MATHEMATICA
CENTER FOR
STUDYING DISABILITY POLICY

DRC Working PAPER

WORKING PAPER NUMBER: 2019-07

Supported Employment for People with Intellectual Disabilities, Autism Spectrum Disorders, and Schizophrenia: A Propensity Matched Comparison of Vocational Rehabilitation Outcomes

March 18, 2019

Fong Chan
John Kregel*

***Corresponding author's contact information:**
Virginia Commonwealth University
Rehabilitation Research and Training Center
1314 West Main Street
PO Box 842011
Richmond, VA 23284
Telephone: (804) 828-1872
Email: jkregel@vcu.edu
Reference Number: 40122.D-MP-16-08

The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Disability Research Consortium. The opinions and conclusions expressed are solely those of the authors and do not represent the opinions or policy of SSA or any agency of the Federal Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof.

This page has been left blank for double-sided copying.

CONTENTS

This page has been left blank for double-sided copying.

TABLES

FIGURES

This page has been left blank for double-sided copying.

ABSTRACT

Project Number

D-MP-16-08

Title

Supported Employment for People with Intellectual Disabilities, Autism Spectrum Disorders, and Schizophrenia: A Propensity Matched Comparison of Vocational Rehabilitation Outcomes

Authors

Fong Chan (University of Wisconsin at Madison) and John Kregel

Date

March 18, 2019

Key Findings and Policy Implications

This study examined whether Supported Employment (SE) is an effective Vocational Rehabilitation (VR) intervention for individuals with intellectual disabilities, autism spectrum disorders, and schizophrenia who were served by the state-federal VR program. The study relied on a data extract from the U. S. Department of Education, Rehabilitation Services Administration Case Service Report (RSA-911) database that covered fiscal years 2010 through 2013. The sample consisted of 182,719 individuals, including 108,819 (59.56%) classified as having an intellectual disability; 26,086 individuals (14.28%) diagnosed with autism; and 47,814 (26.17%) with schizophrenia. A total of 31.8% of the participants reported receiving Supplemental Security Income (SSI) and 14.7% reported receiving Social Security Disability Insurance (SSDI) at the time of application for VR services. We used propensity score matching to compare the likelihood that VR clients with various demographic characteristics would receive SE as a rehabilitation intervention. A classification tree was used to identify subsets of participants who have similar propensities of receiving SE interventions based on their demographic covariates.

Results indicated a positive effect of the SE intervention for individuals with intellectual disabilities, autism spectrum disorders or schizophrenia. This effect was strongest for transition age youth (mean age of 19 years) who received Supplemental Security Income (SSI) disability benefits (15% difference in employment outcomes) and persons with intellectual disabilities or autism who graduated from regular high school (13.3% difference in employment outcomes). The propensity adjusted estimate of the overall effect of SE on VR outcomes showed that individuals who received SE had on average a 7.8% higher employment rate than individuals who did not receive SE.

This page has been left blank for double-sided copying.

I. INTRODUCTION

Largely due to high unemployment and underemployment among citizens with disabilities (Brooke, et al., 2018; Luciano, et al., 2014; Wehman, et al., 2018), publicly-funded programs are increasingly focusing on integrated competitive employment as the intended outcome. P,L. 113-128, the Workforce Innovation and Opportunities Act of 2014 (WIOA), defines this term as full- or part-time work at minimum wage or higher, with wages and benefits similar to those without disabilities performing the same work, and fully integrated with co-workers without disabilities. Prior to the implementation of WIOA, the Rehabilitation Services Administration, which administers the Rehabilitation Act, had implemented regulations that removed sub-minimum wage employment as a potential "successful" rehabilitation outcome with the Vocational Rehabilitation (VR) system. WIOA places further restrictions on the placement in sub-minimum wage positions, including limiting the period of time during which a VR client may be engaged in sub-minimum wage work.

The movement away from sub-minimum wage employment has been reflected in policy changes at the state level. Over 30 states have adopted an Employment First Initiative (EFI), with at least 15 adopting formal policies and/or legislation (Hoff, 2012). The purpose of the EFI is to advance integrated competitive employment as the first option for individuals with disabilities receiving publicly-funded employment services within the state. Examples of activities undertaken by the EFIs include: Developing cross-disability and cross-agency policies, definitions, goals, and collaborations; modifying contracts, including fee structures, with community rehabilitation programs to provide financial incentives; developing common measures of employment outcomes and data-sharing; and advancing supported employment (SE) as the preferable alternative to sub-minimum wage sheltered employment or other non-competitive work options.

Purpose

This study examines whether SE is an effective VR intervention for people with intellectual disability, autism spectrum disorders, and schizophrenia who were served by the state-federal VR program. Using data from the Rehabilitation Services Administration Case Report (RSA-911), we conducted a matched case-control study using propensity score balancing to adjust for non-random assignment to evaluate the effect of SE on employment outcomes among the aforementioned group of individuals receiving services from state VR agencies. Specifically, this study was designed to answer two key research questions:

1. What are the patterns and demographic predictors of individuals with intellectual disability, autism spectrum disorders, and schizophrenia (and other psychotic disorders) most likely to receive SE as a vocational rehabilitation intervention?
2. Is SE an effective intervention for enhancing VR outcomes for individuals with intellectual disability, autism spectrum disorders, and schizophrenia?

In the next section, we provide background information regarding Social Security Disability benefits, Vocational Rehabilitation, and supported employment. We then provide information about the study cohort, major variables, and statistical design and analysis. Finally, we describe

the results of data analyses addressing the study's two research questions, including subgroup-specific data.

II. LITERATURE REVIEW

The Social Security Administration (SSA) operates two financial benefit programs for individuals with benefit programs. Social Security Disability Insurance (SSDI) is a payroll tax-funded insurance program that provides financial benefits to qualified individuals with prior work histories whose disabilities preclude work. Supplemental Security Income (SSI) is a means-tested welfare program that provides basic cash assistance for individuals with disabilities with minimal incomes and limited financial and material assets.

A. Vocational Rehabilitation

VR is a joint federal-state program that assists eligible individuals with disabilities to obtain and retain employment. VR implements interventions designed to increase the likelihood that individuals with disabilities will obtain and retain competitive employment at market wages in an area of their vocational interests.

