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Course of Mental Illness and Role of Multiple Health Conditions Among People Under Age 50 in Predicting Change in Public Disability Benefit Status and Labor Force Participation

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ABSTRACT

Project Number

D-MP-16-06

Title

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Key Findings and Policy Implications

Given the evidence for the effectiveness of supported employment services in helping people with serious mental illness acquire and maintain employment, there have been calls for expanding evidence-based supported employment services for this population, with suggestions that this also might reduce Social Security Administration (SSA) disability program costs.

The purpose of this study is to determine whether deteriorating mental health conditions result in premature labor force exit among workers with psychiatric disabilities under age 50 and, concomitantly, whether worsening mental health increases the likelihood of becoming an SSI/DI beneficiary. We also examine whether co-occurrence of physical health conditions along with disabling mental health disorders increases the risk of premature labor force exit, and leads to enrollment in the SSI and DI programs. Finally, our study explores whether receiving supported employment services interacts with the presence of co-morbid physical health conditions and deteriorating mental illness course to influence labor force participation and SSA disability beneficiary status.

We found that deteriorating mental health conditions as measured by exacerbated symptomatology were significantly associated with more frequent and earlier job loss among people with severe mental illness. In addition, we found that mental health deterioration without proper management was significantly associated with premature job loss. For our second study question, we found that mental health deterioration resulted in more frequent and earlier reports of new SSI/DI cash benefits. We found that the presence of comorbid physical health conditions was not associated with job loss or report of new SSI/DI cash benefits. Finally, there was no interaction effect between supported employment and deteriorating mental illness or the presence of physical health co-morbidities. However, supported employment recipients were more likely to receive proper clinical care management, and more likely to secure and maintain employment.

Results suggest that expansion of supported employment services may serve to also expand access to best practice clinical treatment, and that appropriate clinical management of mental health deterioration will promote labor force participation and prevent premature job loss.

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I. BACKGROUND

Given evidence from multiple national household surveys that sizable proportions of adults with psychiatric disabilities remain out of the labor force for long periods of time (Cook, 2006), there have been calls for expanding evidence-based supported employment services for this population (Drake et al., 2009) suggesting that this also might reduce the Social Security Administration (SSA) disability program costs (Salkever, 2013). Our recent research found small but significant long-term, positive effects of evidence-based supported employment services on employment, earnings, and suspension or termination from Supplemental Security Income (SSI) or Social Security Disability Insurance (SSDI) cash benefits due to work in the decade following service receipt (Cook, Burke-Miller & Roessel, 2016). The SSA's Mental Health Treatment Study (MHTS) results also suggest that expanding access to both supported employment and medical treatment might enhance work outcomes and forestall enrollment in public disability programs for some individuals (Drake et al., 2015). However the MHTS was unable to address the impact of supported employment and appropriate medical management on avoiding enrollment in SSA public disability programs among non-beneficiaries.

The purpose of this study is to determine whether deteriorating mental health conditions result in premature labor force exit among workers with psychiatric disabilities under age 50 and, concomitantly, whether worsening mental health is associated with increased likelihood of SSI/DI program entry among workers who are not initially beneficiaries. We also examine whether co-occurrence of physical health conditions along with disabling mental health disorders increases the risk of premature labor force exit, and is associated with enrollment in the SSI and DI programs. Finally, our study explores whether receiving supported employment services interacts with the presence of co-morbid physical health conditions and deteriorating mental illness course to influence labor force participation and public disability beneficiary status.

Little research attention has been directed to these topics. Regarding associations between mental health and labor force participation, a number of studies have shown that separation from the labor force is associated with subsequent deterioration of mental health status (Artazcoz et al., 2004; Burgard et al., 2007; Price et al., 2002). Less often examined is whether deteriorating mental health can be a precursor to early labor force exit. Research has shown that workers in poor health have longer subsequent periods of unemployment (Stewart, 2001), and are more likely to move from unemployment to more permanent economic inactivity (Böheim & Taylor, 2000). Studying middle-age men and women in the longitudinal U.S. Health and Retirement Study, Wray (2003) found that worsening mental health, defined as increasing depression symptom severity, nearly doubled the odds of subsequent involuntary job separations for women and more than tripled the odds for men. Similarly, García-Gómez and colleagues (2010) used data from the first 12 waves of the British Household Panel Survey and found that deteriorating mental health, measured as worsening emotional distress symptoms, increased the hazard ratio of later non-employment, and also that this effect was greater for men relative to women. To date, we have not located published studies addressing whether illness exacerbation among those with severe and persistent mental illnesses is associated with premature labor force exit, which is one of our research questions.

Next, we turn to the impact of mental health on likelihood of applying for and receiving public disability benefits. Here, we find evidence that poor mental health is associated with

public disability beneficiary status. Using a population-based cohort in Norway, Mykletun and colleagues (2006) found that symptoms of anxiety and depression were robust predictors of disability pension awards, and this relationship persisted even excluding awards due to mental disorders. They also showed that anxiety and depression symptoms were associated with receiving a disability pension even controlling for physical health symptoms and diagnoses. In a study of 169 adults with newly diagnosed psychiatric disorders, Estroff and colleagues (Estroff, Patrick et al., 1997) found that number of days spent in psychiatric hospitals, a proxy for worsening mental health, was associated with applying for SSI and DI, and also that a higher degree of psychological impairment was associated with receipt of SSI or DI (Estroff, Zimmer et al., 1997).

