner." Responses to these questions are binary (yes = 1). We define job autonomy = 1 if the sum across the 5 items is ≥ 4.

Occupations

Occupation is an open-ended response on the survey. Workers' descriptions of their occupations are coded into 22 major occupational groups defined by 2-digit Standard Occupational Classification (SOC) codes, with the aid of O*Net, an on-line application sponsored by the Department of Labor.[49] We use the SOC codes to define white-collar (SOC 11-29), administrative (SOC 43) and blue-collar (SOC 31-41, 45-55) occupations.