There is emerging empirical evidence to support the value of the state-federal VR program. For example, O'Neill, Mamun, Potamites, Chan, and Cardoso (2015) examined the relationship between services provided by state vocational rehabilitation (VR) agencies and return-to-work outcomes of Social Security Disability Insurance (DI) beneficiaries using propensity score matching analysis. Specifically, they compared DI beneficiaries who enrolled in state VR services with matched and unmatched comparison groups of beneficiaries who did not enroll in these services. Their research findings indicated that employment outcomes of state VR clients are substantially better than those of their matched and non-matched non-enrollee counterparts, and the timing of their employment outcomes is strongly associated with the timing of vocational rehabilitation (VR) enrollment.

In a 2013 evaluation of the impact of Utah's VR program (Wilhelm & Robinson, 2013) found that "both the earning impact and employment impact of the VR program appear to be positive and quite large. Individuals who received services compared with the comparison group witnesses a larger wage increase that did not diminish over time. Individuals who received services were 9.1% more likely to gain employment (p. 156)." They noted that economic benefits extended beyond individuals to the state due to increased tax revenue and a reduction of disability benefit payments. The savings and federal contributions Utah gained outweighed the VR program's public costs. However, it should be noted that while these researchers have made extensive efforts to control for confounding factors, it is not possible to know how well they succeeded in doing so.

Individuals with disabilities, their families, policy makers, and society highly value and prioritize employment. (Bond, 2004; Drake, et al. 2009). Absent an effective intervention, individuals with severe disabilities face underemployment, unemployment, and financial dependence. The combined goals of the SSA benefit programs and Vocational Rehabilitation programs are to promote meaningful, gainful employment for individuals with disabilities, and provide a reliable source of income for those individuals whose disabilities preclude work. As such, both programs have a strong interest in VR implementing evidence-based practices that result in positive outcomes for a wide range of clients. Examination of the economic self-sufficiency of SE clients served by VR agencies will enable SSA to assess the effectiveness of

SE as an early intervention strategy for non-beneficiaries and a work entry/return-to-work (RTW) option for SSA beneficiaries.

B. Supported Employment

Supported employment facilitates real, competitive, integrated employment for individuals with disabilities, including severe disabilities. The U.S. Department of Education, Office of Special Education and Rehabilitation Services defines SE in its Regulations of the Offices of the Department of Education as follows:

- Supported employment means:
  - Competitive employment in an integrated setting with ongoing support services for individuals with the most severe disabilities -
    - For whom competitive employment has not traditionally occurred or for whom competitive employment has been interrupted or intermittent as a result of a severe disability; and
    - Who, because of the nature and severity of their disabilities, need intensive supported employment services from the designated State unit and extended services after transition in order to perform this work; or
  - Transitional employment for individuals with the most severe disabilities due to mental illness. (34 C.F.R. 363.6(c))

Supported employment is operationally defined as a service delivery model that includes services provided in the competitive employment context, voluntary consumer participation, a rapid job search, integrated rehabilitation and mental health services, individualized support, a focus on consumer preferences, and ongoing support (Bond, 2004). There is a wide consensus among practitioners on supported employment principles. Becker, Xie, McHugo, Halliday, & Martinez (2006) found that high fidelity implementation of supported employment is critical to good outcomes. Deviation from fidelity, including adapting the model to local conditions, compromises fidelity and reduces efficacy (Becker, et al., 2006).

Supported employment promotes competitive employment for individuals with disabilities who are at risk for unemployment or underemployment. An individual with a disability not engaged in competitive employment is at risk for financial dependence, including dependence on Social Security Disability Insurance (SSDI) and/or Supplemental Security Income (SSI) (Drake et al., 2009). The original supported employment design served individuals at risk for placement in sheltered and segregated settings and the current purpose is similar (West, Targett, Wehman, Cifu, & Davis, 2015). Employment programs such as day treatment programs, psychosocial rehabilitation programs, and sheltered workshops are ineffective in improving competitive employment outcomes for individuals with disabilities (Wehman, et al., 2018). Moreover, adults with an autism spectrum disorder experience more successful vocational outcomes if they do not participate in sheltered workshops prior to participating in supported employment (Cimera, Wehman, West, Burgess, 2012).

Literature reviews consistently find substantial evidence that supported employment positively influences competitive employment outcomes for individuals with disabilities.

Marshall and colleagues (2014) searched nine databases and reviewed 12 systematic reviews and 17 randomized controlled trials of the individual placement and support (IPS) model to evaluate the efficacy of supported employment for adults with mental disorders or co-occurring mental and substance abuse disorders. The level of research evidence for supported employment was graded as high. Specifically, supported employment consistently demonstrated positive outcomes for individuals with mental disorders, including higher rates of competitive employment, fewer days to the first competitive job, more hours and weeks worked, and higher wages. There was also strong empirical evidence supporting the effectiveness of individual elements of the model.

Supported employments benefits extend beyond initial job acquisition. Hoffman and colleagues (2014) found that five years into supported employment, twice as many participants obtained competitive work through supported employment than through traditional vocational rehabilitation programs, and retained their employment about three times longer. Supported employment participants worked more hours and earned higher wages than those in traditional vocational rehabilitation programs. The trend for positive employment outcomes extends to SSDI/SSI beneficiaries. Bond, Xie, and Drake (2007) found that SSDI and SSI beneficiaries receiving supported employment obtained and maintained employment at better rates than beneficiaries who did not receive supported employment, but at lower rates than those who did not receive SSA benefits.

Supported employment is effective across demographic categories and disabilities, with recent research building upon years of foundational research. Supported employment was first geared towards individuals with intellectual and other developmental disabilities (Wehman, 2012). Its success let to implementation for individuals with diverse disabilities, including veterans with spinal cord injury, veterans with posttraumatic stress disorder, and middle-aged and older individuals with schizophrenia, (Ottomanelli, Barnett, Goetz, 2014; Davis et al., 2012; Twamley et al., 2012).

Wehman, Chan, Ditchman, and Kang (2014) studied existing RSA-911 data on 23,298 transition-age youth with intellectual and developmental disabilities who were VR clients, and found that supported employment is an effective intervention. The results indicated that supported employment increased employment rates across all categories, and especially for SSI and SSDI beneficiaries, special education students, and youth with intellectual disabilities or autism who are high school graduates. These are but a few examples of the demographic and disability categories for which supported employment is effective. Supported employment participants experience better outcomes regardless of background demographics, clinical characteristics, and employment characteristics (Campbell, Bond, & Drake, 2011).