Increasing attention has been paid to the high co-occurrence of physical and mental health conditions among adults with more severe and persistent forms of mental illness (Cook et al., 2016; DeHert et al., 2011; Sokal et al., 2004), and their association with disability (Scott et al., 2009) and early mortality (Colton et al., 2006). Less often examined is whether mental and medical co-morbidity are associated with reduced labor force participation and increased likelihood of disability beneficiary status. In a large multisite cohort of depressed outpatients participating in an antidepressant medication trial (Yates et al., 2004), those with co-occurring medical conditions had significantly greater work impairment than those without co-morbidities. Our previous research (Cook et al., 2007) found that compared to adults with psychiatric disabilities alone, those with co-occurring physical health conditions had lower earnings, worked fewer hours, and were less likely to work competitively. Using data from the National Health Interview Survey of Disability, Druss and colleagues (2000) found that comorbid medical and mental conditions were associated with a twofold increase in odds of unemployment, and a two-thirds increase in odds of support on disability payments compared to respondents with a single form of disability.

The well-established efficacy of evidence-based supported employment in the return-to-work process for people with psychiatric disabilities has raised the question of whether more widespread availability of these services might help to prevent labor force withdrawal as well as reduce dependence on disability income support (Drake et al., 2009). Our analysis (Cook, Leff et al., 2006) of work outcomes among 450 SSDI beneficiaries with psychiatric disabilities enrolled in a 2-year clinical trial study of evidence-based supported employment services in the Employment Intervention Demonstration Program (EIDP) estimated that only 4 percent worked long enough at a high enough income level to have completed their trial work period and left the rolls. Similarly, Drake and colleagues (2013) found that less than 3 percent of SSDI beneficiaries with psychiatric disabilities receiving 2 years of supported employment in SSA's MHTS had monthly earnings at or above the SSA's threshold for substantial gainful activity. However, our 12-year follow-up of SSA beneficiaries in the EIDP study (Cook, Burke-Miller, Roessel, 2016), also found that while only 13% ever had their SSI or DI monthly benefits reduced or suspended due to work during that period, those receiving supported employment services were 12 times as likely as those who did not to experience suspension or termination of SSI or SSDI cash benefits due to work.

Given the foregoing literature, our study addressed the following research questions. The first study question is whether individuals under age 50 with psychiatric disabilities who experience deterioration of their mental health condition over time are more likely than those

whose conditions do not deteriorate to exit the labor force, and whether appropriate illness management can ameliorate the effects of illness deterioration on work outcomes. The second study question is whether mental health condition deterioration over time results in eventual entry into the SSI and/or DI programs. The third study question is whether the co-occurrence of one or more physical health conditions with mental illness places individuals at greater risk of labor market exit. The fourth study question is whether the co-occurrence of one or more physical health conditions with mental illness places individuals at greater risk of entry onto the SSI/DI rolls. The fifth study question is whether receipt of evidence-based supported employment services interacts with the presence of health co-morbidities and deteriorating mental illness course to influence work outcomes and entry onto the SSI/DI rolls.

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II. METHODS

A. Study Procedures

The Employment Intervention Demonstration Program (EIDP) was a 5-year study of supported employment programs for people with serious mental illnesses, funded by the Center for Mental Health Services of the Substance Abuse and Mental Health Services Administration (SAMHSA) (Cook et al., 2002; Cook et al., 2005). Participants met the following study inclusion criteria: age 18 years or older; designation of "severe and persistent mental illness" based on *Diagnostic and Statistical Manual of Mental Disorders-IV* (American Psychiatric Association, 1994) diagnosis, duration, and level of disability as established by SAMHSA (Manderscheid & Sonnenschein, 1992); desiring employment; being unemployed (except at one site); and providing informed consent. After enrollment, participants were randomly assigned to study condition. The control condition was defined as either usual services alone or usual services plus unenhanced vocational rehabilitation services. The experimental condition consisted of evidence-based supported employment services delivered by employment specialists on multidisciplinary teams that met frequently to coordinate employment and clinical services; the goal of these services was placement in competitive jobs that met patients' career preferences, using a job search process beginning soon after program entry and providing vocational supports throughout the study.

B. Participants

EIDP participants (N=1,648) were enrolled from 1996 to 1998 at eight sites in four U.S. geographic regions (Northeast, Mid-Atlantic, Southeast, Southwest) and were followed for 24 months, through 1998 to 2000. Participants provided written informed consent and were monetarily compensated (amounts varied from $10 to $20 per semi-annual interview). In addition to participant interviews, clinical and vocational services data were collected monthly from each site's administrative service utilization data and employment information was collected weekly by the sites' vocational and research staff. The current study population includes all EIDP participants who were under 50 years of age at baseline (N=1,455). For the labor market exit analysis, we further limited the sample to those who worked at all during the study period (n=991). For the disability program entry analysis we limited the sample to those not enrolled in either SSI and/or SSDI at baseline (n=1,261).

C. Measures

Mental health deterioration. Longitudinal data from the EIDP study were used to characterize study participants' mental health trajectories at each of four semi-annual data collection time points over the 24-month follow-up period. Deterioration of mental health condition was measured using the Positive and Negative Syndrome Scale (PANSS), a well-researched, clinical assessment of symptom type and severity which was administered by specially trained interviewers (Kay et al., 1987). The PANSS assesses depressive symptoms, positive symptoms, negative symptoms, cognitive symptoms, and symptoms of excitement. PANSS interviewer interrater reliability was monitored on an ongoing basis both within and across study sites; periodic refresher training occurred via monthly teleconferences with the scale's coauthor (L. Opler). An independent psychometric evaluation of PANSS interrater reliability by Salyers and colleagues (2000) found good to excellent reliability, with total sample

intraclass correlation coefficients (ICCs) from .71 to .87, and mean ICCs for Positive symptoms = .92 (SD=0.05), General symptoms =.83 (SD=0.15), and Negative symptoms = .81 (SD=0.16). Published norms (Leucht et al., 2005) indicate that a PANSS total score of 58 indicates "mild illness," a PANSS of 75 represents "moderate illness," a PANSS of 95 indicates "marked illness," and a PANSS of 116 represents "severe illness." Participants whose PANSS scores increased across one or more of these thresholds from their prior PANSS score were considered to be in an episode of marked mental health deterioration.