Despite the strong promise of supported employment's role in reduced SSA benefits, few studies have examined the relationships between supported employment and SSA benefit receipt by subcategories of individuals with disabilities.

This page has been left blank for double-sided copying.

III. METHOD

A. Study Cohort

We extracted data for this study from the U. S. Department of Education, Rehabilitation Services Administration Case Service Report (RSA-911) database. The RSA-911 data contain information related to demographics, disability, types of VR services, and employment outcomes for clients receiving state VR services in the U.S., and the data are furnished annually to RSA by state VR agencies. Data from the RSA-911 for fiscal year 2010 to 2013 were extracted for this study. The version of the RSA-911 data released to researchers does not contain any personal identifiers.

The state-federal VR program is the public rehabilitation program in the United States that provides services and supports designed to promote the employment and independence of individuals with severe disabilities. In order to be eligible for services, an applicant must meet the criteria presented in §102(a) (1) of the Rehabilitation Act of 1973: (a) an individual who has a physical or mental disability that constitutes or results in a substantial impediment to employment; (b) an individual who can benefit from the provision of VR services to improve employment outcomes; and (c) an individual who requires VR services to prepare for, enter into, engage in, or retain gainful employment (Ditchman et al., 2014). Only individuals who had been determined eligible and then actually received VR services were included in this study.

The sample in this study consisted of 182,719 individuals with disabilities. Detailed description of the demographic characteristics of the study sample is presented in Table 1.

Table 1. Sample Characteristics (N = 182,719)

Variable	N (%)	M (SD)
Age at application	28.76	(12.37)
Gender		
Male	115,931	(63.4%)
Female	66,788	(36.6%)
Race/Ethnicity		
White	105,304	(57.6%)
Black	55,207	(30.2%)
Hispanic	15,348	(8.4%)
Asian	4,546	(2.5%)
Native American	2,314	(1.3%)
Primary Disability		
Intellectual disability	108,819	(59.6%)
Autism	26,086	(14.3%)
Schizophrenia	47,814	(26.2%)
Education		
Special education	39,474	(21.6%)
High school dropout	66,248	(36.3%)
High school graduate	53,022	(29.0%)
Associate degree	18,700	(10.2%)
Bachelor's degree	5,275	(2.9%)
Social Security Disability Benefits		
Yes	97,141	(53.2%)
No	85,578	(46.8%)

B. Major Variables

Competitive employment was the primary outcome measure and SE intervention was the independent variable for the propensity score matching in this study. Competitive employment was defined in the RSA-911 manual as, "employment in an integrated setting, self-employment, or employment in a state-managed Business Enterprise Program (BEP) that is performed on a full-time or part-time basis for which an individual is compensated at or above the minimum wage." (*Note.* BEP refers to vending facilities and small businesses operated by individuals with significant disabilities as well as home industry that fall under the management of the state vocational rehabilitation agency.) Clients who were not working after completing their planned rehabilitation program were considered unsuccessful outcomes.

Seven demographic covariates were used to adjust for selection bias, including: (a) gender (male, female), (b) race/ethnicity (White, African American, Hispanic, Asian, and Native American), (c) age (16-34, 35-54, 55-64, 65+), (d) education (special education, less than high school education, completed high school, associate degree, and bachelor degree), (e) type of disability (intellectual disability, autism, and schizophrenia), (f) SSI status (yes/no), and (g) SSDI status (yes/no).

C. Statistical Design and Analysis

Propensity score analysis was used to adjust for selection bias on the basis of all prominent demographic covariates that are relevant to the propensity to receive SE as a rehabilitation intervention. A classification tree was used to identify subsets of participants who have similar propensities of receiving SE interventions based on their demographic covariates. The proportion of the participants receiving SE in each subset was then used as the estimate of the common propensity for that subgroup. Demographic covariates were used in a classification tree model to group participants into homogeneous subgroups and to estimate propensity scores (i.e., likelihood to receive SE). Then, the homogeneous subgroups were arranged in descending order based on their estimated propensity scores, and comparisons between participants who received SE and those who did not were made on the employment outcome variable, and then the direct adjustment estimator was applied to adjust for selection bias.

In this study, the classification and regression tree (CART) method was used to estimate propensity scores. The CART method is an empirical, statistical technique based on recursive partitioning analysis. Recursive partitioning examines all available predictors and identifies a series of predictor variables that are most related to the outcome measure through a decision tree composed of progressive binary splits (Zhang & Singer, 1999). Every value of each predictor variable is considered as a potential split, and the optimal split is selected based on an impurity criterion (the reduction in the residual sum of squares due to a binary split of the data at that tree node). The Gini index is the splitting criterion for growing a CART tree. Each parent node in the decision tree produces two child nodes, which in turn can become parent nodes producing additional child nodes. This process continues with both tree building and pruning until statistical analysis indicates that the tree fits without overfitting the information contained in the data set.

Cost-complexity pruning was used to prune the tree (Breiman, Friedman, Olshen, & Stone, 1984). The complexity parameter (α: a measure of how much additional accuracy a split must add to the entire tree to warrant the additional complexity) would gradually increase during the pruning process. Beginning at the last level (i.e., the terminal nodes), the child nodes are pruned away if the resulting change in the predicted misclassification cost is less than α times the change in tree complexity. As α increase, more and more nodes are pruned away, resulting in a simpler tree that optimally fits the true information in the dataset (Lewis, 2000). In addition, 10-fold cross-validation was used to assess the predictive ability of the tree model. The Answer Tree statistical software package was used to conduct the CART analyses (SPSS, 1999).

This page has been left blank for double-sided copying.

IV. RESULTS

A. Descriptive Statistics

For the overall sample, the proportion of individuals with intellectual disability, autism spectrum disorders, and schizophrenia receiving SE was 36.38%. Individuals with intellectual disabilities (44.3%) had a higher propensity to receive SE than people with autism (34.2%) or schizophrenia (26.5%). Participants who had postsecondary education (associate degree [24.2%] and bachelor degree [21.5%]) were less likely to receive SE than individuals with no postsecondary education experiences. SSI recipients (49.7%) and SSDI recipients (42.9%) had higher propensity to receive SE than non-Social Security beneficiaries.

B. Tree Classification

We used CART analysis to examine the effect of gender, race, education, type of disability, and Social Security benefit status on the propensity to receive SE as a primary VR intervention. The decision tree initially grew to five levels with 20 homogeneous subgroups. The tree was pruned using the cost-complexity pruning method (Breiman et al., 1984) to reduce overfitting.

Experimental-wise error was controlled using Bonferroni correction. The improvement index for each level of split was reported in Figure 1a and Figure 1b. Using the one-standard error rule resulted in a final subtree with 9 homogeneous subgroups. In the optimally fitted tree, participation in special education was the most significant predictor followed by Social Security benefit status, type of disability, age group, and educational attainment. Each subgroup is characterized by different combinations of the demographic variables with estimated propensity scores in the subgroups ranging from a low propensity (28.2%) to receive SE to a high of 69.8%. Due to page constraint, we have to present the tree diagram in two figures (1a and 1b). Figure 1a depicts the branch for VR consumers who received special education in high school. Figure 1b represents consumers who did not receive special education in high school. Figure 1a and 1b constitute the whole tree.

The following is a brief description of the nine homogeneous subgroups in the order of their propensity to receive SE and the employment outcomes of the SE and no SE group.

Subgroup 3. This group represents 17,497 individuals who were SSI recipients and who had received special education in secondary school. The majority of the participants in this group were individuals with intellectual disabilities (85.9%) and 61.1% were male. The average age of the clients in this group at application was 26.34 years (*SD* = 9.40). With a propensity score of .698 (69.8%), individuals in this group had the highest propensity to receive SE services compared to individuals in the other subgroups. Of the individuals in this subgroup who received SE as a VR intervention, 44.7% obtained successful employment closures, which was appreciably higher than the employment rate of those who did not receive SE (35.6%).

Figure 1a. Propensity to receive supported employment classification tree for individuals with intellectual disability, autism spectrum disorders, and schizophrenia and other psychotic disorders (special education groups)

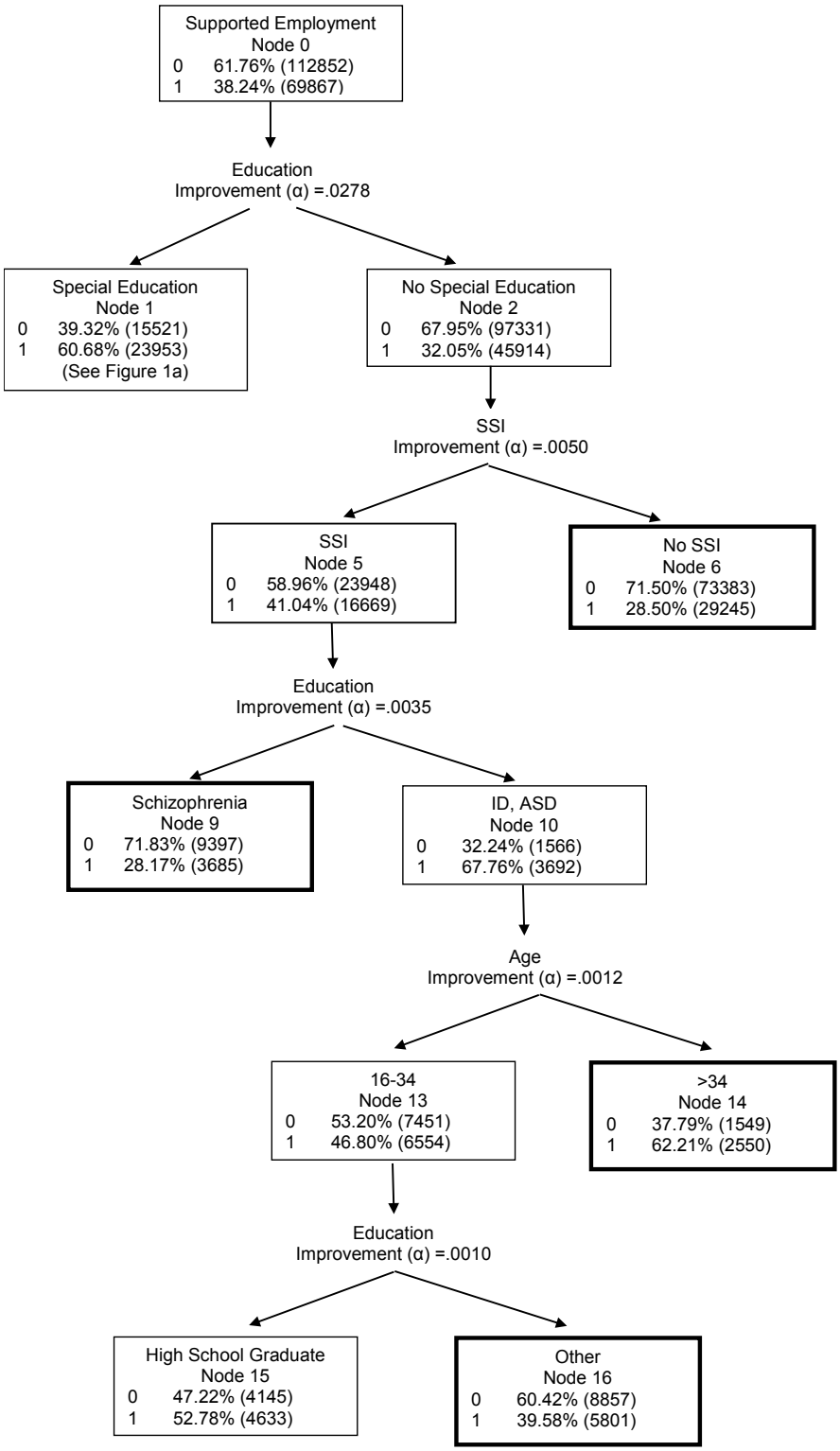
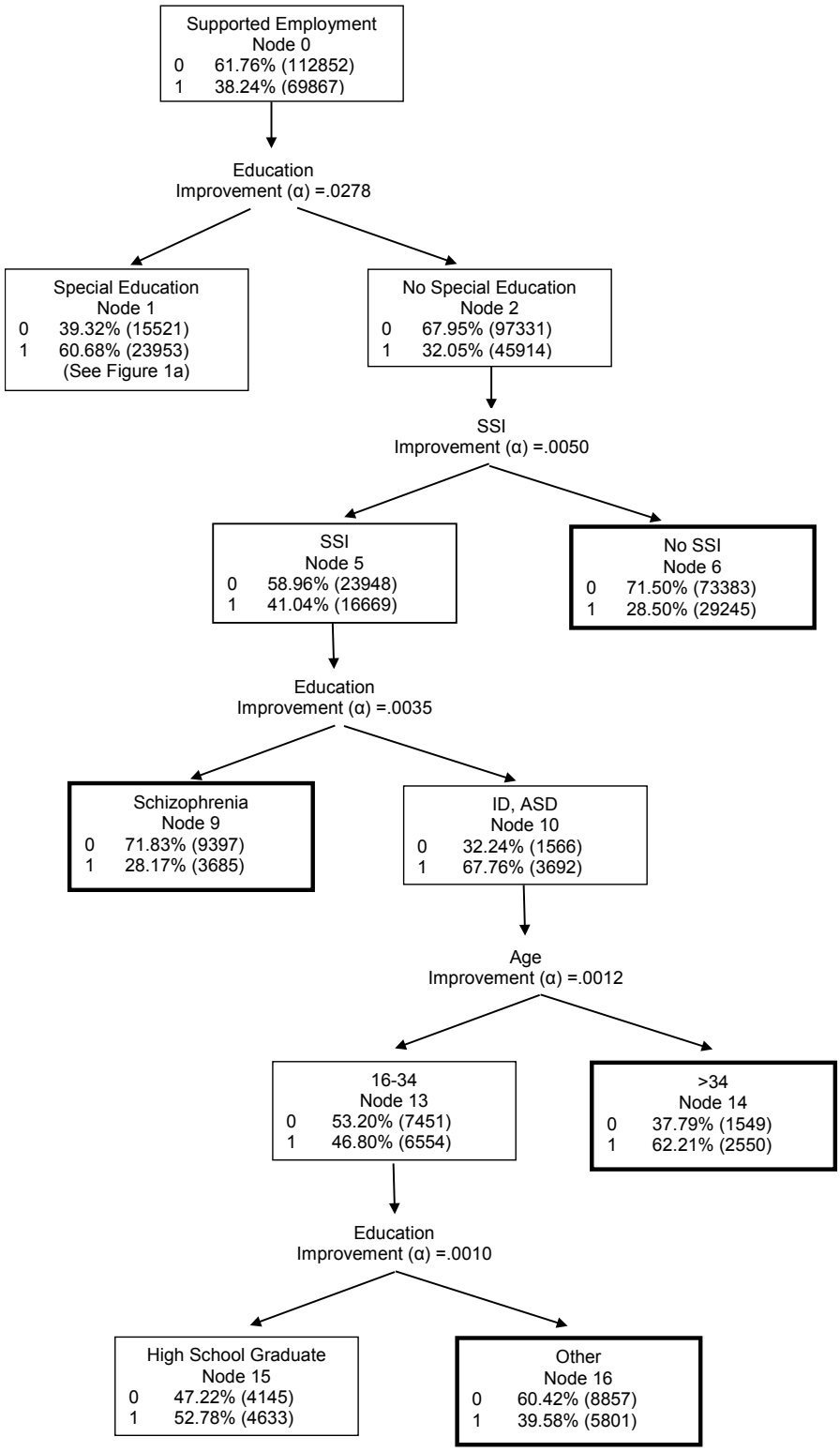