Comorbid physical conditions. We characterized participants in terms of the presence or absence of one or more self-reported co-occurring physical comorbidities, including: visual impairment, hearing impairment, seizure disorder, spinal cord injury, HIV, speech/language impairment, cerebral palsy, and chronic medical conditions including diabetes and arthritis.

Clinical management. In order to characterize clinical management of study participants' mental health conditions, we used algorithms developed by Wang and colleagues (2002) for their psychiatric epidemiological studies of treatment prevalence for serious mental illness in the National Comorbidity Survey. These algorithms were derived from evidence-based treatment guidelines for specialty mental health providers published by the American Psychiatric Association (Wang et al., 2000). Adapting these algorithms based on available mental health services data in the EIDP study, best practice treatment was defined as receipt of psychiatric medications, medication management, and one or more sessions of individual or group psychotherapy. Adequate clinical treatment was defined as receipt of psychiatric medications and at least one other type of clinical service. Treatment received in the 6-month periods between interview time points was characterized as best practice or adequate for time intervals that were concurrent with assessments of deterioration using symptom data from the PANSS.

Outcomes. Among those who had been employed during the EIDP, we looked at 2 outcomes related to labor market exit over 24 months of study participation: 1) occurrence of job separation for any reason; and 2) time from baseline to first job separation. Among people who were not receiving both SSI and SSDI at baseline, we looked at the outcome of a report of new SSI or DI benefits that were not reported at baseline.

D. Analysis

We described participant characteristics, mental health deterioration and comorbid conditions and outcomes, using frequency distributions. We examined differences in participant characteristics in relationship to ever experiencing a mental health deterioration or having a comorbid condition using bivariate chi-square and t-tests. We analyzed relationships between mental health deterioration and comorbid conditions and outcomes, adjusting for potentially confounding participant characteristics. Multivariable logistic regression models were used to calculate adjusted odds ratios (aOR), and multivariable Cox proportional hazards models were used to calculate adjusted hazards ratios (aHR).

III. RESULTS

Respondent background characteristics. Table 1 shows the baseline study characteristics of the 1,455 participants included in the study, as well as characteristics by deterioration and comorbid physical condition. Almost half of the 1,455 participants were White (46.7%), a third Black (33.2%) and 14.2% Hispanic/Latino. Almost half were female (45.5%); most had a high school diploma or equivalency degree (65.8%); and most had worked in the 5 years prior to study entry (64.9%). Half had a schizophrenia spectrum diagnosis (49.9%) and about a third had a substance abuse diagnosis (35.5%). Half had been randomized to the Supported Employment experimental study condition (49%): 31.1% at sites in the Northeastern United States, 24.7% in the Mid-Atlantic region, 9.2% in the Southeast and 34.9% in the Southwest. Average age was 36.1 years.

Deterioration. Across the entire 24 months, 47% (n=684) of the 1,455 participants under age 50 experienced an episode of marked mental health deterioration. For the most part, the 684 participants experienced such episodes infrequently, with 36% of all participants (522/1,455) having one episode, 11% (153/1,455) having two episodes, and <1% (9/1,455) having episodes at 3 of the 4 time points. Among the 53% (n=771) without measured deterioration, most were nevertheless consistently symptomatic (64%). Almost a quarter of EIDP participants under age 50 had one or more co-occurring physical conditions (337/1,455 or 23.2%).

Table 1 also presents differences in participant characteristics associated with ever experiencing a mental health deterioration over 24 months in the study. In bivariate tests of association, deterioration was significantly less likely (unadjusted p<.05) among White participants and those with at least a high school or equivalent education, and more likely among participants with schizophrenia spectrum or substance abuse diagnoses. There also were regional variations with deterioration more common in the Northeastern and Southeastern regions, and less common in the Mid-Atlantic States. There was no association between deterioration and study condition, which is not surprising given the focus of supported employment on improving vocational outcomes regardless of clinical status. Comorbid physical conditions were significantly more common (unadjusted p<.05) among White participants, less common among Hispanic/Latino participants, and there also were regional variations in comorbid conditions.

Best practice and adequate mental health treatment. Among all participants, the large majority or 83.8% (1,219/1,455) received adequate clinical treatment, while around half or 50.7% (737/1,455) received best practice clinical treatment (not shown). Almost all participants with any mental health deterioration received adequate clinical treatment (97.2% or 665/684) which was a significantly higher proportion than among those who did not experience deterioration (71.9% or 554/771) (chi-square = 171.64, p<.001). A higher proportion of those with mental health deterioration also received best practice clinical treatment compared to those without deterioration (61.5% (421/684) compared to 41.0% (316/771)) (chi-square = 61.32, p<.001). Receiving supported employment services was associated with both greater likelihood of receiving best practice clinical treatment (unadjusted OR = 1.48, p<.001) and receiving adequate clinical treatment (unadjusted OR = 1.33, p=.049).

Table 1. Participant characteristics at baseline shown for all participants, and bivariate associations with presence or absence of a symptom deterioration over 24 months, and with presence or absence of a comorbid condition at baseline

Characteristic at baseline	Total 100% N=1,455 % (n)	Experienced Deterioration 47.0% N=684 % (n)	No deterioration 53.0% N=771 % (n)	χ^2, p-value	Co-morbid physical 23.2% N=337 % (n)	No Co-morbid physical 76.8% N=1,119 % (n)	χ^2, p-value
Race/ethnicity							
White non-Hispanic	46.7% (679)	43.4% (297)	49.5% (382)	5.46, p=.021	54.3% (183)	44.4% (496)	10.28, p=.001
Black non-Hispanic	33.2% (483)	34.5% (237)	31.9% (246)	1.23, p=.289	30.0% (101)	34.2% (382)	2.06, p=.166
Hispanic/Latino	14.2% (207)	16.1% (110)	12.6% (97)	3.64, p=.060	10.4% (35)	15.4% (172)	5.30, p=.021
Female	45.5% (662)	43.4% (297)	47.3% (365)	2.25, p=.140	55.5% (187)	54.2% (606)	0.17, p=.708
High School Graduate/GED	65.8% (958)	63.0% (430)	68.7% (528)	5.24, p=.023	68.7% (230)	65.2% (728)	1.39, p= .264
Worked in 5 years prior	64.9% (945)	67.3% (430)	70.6% (515)	1.79, p=.197	66.6% (213)	69.8% (732)	1.24 .270
Schizophrenia	49.9% (726)	57.6% (394)	43.1% (332)	30.66, p=<.001	46.3% (156)	51.0% (570)	2.28, p=.136
Substance abuse	35.5% (517)	40.9% (280)	30.7% (237)	16.45, p=<.001	32.3% (109)	36.5% (408)	1.95, p=.173
Experimental Study Condition	49.0%	48.4% (331)	49.5% (382)	.193, p=.674	50.4% (170)	48.6% (543)	0.36, p=.576
Northeast	31.1% (453)	35.2% (241)	27.5% (212)	10.12, p=.002	23.1% (78)	33.5% (375)	13.05, p<.001
Mid-Atlantic	24.7% (360)	20.9% (143)	28.1% (217)	10.20, p=.002	21.1% (71)	25.8% (289)	3.18, p=.084
Southeast	9.2% (134)	11.5% (79)	7.1% (55)	8.45, p=.005	9.8% (33)	9.0% (101)	0.18, p=.668
Southwest	34.9% (508)	32.3% (221)	37.2% (287)	3.85, p=.054	46.0% (155)	31.6% (353)	23.69, p<.001
				t (df), p-value			*t* (df), p-value
Mean Age (sd), years	36.1 (7.4)	36.5 (7.2)	35.8 (7.6)	-1.66 (1,453), p=.098	36.6 (7.5)	36.0 (7.4)	-1.26 (1,453), p=.864

Job loss. The prevalence and risk of job separation among working EIDP participants with mental health deterioration, best practice treatment, adequate clinical treatment, and co-occurring conditions are shown in Table 2. Most workers experienced job loss, including 90.5% of participants with mental health deterioration, 89.2% of those receiving best practice clinical treatment, and 90.2% of those receiving adequate clinical treatment. Job loss occurred less frequently among participants without deterioration (71.4%) and those who did not receive best practice clinical treatment (70.4%) or either (76.3%). Job loss was lowest among those who did not receive adequate clinical treatment (33.3%), although this was a small group.

Impact of deterioration, treatment, and co-morbidity on job loss. In a multivariable logistic regression model examining the relationship of deterioration with and without best practice clinical treatment, there was a significant main effect of deterioration associated with greater likelihood of job loss (adjusted odds ratio (aOR)=7.95, $p<.001$), and a significant association of best practice treatment with job loss (aOR 6.21, $p<.001$). The interaction term was also significant, indicating that participants who both deteriorated and received best practice clinical treatment had a significantly lower risk of job loss (aOR = 0.11, $p<.001$). There was a similar pattern in a multivariable logistic regression model examining deterioration with and without adequate clinical treatment: deterioration and adequate treatment separately were associated with greater risk of job loss (aOR=28.26, $p=.002$ and aOR=21.81, $p<.001$ respectively); and the interaction of deterioration with adequate clinical treatment was associated with a significantly lower risk of job loss (aOR=0.04, $p=.002$).

As shown in Table 2, working participants who experienced any mental health deterioration had an average of 10.5 months (319 days) between study baseline and job separation, similar to 10.4 months (317 days) for those receiving best practice clinical treatment, and slightly shorter than those with both deterioration and best practice treatment (10.6 months or 323 days). Similar patterns were found for the corresponding adequate treatment groups. Participants with the longest times between baseline and job loss were the minority not receiving adequate treatment (average of 19.3 months or 587 days). Regardless of how long after baseline a job started, deterioration was significantly associated with earlier job loss.

In Cox Proportional Hazards models of time to job loss (from baseline) there were significant hazard ratios for job loss associated with mental health deterioration and with best practice clinical treatment (Table 2). In the first model, we looked at mental health deterioration, receipt of best practice clinical treatment, and the interaction of the two terms. The results show that people with mental health deterioration had more than twice the risk of experiencing a job loss as people without mental health deterioration (adjusted hazard ratio (aHR)=2.12, $p<.001$), and people with best practice clinical treatment were also at more than twice the risk of experiencing job loss (hazard ratio (aHR=2.32, $p<.001$). At the same time, the interaction of deterioration with receiving best practice clinical treatment is associated with a protective effect (aHR = 0.43, $p<.001$), meaning that the adjusted event rate for this group is lower than those who either did not deteriorate or did not receive best practice clinical treatment. There was a similar pattern in models of time to job loss associated with deterioration and adequate clinical treatment: mental health deterioration aHR = 5.18, $p<.001$; adequate treatment aHR = 5.89, $p<.001$; and the interaction of deterioration and adequate treatment aHR = 0.19, $p.001$).