Figure 1b. Propensity to receive supported employment classification tree for individuals with intellectual disability, autism spectrum disorders, and schizophrenia and other psychotic disorders (No special education groups)



Subgroup 8. This group represents 4,858 individuals who were SSDI recipients and who had received special education in secondary school. The majority of the participants in this group were individuals with intellectual disabilities (87.1%) and 61.6% were men. The average age of the clients in this group at application was 35.45 years (*SD* = 11.38). With a propensity score of .678 (67.8%), individuals in this group had the second highest propensity to receive SE services compared to individuals in the other subgroups. Of the individuals in this subgroup who received SE as a VR intervention, 57.3% obtained successful employment closures, which was appreciably higher than the employment rate of those who did not receive SE (49.0%).

Subgroup 14. This group represents 4,099 individuals with intellectual disabilities (96.4%) or autism (3.6%) who were SSI recipients. Most of them had a less than high school education (43.6%) or a high school education (51.3%). Mean age of the clients was 45.37 years (*SD* = 7.73). This group had a propensity score estimate of .622 (62.2%). Over half (45.7%) of those who received SE as a VR intervention were employed, compared to 40.0% for those who did not receive SE.

Subgroup 12. This group represents 3,114 individuals who received special education in secondary school but were not SSI or SSDI beneficiaries. The majority of the participants in this group were individuals with intellectual disabilities (91.7%). Mean age of the clients was 44.11 years (*SD* = 6.66). This group had a propensity score estimate of .609 (60.9%). Supported employment services were not a more effective intervention than other VR services for this subgroup.

Subgroup 15. This group represents 8,778 individuals with intellectual disabilities (78.9%) or autism (21.1%) who were SSI beneficiaries. They were all high school graduates. Mean age of the clients was 23.31 years (*SD* = 4.25). This group had a propensity score estimate of .528 (52.8%). For these individuals, supported employment was substantially more effective than other VR services. Over half (54.6%) of those who received SE as a VR intervention were employed, compared to only 41.3% for those who did not receive SE.

Subgroup 11. This group represents 14,005 individuals who received special education in secondary school but were not SSI or SSDI beneficiaries. The majority of the participants in this group were individuals with intellectual disabilities (80.5%) or autism (16.5%). Overwhelmingly, group members were transition aged youth. The mean age of the clients was 21.39 years (*SD* = 4.59). This group had a propensity score estimate of .468 (46.8%). Individuals in this subgroup who received SE as a VR intervention had an employment rate of 54.7%, compared to a 46.4% employment rate for those who did not receive SE.

Subgroup 16. Similar to Subgroup 11, this subgroup was comprised of primarily of transition aged youth. Subgroup 16 represents 14,658 individuals with intellectual disabilities (79.8%) or autism (20.2%) who were SSI beneficiaries. This subgroup was comprised of participants with less than high school education or have an associate degree or have a college degree. Mean age of the clients at application was 19.45 years (*SD* = 3.57). This group had a propensity score estimate of .396 (39.6%). Individuals in this subgroup who received SE as a VR intervention had an employment rate of 48.6% compared to a 33.6% employment rate for those who did not receive SE.