Table 2. Association of mental health deterioration (alone and with clinical management) and co-occurring conditions with risk of job loss in multivariable logistic regression and Cox proportional hazards models, among participants who worked during the study (n=991).

	N=991	Lost job % (n)	[a]Lost Job OR (95% CI), p-value	Months to Job Loss; Days to Job Loss Mean (SD)	[a]Months to Job Loss HR (95% CI), p-value
MH Deterioration	431	90.5% (390)	7.95 (4.12, 15.36), p<001	10.5 (7.9); 319 (241)	2.12 (1.70, 2.64), p<.001
No MH deterioration	560	71.4% (400)	reference	13.3 (9.2); 377 (271)	reference
Best Practice Treatment	491	89.2% (438)	6.21 (3.72, 10.36), p<.001	10.4 (7.8); 317 (237)	2.32 (1.89, 2.87), p<.001
Non-Best Practice Treatment	500	70.4% (352)	reference	13.7 (9.4) 417 (285)	reference
Deterioration* Best Practice Treatment	271	88.9% (241)	0.11 (0.05, 0.27), p<.001	10.6 (7.8); 323 (236)	0.43 (0.32, 0.58), p<.001
No Deterioration or Non-Best Practice Treatment	720	76.3% (549)	reference	12.7 (9.1); 385 (276)	reference
MH Deterioration	431	90.5% (390)	28.26 (3.52, 164.34), p=.002	10.5 (7.9); 319 (241)	5.18 (2.74, 9.81), p<.001
No MH deterioration	560	71.4% (400)	reference	13.3 (9.2); 377 (271)	reference
Adequate Treatment	808	90.2% (729)	21.81 (13.43, 35.40), p<.001	10.4 (7.9); 317 (239)	5.89 (4.34, 8.00), p<.001
Non-Adequate Treatment	183	33.3% (61)	reference	19.3 (8.9); 587 (271)	reference
Deterioration* Adequate Treatment	418	90.4% (378)	0.04 (0.01, 0.30), p=.002	10.5 (7.9); 318 (240)	0.19 (0.10, 0.36), p<.001
No Deterioration or Non-Adequate Treatment	573	71.9% (412)	reference	13.3 (9.2); 404 (280)	reference
		Lost job % (n)	[b]Lost Job OR (95% CI), p-value	Months to Job Loss Mean (SD); Days to Job Loss	[b]Months to Job Loss HR (95% CI), p-value
Co-occurring Physical condition	173	82.1% (142)	1.18 (0.76, 1.82), p=.469	12.1 (8.6); 367 (268)	1.01 (0.83, 1.22), p=.943
No co-occurring Physical Condition	818	79.2% (648)	reference	12.1 (8.9); 368 (260)	reference

[a]Adjusting for race/ethnicity, education, diagnosis and geographic region.

[b]Adjusting for race/ethnicity and geographic region.

Figure 1. Cumulative job loss hazard functions among participants with and without deterioration and best practice treatment.
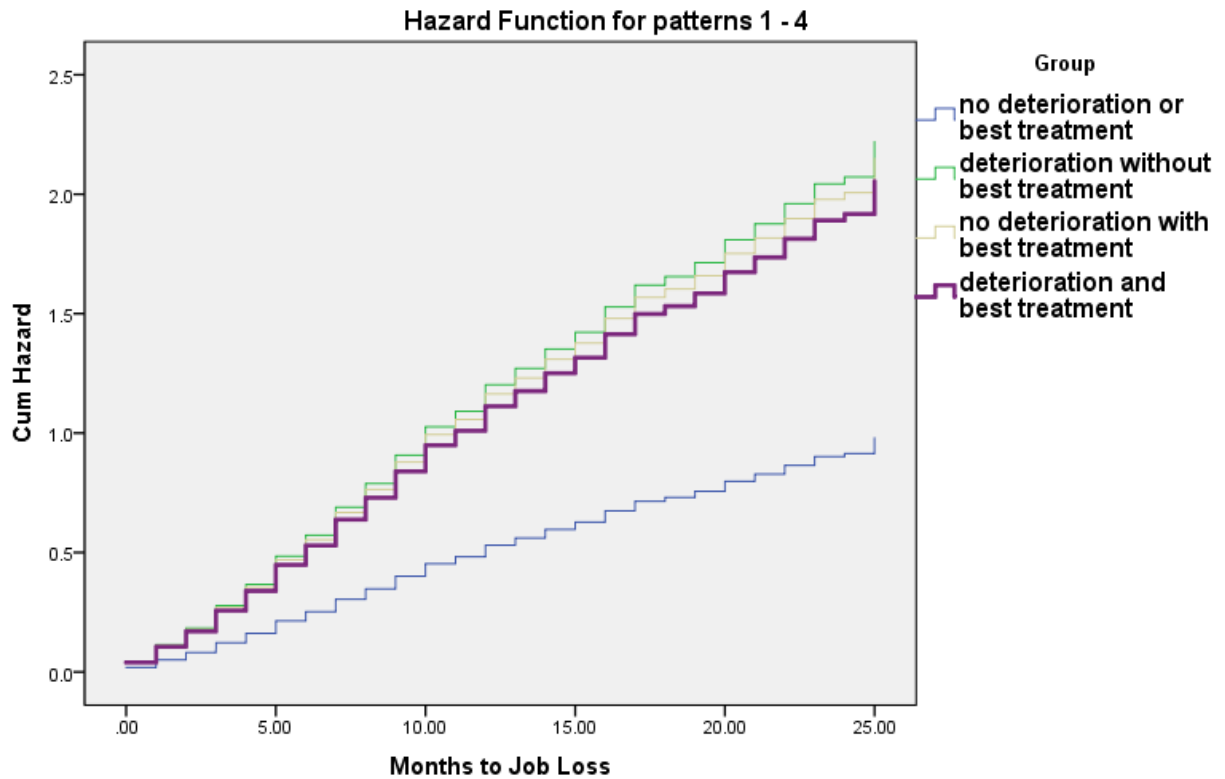
Finally also shown in Table 2 is that co-occurring physical conditions were not significantly associated with job loss (aOR=1.18, p=.469) or time to job loss (aHR=1.01, p=.943).

New SSI/DI cash benefit. Just over a quarter (26.5%) of study participants started receiving SSI or SSDI cash benefits during the study, and this did not differ by study condition (26.7% of experimental and 26.4% of control group, p=1.00). The prevalence and likelihood of reporting new SSI or SSDI cash benefits among EIDP participants with mental health deterioration, best practice or adequate clinical treatment, and co-occurring conditions are shown in Table 3. Among the 1,291 participants who were not SSI beneficiaries or were not SSDI beneficiaries at baseline, 30.2% of those with a mental health deterioration reported starting to receive cash benefits (either SSI or SSDI or both) later in the study, as did 30.4% of those receiving best practice treatment, 33.1% of those with deterioration and best practice clinical treatment, and 27.5% of those receiving adequate treatment. New benefits were less frequently reported among participants without deterioration (18.1%), those who did not receive best practice clinical treatment (17.0%), or those without either (20.0%). New benefit reports were lowest among those who did not receive adequate clinical treatment (4.7%), although this was a small group.

Deterioration, treatment and new SSI/DI cash benefit. In a multivariable logistic regression model examining the relationship of deterioration with and without best practice clinical treatment, there was a significant main effect of deterioration associated with greater likelihood of new SSI and /or SSDI cash benefits (adjusted odds ratio (aOR)=1.90, p<.001), and

a significant association of best practice treatment with new benefits (aOR 2.24, p<.001). The interaction term was also significant; here, participants who both deteriorated and received best practice clinical treatment had a significantly *lower* likelihood of reporting new benefits (aOR = 0.55, p<.001). There was a similar pattern in a multivariable logistic regression model examining deterioration with and without adequate clinical treatment: here, deterioration and adequate treatment were each separately associated with greater likelihood of new benefits (aOR=6.68, p=.006 and aOR=7.50, p<.001 respectively); and those who both deteriorated and received adequate clinical treatment had a significantly *lower* likelihood of reporting new benefits (aOR=0.15, p=.007).

As shown in Table 3, participants who experienced any mental health deterioration had an average of 21.2 months (645 days) between baseline and new benefit report, similar to 21.0 months (640 days) for those receiving best practice clinical treatment, and slightly longer than those with both deterioration and best practice treatment (20.7 months or 629 days), with similar patterns for adequate treatment groups. Participants with the longest times between baseline and new benefit report were the minority not receiving adequate treatment (average of 24.5 months or 745 days). (Note that although participants were followed for 24 months, the window of time allowed for completing interviews could be longer.)

In Cox Proportional Hazards models of time to new benefit report (from baseline) there were significant hazard ratios for new benefits associated with mental health deterioration and with best practice clinical treatment (Table 3). In the first model, we looked at mental health deterioration, receipt of best practice clinical treatment, and the interaction of the two terms. The results show that people with mental health deterioration had more than twice the likelihood of reporting new benefits as people without mental health deterioration (adjusted hazard ratio (aHR)=2.18, p<.001), and people with best practice clinical treatment were also at more than twice the likelihood of reporting new benefits (hazard ratio (aHR=2.24, p<.001). At the same time, the interaction of deterioration with receiving best practice clinical treatment is associated with a protective effect (aHR = 0.58, p=.028), meaning that the adjusted event rate for this group was lower than for those who either did not deteriorate or did not receive best practice clinical treatment. There was a similar pattern in models of time to new benefit report associated with deterioration and adequate clinical treatment: mental health deterioration aHR = 15.13, p<.001; adequate treatment aHR = 11.05, p<.001; and the interaction of deterioration and adequate treatment aHR = 0.08, p.<001).

Again, we used categorical variables to examine the relative hazard of each deterioration by treatment group in likelihood of new benefit report. Compared to the reference category (no deterioration and no best practice treatment), those with deterioration who received best practice treatment had an aHR = 1.69 (p<.001); those with deterioration without best practice treatment had an aHR = 2.11 (p<.001); and those without deterioration and who were receiving best practice treatment aHR = 1.51 (p=.014). In a separate model, compared to the reference category (no deterioration and no adequate treatment), those with deterioration and adequate treatment had an aHR = 2.66 (p<.001); those with deterioration without adequate treatment had an aHR = 12.51 (p<.001); and those without deterioration and who were receiving adequate treatment aHR = 3.07 (p=.002).

Table 3. Association of mental health deterioration (alone and with clinical management) and co-occurring conditions with reports of new SSI/DI cash benefits in multivariable logistic regression and Cox proportional hazards models (n=1,261).