Subgroup 6. This group was the largest, representing 102,628 individuals who did not receive special education in secondary school and were not a SSI recipient. However, 21.4% of the participants were SSDI recipients. Mean age of the clients was 29.48 years (*SD* = 13.08). This group had a propensity score estimate of .285 (28.5%), indicating that only about one-fourth of group members received SE services. Individuals in this subgroup who received SE had an employment rate of 53.9%, compared to an employment rate of 47.3% for those who did not receive SE.

Subgroup 9. This group represents 13,082 individuals with schizophrenia who did not receive special education in high school and were SSI recipients. Mean age of the clients at application was 36.95 years (*SD* = 11.70). This subgroup had a propensity score estimate of .282 (28.2%).

C. Effectiveness of SE Services

Table 2 presents the homogeneous subgroups sorted by their propensity scores. Results indicate a positive effect of SE intervention for individuals with intellectual disabilities, autism spectrum disorders or schizophrenia. This effect is strongest for Social Security disability beneficiaries who were special education graduates (21% difference in employment outcomes) and persons with intellectual disabilities or autism who graduated from regular high school (20% difference in employment outcomes). The propensity adjusted estimate of the overall effect of SE on VR outcomes showed that individuals who received SE had on average a 12.49% higher employment rate than individuals who did not receive SE.

D. Supported Employment and VR Outcomes

The results provided in in Table 2 indicate a positive effect of SE intervention for individuals with intellectual disabilities, autism spectrum disorders or schizophrenia. This effect was strongest for transition age youth (mean age of 19 years) who received Supplemental Security Income (SSI) disability benefits (15% difference in employment outcomes) and persons with intellectual disabilities or autism who graduated from regular high school (13.3% difference in employment outcomes). The propensity adjusted estimate of the overall effect of SE on VR outcomes showed that individuals who received SE had on average a 7.8% higher employment rate than individuals who did not receive SE.

Table 2. Effect of Supported Employment on VR Outcomes of Individuals with Disabilities in the Present Study

Strata No./N	Participants	Group Count	Estimated Propensity Score[a]	Successful employment outcome	Difference in employment outcome[b]	Significance (*p*)	Weight for each difference	Weighted employment difference
Subgroup 3 N_3 = 17497	SE	12212	.70	44.7%	9.1%	$\chi^2(2, N = 17497) = 125.73, p < .001$	.096	0.874%
	No SE	5285		35.6%				
Subgroup 8 N_8 = 4858	SE	3292	.68	57.3%	8.3%	$\chi^2(2, N = 4858) = 29.58, p < .001$	.027	0.224%
	No SE	1566		49.0%				
Subgroup 14 N_{14} = 4099	SE	2550	.62	45.7%	5.7%	$\chi^2(2, N = 4099) = 12.56, p < .001$	.022	0.125%
	No SE	1549		40.0%				
Subgroup 12 N_{12} = 3114	SE	1895	.61	53.2%	-3.6%	$\chi^2(2, N = 3114) = 3.83, p = .051$, *n.s.*	.017	-.061%
	No SE	1219		56.8%				
Subgroup15 N_{15} = 8778	SE	4633	.53	54.6%	13.3%	$\chi^2(2, N = 8778) = 155.10, p < .001$	.048	0.638%
	No SE	4145		41.3%				
Subgroup11 N_{11} =14005	SE	6554	.47	54.7%	8.3%	$\chi^2(2, N = 14005) = 96.16, p < .001$	.077	0.639%
	No SE	7451		46.4%				
Subgroup16 N_{16} =14658	SE	5801	.40	48.6%	15.0%	$\chi^2(2, N = 14658) = 329.68, p < .001$	.080	1.200%
	No SE	8857		33.6%				
Subgroup 6 N_6 = 102628	SE	29245	.29	53.9%	6.6%	$\chi^2(2, N = 102628) = 364.46, p < .001$	.562	3.709%
	No SE	73383		47.3%				
Subgroup 9 N_9 = 13082	SE	3685	.28	33.3%	7.4%	$\chi^2(2, N = 13082) = 87.58, p < .001$	.072	0.533%
	No SE	9397		25.9%				
Total direct adjustment estimator[c]								7.811%

[a]Estimated propensity score for each subgroup is equal to the number of SE participants in the subgroup divided by the size of the subgroup.

[b]Difference in employment outcome is the difference between the percent of employment for SE and non-SE participants in the subgroup.

[c]Weight for each difference is the ratio between each subgroup count and whole data set count.

V. DISCUSSION

The study possesses several limitations that affect the interpretation of the results and reduce the quality of policy implications that can be drawn from the findings. First, the study relies exclusively on information extracted from the RSA-911 data system. Some data points are collected only at the time of application and the time of case closure. No longitudinal data is available that can be used to assess the impact of SE services on long-term employment retention. Recent literature described above (Bond, Xie, & Drake, 2007; Hoffman, et al., 2014) provides evidence that SE often leads to successful long-term employment outcomes. However, in this study, while the SE intervention led to consistently positive results in terms of employment status at closure for a select group of VR program participants, but it cannot be assumed that individuals receiving supported employment are able to maintain employment for a longer period of time when compared to other VR clients.

Second, the study only addresses the receipt of one type of service (SE) and employment at a specific point in time (case closure). It does not capture the earnings of individuals in the study sample after case closure. While the results indicate that SE is often the preferred service approach for certain groups of VR clients, and these individuals may have higher employment rates at closure when compared to other clients, the findings from this study shed no light on the extent to which SE results in higher earnings than other VR services or promotes the long-term economic self-sufficiency of vocational rehabilitation clients.

Third, despite the use of propensity scores, the study does not address all potential confounding factors. Cross-state variation in the underlying labor market and differences in the amount and scope of services provided by VR agencies are not accounted for in the analysis and should be considered limitations of the study.

The study makes a significant contribution to the current body of literature regarding VR service practices for individuals with intellectual disabilities, autism spectrum disorders, and schizophrenia, including individuals who were Social Security disability beneficiaries at the time of service. Propensity scores across the nine homogeneous subgroups ranged from a high of 70 percent to a low of 28 percent of subgroup members. In five of the nine subgroups, over half of all subgroup members received SE services. Individuals in Subgroup 3, which was comprised of SSI beneficiaries with intellectual disabilities who received special education services while in school were most likely to receive SE services. Conversely, individuals in Subgroup 9, made up of SSI beneficiaries with schizophrenia who had not received special education services, were least likely to receive SE services.