	N=1,261	New SSI/DI benefit % (n)	[a]New SSI/DI benefits OR (95% CI), p-value	Months; Days to new SSI/DI benefits Mean (SD)	[a]Months to new SSI/DI benefits HR (95% CI), p-value
MH Deterioration	580	30.2% (175)	1.90 (1.26, 2.88), p=.002	21.2 (6.7); 645 (204)	2.18 (1.48, 3.22), p<.001
No MH deterioration	681	18.1% (123)	reference	22.7 (5.6); 689 (172)	reference
Best Practice Clinical Treatment	624	30.4% (190)	2.24 (1.51, 3.33), p<.001	21.0 (6.9); 640 (210)	2.24 (1.51, 3.30), p<.001
Non-Best Practice Clinical Treatment	637	17.0% (108)	reference	22.9 (5.3); 698 (160)	reference
Deterioration* Best Practice Treatment	354	33.1% (117)	0.55 (0.32, 0.93), p=.014	20.7 (7.1); 629 (216)	0.58 (0.35, 0.94), p=.028
No Deterioration or Non-Best Practice Treatment	907	20.0% (181)	reference	22.5 (5.7); 685 (174)	reference
MH Deterioration	580	30.2% (175)	6.68 (1.72, 25.92), p=.006	21.2 (6.7); 645 (204)	15.13 (4.05, 55.52), p<.001
No MH deterioration	681	18.1% (123)	reference	22.7 (5.6); 689 (172)	reference
Adequate Treatment	1048	27.5% (288)	7.50 (3.59, 15.64), p<.001	21.5 (6.6); 653 (199)	11.05 (4.07, 30.00), p<.001
Non-Adequate Treatment	213	4.7(10)	reference	24.5 (2.9); 745 (90)	reference
Deterioration* Adequate Treatment	563	30.2% (170)	0.15 (0.04, 0.61), p=.007	21.2 (6.7); 645 (204)	0.08 (0.02, 0.31), p<.001
No Deterioration or Non-Adequate Treatment	698	18.3% (128)	reference	22.7 (5.7); 689 (172)	reference
		New SSI/DI benefit % (n)	[b]New SSI/DI benefits OR (95% CI), p-value	Months to new SSI/DI benefits Mean (SD)	[b]Days to new SSI/DI benefits HR (95% CI), p-value
Co-occurring Condition	242	20.2% (49)	0.88 (0.62, 1.23), p=.490	21.8 (6.4); 663 (194)	0.84 (0.61, 1.15), p=.268
No Co-occurring Condition	1,019	24.4% (249)	reference	22.8 (6.2); 693 (162)	reference

[a]Adjusting for race/ethnicity, education, diagnosis and geographic region.

[b]Adjusting for race/ethnicity and geographic region.

Also shown in Table 3 is that co-occurring physical conditions were not significantly associated with report of new benefits (aOR=0.88, p=.490) or time to report of new benefits (aHR=0.84, p=.268).

Receipt of evidence-based supported employment. Finally we ran models designed to test whether being in the experimental supported employment condition interacted with mental health deterioration or with co-occurring physical condition to influence job loss or report of new SSI/DI benefits, and found that it did not (Table 4). In these models, the main effect of mental health deterioration was again associated with greater likelihood of job loss and new benefit report, but receiving evidence-based supported employment and the interaction of receiving supported employment and experiencing deterioration were not significantly associated with job loss or with new benefit report.

Table 4. Association of mental health deterioration and co-occurring conditions alone and with Supported Employment with risk of job loss (n=991) and reports of new SSI/DI cash benefits (n=1,261) in multivariable logistic regression and Cox proportional hazards models.

	[a]Lost Job OR (95% CI), p-value	[a]Months to Job Loss HR (95% CI), p-value	[a]New SSI/DI benefits OR (95% CI), p-value	[a]Months to new SSI/DI benefits HR (95% CI), p-value
Deterioration	3.34 (1.92, 5.81), p<.001	1.51 (1.22, 1.88), <.001	1.92 (1.29, 2.86), p=.001	1.77 (1.25, 2.52), p=.001
Supported Employment Experimental Condition	1.31 (0.90, 1.91), p.=161	1.15 (0.94, 1.41), p=.172	1.30 (0.87, 1.94), p=.201	1.18 (0.81, 1.71), p=.386
Deterioration* Supported Employment	0.96 (0.45, 2.03), p=.910	0.95 (0.71, 1.27), p=.728	0.82 (0.47, 1.41), p=.466	0.90 (0.56, 1.45), p=.661
	[b]Lost Job OR (95% CI), p-value	[b]Months to Job Loss HR (95% CI), p-value	[b]New SSI/DI benefits OR (95% CI), p-value	[b]Months to new SSI/DI benefits HR (95% CI), p-value
Co-occurring Physical Condition	1.16 (0.61, 2.23), p=.651	0.98 (0.74, 1.31), p=.894	0.74 (0.43, 1.27), P=.273	0.80 (0.51, 1.26), p=.335
Supported Employment Experimental Condition	1.36 (0.95, 1.93), p=.090	1.15 (0.99, 1.35), p=.098	1.12 (0.83, 1.50), p=.458	1.05 (0.82, 1.34), p=.721
Co-occurring Physical Condition* Supported Employment Experimental Condition	0.97 (0.41, 2.32), p=.950	1.04 (0.71, 1.51), p=.854	1.36 (0.67, 2.76), p=.400	1.09 (0.58, 2.04), p=.785

[a]Adjusting for race/ethnicity, education, diagnosis and geographic region.

[b]Adjusting for gender, education, age, prior work history and geographic region.