SE services had a positive effect on the employment outcomes of study participants. Employment rates among members of the nine subgroups who received SE ranged from 33 percent to 57 percent. In eight of the nine subgroups, individuals who received SE services were significantly more likely to be employed at closure. For individuals in Subgroup 12, comprised of persons who had received special education services and were not SSI or SSDI beneficiaries, SE services did not result in more positive employment outcomes than other VR services.

While the study found that the delivery of SE services had a significant effect on the employment outcomes of individuals with intellectual disabilities, autism spectrum disorders,

and schizophrenia when compared to other VR services, in absolute terms the employment of rate of SE participants was relatively low. For four of the subgroups, the percentage of individuals employed at the time of case closure was less than 50 percent. The current study does not allow a complete analysis of the characteristics of individuals in each subgroup who became employed versus those who did not. This limits the extent to which the findings can be used to improve SE services.

In summary, the results of the study documented the effectiveness of SE as an effective VR intervention for individuals with intellectual disabilities, autism spectrum disorders, and schizophrenia who were served by the state-federal VR program. Individuals receiving SE were significantly more likely to become employed after receiving services. Notably, the effect was strongest for transition age youth, SSI beneficiaries, and individuals with intellectual disabilities, groups that traditionally have been underemployed and dependent on Social Security disability benefits.

Despite the positive findings, the study possessed significant limitations. Future research should examine the effect of SE on the wages and long-term employment retention of VR clients with intellectual disabilities, autism spectrum disorders and schizophrenia, investigate the potential effect of confounding factors such as underlying economic trends on employment outcomes, and identify additional demographic and functional characteristics of VR clients most likely to benefit from SE services.

REFERENCES

Becker, D.R., Xie, H., McHugo, G.J., Halliday, J., Martinez, R.A. (2006). What Predicts Supported Employment Program Outcomes? *Community Mental Health Journal*, 42(3), 303-313.

Bond, G.R. (2004). Supported Employment: Evidence for an Evidence-Based Practice. *Psychiatric Rehabilitation Journal*. *27*, (4), 345-359.

Bond, G.R., Drake, R.E. & Becker, D.R. (2008). An Update on Randomized Controlled Trials of Evidence-Based Supported Employment. *Psychiatric Rehabilitation Journal*, 31(4), 280-290

Bond, G.R., Xie, H., Drake, R.E. (2007). Can SSDI and SSI Beneficiaries With Mental Illness Benefit from Evidence-Based Supported Employment? *Psychiatric Services.* 58(11).

Breiman, L., Friedman, J. H., Olshen, R. A., & Stone, C. J. (1984). *Classification and regression trees*. Pacific Grove, CA: Wadsworth.

Brooke, V., Brooke, A. M., Schall, C., Wehman**, P**., McDonough, J., Thompson, K., & Smith, J. (2018). Employees with Autism Spectrum Disorder Achieving Long-Term Employment Success: A Retrospective Review of Employment Retention and Intervention. *Research and Practice for Persons with Severe Disabilities*

Brown, P. & Johnson, K. (2014). Aging with a Disability and State Vocational Rehabilitation Services. *Work.* 48: 441-451.

Boutin D.L. & Accordino, M.P. (2011). Importance of Collegiate Training for Vocational Rehabilitation Consumers with Psychiatric Disabilities. *American Journal of Psychiatric Rehabilitation*, 14, 76-95.

Campbell, K., Bond, G.R., and Drake, R.E. (2011). Who Benefits from Supported Employment. *Schizophrenia Bulletin*. 37(2), 370-380.

Chiu, C., Chan, F., Strauser, D., Feuerstein, M., Ditchman, N., Cardoso, E. &…Muller, V. (2014). State Rehabilitation Services Tailored to Employment Status Among Cancer Survivors. *Journal of Occupational Rehabilitation,* 24(1), 89-99.

Chronister, J., Chih Chin, C., Frain, M. & da Silva Cardoso, E. (2008). The Relationship Between Social Support and Rehabilitation Related Outcomes: A Meta-analysis. *Journal of Rehabilitation,* 74(2), 16-32.

Cimera, R.E., Wehman, P., West, M., Burgess, S. (2012). Do sheltered workshops enhance employment outcomes for adults with autism spectrum disorder? *Autism* 16(1), 87-94.

Davis, L.L., Leon, A.C., Toscano, R., Debring, C.E., Ward, L.C., Parker, P.E., Kashner, T.M., Drake, R.E. (2012). Supported Employment Among Veterans with Posttraumatic Stress Disorder. *Psychiatric Services* 63(5).

Dean, D., Pepper, J.V., Schmidt, R.M., & Stern, S. (2014). State vocational rehabilitation programs and federal disability insurance: an analysis of Virginia's vocational rehabilitation program. *IZA Journal of Labor Policy.* 3(7).

Ditchman, N., Wu, M., Chan, F., Fitzgerald, S., Lin, C. P., & Tu, W. (2013). Vocational rehabilitation. In D. Strauser (Ed.), *Career development, employment, and disability in rehabilitation: From theory to practice* (pp. 343-360). New York: Springer Publishing Company.

Drake, R.E., Skinner, J.S., Bond, G.R., and Goldman, H.H. (2009). Social Security and Mental Illness: Reducing Disability with Supported Employment. *Health Affairs* 28(3), 761-770.

Dutta, A., Gervey, R., Chan, F., Chou, C., & Ditchman, N. (2008). Vocational rehabilitation services and employment outcomes for people with disabilities: A United States study. Journal of Occupational Rehabilitation, 18, 326–334.

Ellison, M.L., Klodnick, V.V., Bond, G.R., Krzos, I.M., Kaiser, S.M., Fagan, M.A., Davis, M. (2015). Adapting Supported Employment for Emerging Adults with Serious Mental Health Conditions. *Journal of Behavioral Health Services & Research*. 42(2), 206-222.

Fabian, E.S. & Waterworth, A. (1993). Reasonable accommodations for workers with serious mental illness: Type, frequency, and associated outcomes. *Psychosocial Rehabilitation Journal*. 17(2), 163-72.

Granger, B. (2000). The role of psychiatric rehabilitation practitioners in assisting people in understanding how to best assert their ADA rights and arrange job accommodations. *Psychiatric Rehabilitation Journal.* 23(3), 215-23.

Hoffman, H., Jackel, D., Glauser, S., Mueser, K., Kupper, Z. (2014). Long-Term Effectiveness of Supported Employment: 5 Year Follow-Up of a Randomized Controlled Trial. *American Journal of Psychiatry*. 171, 1183-1190.

Leahy, M.J., Chan, F., Liu, J., Rosenthal, D., Tansey, T., Wehman, P., Kandu, M., Dutta, A., Anderson, C.A. Del Valle, R., Sherman, S., and Menz, F.E. (2014). An analysis of evidence-based best practices in the public vocational rehabilitation program: gaps, future directions, and recommended steps to move forward. *Journal of Vocational Rehabilitation, 41, 147-163.*

Lewis, R. J. (2000, May). *An introduction to classification and regression tree (CART) analysis.* A lecture presented at the Annual Meeting of the Society for Academic Emergency Medicine, San Francisco, CA.

Luciano A., Drake, R. Bond, G., Becker, D., Carpenter-Song, E., Lord S., Swarbrick, P., & Swanson, S. (2014). Evidence-based supported employment for people with severe mental illness: Past, current, and future research. *Journal of Vocational Rehabilitation* 40 (2014) 1–13.

Markussen, S. & Roed, K. (2014). The impacts of vocational rehabilitation. *Labour Economics*. 31, 1-13

Marshall, T., Goldberg, R.W., Braude, L., Dougherty, R.H., Daniels, A.S., Ghose, S.S., George, P. & Delphin-Rittmon, M.E. (2014). Supported employment: Assessing the evidence. *Psychiatric Services* 65(1), 16-23.

McGurk, S.R., Mueser, K.T., Feldman, K., Wolfe, R., and Pascaris, A. (2007). Cognitive Training for Supported Employment :2-3 year Outcomes of a Randomized Controlled Trial. *American Journal of Psychiatry.* 164(3)

Ottomanelli, L., Barnett, S.D., Goetz, L.L. (2014). Effectiveness of Supported Employment for Veterans with Spinal Cord Injury: 2-Year Results. *Archives of Physical Medicine and Rehabilitation* (95), 784-790.

O'Neil, J.O., Mamun, A.A., Potamites, E., Chan, F. & da Solve Cordoso, E. (2015). Return to work of disability insurance beneficiaries who do and do not access state vocational rehabilitation agency services. *Journal of Disability Policy Studies, 26(2), 111-123.*

Pruett, S.R., Swett, E.A., Fong, C., Rosenthal, D.A. & Lee, G.K. (2008). Empirical Evidence Supporting the Effectiveness of Vocational Rehabilitation. *Journal of Rehabilitation,* 74(2), 56-63.

Sears, J.M., Wickizer, T.M., Schulman, B.A. (2014). Injured workers' assessment of Vocational Rehabilitation services before and after retraining. *Journal of Occupational Rehabilitation.* 24, 458-468.

Sosulski, M.R., Donnell, C. & Kim, W.J. (2012) Disability and Employee Benefits Receipt: Evidence From the U.S. Vocational Rehabilitation Services Program, *Journal of Social Work in Disability & Rehabilitation,* 11:1, 33-54, DOI:10.1080/1536710X.2012.648115

Statistical Package for the Social Sciences (1999). SPSS *AnswerTree algorithm summary*. Chicago: Author.

Twamley, E.W., Vella, L., Burton, C.Z., Becker, D.R., Bell, M.D., Jeste, D.V. (2012) The efficacy of supported employment for middle-aged and older adults with schizophrenia. *Schizophrenia Research*, 135, 100-104.

United States Commission on Civil Rights (n.d.). Sharing the Dream: Is the ADA Accommodating All? Chapter 1: The Road to the ADA. Retrieved from http://www.usccr.gov/pubs/ada/ch1.htm

Wagner, S.L., Wessel, J.M., and Harder, H.G. (2011). Workers' Perspectives on Vocational Rehabilitation Services. *Rehabilitation Counseling Bulletin.* 55(1), 46-61.

Wehman, P. (2012). Supported Employment: What is it? *Journal of Vocational Rehabilitation*. 37, 139-142.

Wehman, P., Chan, F., Ditchman, N., & Kang, H.J. (2014). Effect of supported employment on Vocational Rehabilitation outcomes of transition-age youth with intellectual and Developmental Disabilities: A case control study. *Intellectual and Developmental Disabilities,* 4, 296-310.

Wehman, P., Kregel, J., Keyser-Marcus, L., Sherron-Targett, P., Campbell, L., West, M. & Cifu, D.X. (2003). Supported Employment for Persons with Traumatic Brain Injury: A Preliminary Investigation of Long-Term Follow-Up Costs and Program Efficacy. *Archives of Physical Medicine and Rehabilitation,* 84.

Wehman, P.H., Revell, G., Kregel, J., Kreutzer, J.S., Callahan, M. & Banks, D. (1991) Supported Employment: An Alternate Model for Vocational Rehabilitation of Persons with Severe Neurologic, Psychiatric, or Physical Disability. *Archives of Physical Medicine and Rehabilitation* (72).

Wehman, P., Taylor, J., Brooke, V., Avellone, L., Whittenburg, H., Ham, W. & Carr, S. (2018). Toward competitive employment for persons with intellectual and developmental disabilities: What progress have we made and where do we need to go. *Research and Practice for Persons with Severe Disabilities.*

West, M. Targett, P., Wehman, P., Cifu, G., and Davis, J. (2015). Separation from supported employment: a retrospective chart review study. *Disability and Rehabilitation*. 37(12), 1055-1059.

Wilhelm, S. & Robinson, J.L. (2013). The economic impact of Utah's Vocational Rehabilitation Program. *Journal of Disability Policy Studies,* 24(3), 148-157.

Zhang, H., & Singer, B. H. (1999). *Recursive partitioning in the health sciences.* New York: Springer.

This page has been left blank for double-sided copying.

www.mathematica-mpr.com

Improving public well-being by conducting high quality, objective research and data collection

PRINCETON, NJ ■ ANN ARBOR, MI ■ CAMBRIDGE, MA ■ CHICAGO, IL ■ OAKLAND, CA ■ TUCSON, AZ ■ SEATTLE, WA ■ WASHINGTON, DC ■ WOODLAWN, MD

MATHEMATICA
CENTER FOR
STUDYING DISABILITY POLICY