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IV. DISCUSSION

We found that among a group of adults with psychiatric disabilities who were attempting to work, those who experienced deterioration in their mental health conditions were significantly more likely to lose their jobs and lost them sooner compared to those who did not experience deterioration. This greater vulnerability to unemployment and premature job loss may lead in the longer term to labor force exit, especially if workers' mental health conditions are not properly managed. When we looked at deterioration with and without appropriate mental health treatment, the group at greatest risk for premature job loss was comprised of those who experienced symptom deterioration without best practice treatment, and those who experienced deterioration without adequate treatment. We conclude that mental health deterioration without proper management was significantly associated with factors (unemployment, earlier job loss) that are associated with leaving and remaining outside of the labor force.

We also found that those who experienced deterioration in their mental health condition were more likely to begin receiving SSI cash benefits as well as DI cash benefits, and also that they began receiving these benefits earlier than those who did not experience mental health deterioration. Once again, the group with the greatest likelihood of reporting new SSI/DI benefits and reporting them sooner was comprised of those whose mental health condition deteriorated and whose treatment was not well managed, either with delivery of best practice treatment, or delivery of adequate clinical treatment. Thus, we conclude that mental health deterioration without proper clinical management is significantly associated with enrollment and with earlier enrollment in SSA disability assistance programs.

The effects of best practice treatment and of adequate clinical treatment in the absence of mental health deterioration were less clear. Those whose mental health conditions did not deteriorate but who received best practice or adequate treatment were also at higher risk of job loss and earlier job loss, as well as entry and earlier entry into SSI and DI beneficiary status. It is possible that these associations are due to relationships between continued severe psychiatric symptoms and more intensive treatment resulting in confounding by indication and inadequate risk adjustment (Walker, 1996). When clinicians administer different treatments to sicker patients (i.e., best practice treatment delivered to patients with chronically severe symptoms), outcome comparisons are confounded by differences in severity of illness between patients (Sjoding et al., 2015). In these cases, treatments can appear to cause the outcomes they are meant to prevent. For example, study participants may have received best practice or adequate treatment throughout the study because they remained highly symptomatic and thus did not meet our study's definition of deterioration, and not because these forms of treatment in and of themselves cause poor vocational outcomes or lead to SSI/DI enrollment. On the other hand, it is also possible that some types of treatment interfere with work attempts, as when psychotropic medications create side-effects that inhibit employment (Lam et al., 2012) and time-intensive therapeutic interventions leave little time for work or job seeking (Laitinen-Krispijn et al., 2000). By the same token, the association between deterioration and receipt of new SSI/DI cash benefits may reflect the work of clinicians who prioritize successful completion of the SSA disability application and award process in order to increase the financial resources of clients too symptomatic to work (Dow & Boaz, 1994; Frank & Glied, 2006).

We found that the presence of comorbid physical health conditions was not associated with job loss or report of new SSI/DI beneficiary status. In addition, we found no evidence that supported employment interacts with the presence of deteriorating mental illness or the presence of physical health co-morbidities to influence work outcomes or enrollment in SSI/DI.

Prior research on the entire EIDP cohort including respondents of all ages found that while the intervention condition participants received more hours of vocational services than control condition participants, both study conditions received equivalent amounts of clinical services (Cook, Leff, Blyler et al., 2005). In this analysis of a younger subgroup of EIDP participants, we found that those in the supported employment intervention condition had a greater likelihood of receiving best practice or adequate treatment during the study. It may be that the integrated delivery of vocational and clinical services, which is a hallmark of best practice supported employment (Bond & Meyer, 1999), results in better quality or more targeted clinical treatment. If so, this would provide additional support for a public policy of expanded access to supported employment for people with serious mental illness.

V. LIMITATIONS

A major limitation to the study is the confounding of symptoms and clinical treatment, as described above. Some study participants received treatment because they remained symptomatic throughout the study, or because their symptoms increased over time, while others received treatment which kept their symptoms consistently under control. However, although they may have been confounded, symptoms and clinical treatment were not collinear, with only moderate size correlations of $r<.4$. Thus, an important methodological limitation to this study is the inability to identify the temporal relationship between potentially causal factors. Although clinical treatment was measured using monthly service utilization data, deterioration was based on semi-annual interview assessments. Thus, best practice or adequate treatment may have been received before, during or after the onset of a symptom deterioration. Similarly, although job loss was assessed weekly by employment specialists and research staff, reports of new SSI/DI benefits were elicited from respondents at semi-annual interviews. As a result, analysis of time to new report of benefits may have been be influenced by deterioration if a person's symptoms resulted in delayed interview completion. In addition, because of the way data were collected at study baseline, there may have been underreporting of physical comorbidities related to chronic medical conditions such as diabetes or hypertension, since respondents were asked to volunteer the names of different types of comorbidities and not queried specifically about these conditions. Finally, because of data limitations, some of the outcomes we used are proxies. For example, job loss was used as a proxy for labor market exit because we had only 24 months of follow-up observation. Similarly, a respondent's report of new SSI or SSDI cash benefit could reflect reinstatement of benefits and may not have represented actual new enrollment in these SSA programs.

Studies of early interventions for people experiencing a first episode of psychosis suggest that early receipt of supported employment services can enhance employment outcomes (Baksheev, 2012; Major, 2010), as well as reduce symptoms when delivered as part of a special, coordinated care approach that includes increased access to medical as well as mental health treatment (Heinssen, Goldstein, & Azrin, 2014). In this study, we provide evidence that a similar vocational benefit may accrue to people with severe and persistent mental illnesses who experience deterioration in their psychiatric conditions. Future studies should explore this possibility by using more comprehensive, linked data sets containing SSA administrative program data as well as detailed information about respondents' psychiatric status and treatment history. Also beneficial would be research designs that follow individuals over longer time periods to allow for accurate sequencing of treatment and outcomes, and detection of antecedents to both entry and exit from the labor force as well as from the SSI and DI disability programs.

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