

Use of Vocational Rehabilitative Services Among Adults with Autism

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Abstract This study examined the experiences of individuals with autism spectrum disorders (ASD) in the US Vocational Rehabilitation System (VRS). Subjects included all 382,221 adults ages 18–65 served by this system whose cases were closed in 2005; 1,707 were diagnosed with ASD. Adults with ASD were more likely than adults with other impairments to be denied services because they were considered too severely disabled. Among those served, adults with ASD received the most expensive set of services. They and adults with MR were most likely to be competitively employed at case closure. Post hoc analyses suggest that their employment was highly associated with on-the-job supports. The results suggest the importance of the VRS in serving adults with ASD.

Keywords Autism spectrum disorders · Vocational services · Rehabilitation services · Employment · Adults

Introduction

This study compared the experiences of individuals with autism spectrum disorders (ASD) in the United States

vocational rehabilitation system with others who use this system. ASD comprise a group of developmental disorders characterized by deficits in communication and socialization and the presence of repetitive or restricted behaviors (American Psychiatric Association 2000). The impairments associated with ASD typically last throughout the lifespan. With notable exceptions (Howlin et al. 2005; Seltzer et al. 2003), adults with ASD require considerable supports; studies suggest that only 15% achieve independence, with another 20% able to function well in the presence of community-based support (Howlin et al. 2004).

One of the few formal systems that provides support to adults with ASD is the vocational rehabilitation system, administered by the US Department of Education. The goal of vocational rehabilitation is to maximize employment outcomes by providing services such as assessment and diagnosis, counseling, job search assistance, assistive technology, and on-the-job training. Any individual with a disability who requires help attaining employment is eligible for these services, which are aimed at creating the necessary skills and supports for individuals to be employed. Depending on the extent of their disability, individuals can be placed in non-competitive or competitive employment. Competitive employment occurs in integrated settings, with or without supports, and is associated with wages at or above the federal minimum. Non-competitive employment does not have the same wage requirement, and can include sheltered employment (employment in non-integrated settings). While sheltered employment is often a stepping stone to successful competitive employment (Garcia-Villamisar et al. 2002; Moore et al. 2002), it usually includes less social interaction and income, and OVR no longer considers it to be a positive employment outcome.

Individuals with ASD have markedly different vocational needs than individuals with other developmental

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disabilities (Müller et al. 2003). The uneven cognitive and social abilities associated with ASD results in a diverse set of vocational needs that are challenging to address with usual practices, create problems with employment stability, and result in isolated work opportunities. The additional needs increase these challenges associated with finding appropriate and successful employment for adults with ASD (Hillier et al. 2007; Mawhood and Howlin 1999).

The lack of entitlements for individuals with ASD as they age out of the education system has contributed to a call to examine the utility of existing services and further expand adult services (Shattuck et al. 2007). The small body of research in this area suggests that services provided through vocational rehabilitation programs are less than optimal for individuals with ASD. With one exception, however, these studies relied on qualitative data and small samples (Müller et al. 2003). Schaller and Yang (2005) used the 2001 Rehabilitation Services Administration database to describe the characteristics associated with the 815 individuals with ASD out of 1,323 served who achieved competitive and supported employment outcomes. While the authors provided descriptive information regarding demographic characteristics and services used, they did not examine the costs of service, included only demographic characteristics in their adjusted analyses, and provide no comparison with other groups served through this system.

The Expanding the Promise for Individuals with Autism Act of 2007, currently pending passage, would provide funding to states to expand supports for adults with ASD, including vocational services. In light of this new federal initiative, it is worthwhile to examine the current vocational services available to adults with ASD in order to better understand their access to services, intensity of service provision and outcomes relative to other impairment groups using the national data reported by federally-funded vocational rehabilitation programs. Because people with ASD have more complex and significant impairments, we hypothesized that relative to other adults using vocational rehabilitation services, those with ASD would be more likely to be turned away from services because of the magnitude of their needs, would use a greater amount of services, thereby resulting in greater costs, and would be less likely to be placed in competitive work environments.

Methods

Data Source

National data on individuals receiving vocational rehabilitation services were obtained from the US Department of Education's Office of Special Education and Rehabili-

tative Services, and included demographic variables, impairment cause, types and cost of services paid for by the Rehabilitation Services Administration, reasons for closure, and competitive employment status. There were 616,879 individuals in the dataset; 146,357 cases were closed in 2004 and 470,522 were closed in 2005. For this study, we limited the sample to adults ages 18–65 whose cases were closed in 2005 for reasons other than death or because they were determined not to need vocational rehabilitation (VR) services. The final dataset contained 382,221 subjects.

Dependent Variables

There were three dependent variables of interest. The first was a binary variable indicating whether the case was closed because the rehabilitation service provider believed that the individual's disability was too significant to benefit from services. The second was the total dollar amount the state VR agency spent on services. The third dependent variable was a binary variable indicating whether individuals achieved competitive employment by the time of case closure. The Office of Vocational Rehabilitation defines competitive employment as "employment in an integrated setting [with or without supports], self-employment or a state-managed Business Enterprise Program that is performed on a full-time or part-time basis for which an individual is compensated at or above the minimum wage."

Independent Variables

Impairment Causes

There were 37 possible primary impairment causes for the disability in the VR dataset. We separated them into four categories: autism spectrum disorders (ASD, $n = 1,707$), mental retardation (MR, $n = 30,728$), specific learning disabilities (SLD, $n = 33,155$), and combined the other 34 causes into an Other Impairment Cause group (OIC, $n = 316,471$). Although the primary group of interest was individuals with ASD, individuals with MR and SLD were kept separate to provide comparisons with individuals with other developmental disabilities.

Demographic Variables

These variables included gender, race (categorized as Black, White and other), education at case closure (categorized as less than high school, high school graduate or GED, and more than high school), and age at case closure. Age was centered to make associated coefficients more interpretable and stable.

Other Covariates of Interest

These included the number of months services were received, cost of services in \$1,000 increments and an indicator of whether on-the-job supports were used. On-the-job supports are defined as “support services provided to an individual who has been placed in employment in order to stabilize the placement and enhance job retention. Such services include job coaching, follow-up and follow-along, and job retention services.”

Analysis

First, bivariate associations between impairment cause and all other variables were estimated using means, medians and ANOVA for expenditure data, and frequencies and chi-square tests for all other variables.

Logistic regression was used to examine the adjusted association between impairment cause and whether cases were closed because the disability was viewed as too significant to benefit from services. The 7,462 individuals listed as having a disability too significant to benefit from services were removed from all subsequent analyses.

Because some individuals did not receive any services and because some services were paid by non-VR sources, 93,762 (25%) of subjects had no service expenditures in the dataset. A two-part model was used to examine the adjusted association between impairment cause and total VR expenditures. First, logistic regression was employed to examine the adjusted association between impairment cause and whether any expenditure was incurred. Second, linear regression was used to examine the adjusted association between impairment cause and total VR service expenditures for the 280,733 individuals with positive expenditures. Although the distribution of expenditures was skewed even after removing subjects with no expenditures, a logarithmic transformation of costs was not employed to model system costs and decrease the effects of outliers. To address the concerns regarding heavily skewed expenditure data common to studies such as these, however, we also examined average expenditures within each quintile of expenditure for each cause of impairment.

Logistic regression was used to examine the adjusted association between impairment cause and competitive employment outcomes.

Results

Sample Description

Table 1 presents the sample characteristics for each impairment cause. The ASD group had higher percentages

of males and Whites than the other groups. This group also included a large percentage of individuals (89%) between the ages of 18 and 34, which was similar for the SLD group (88%) but substantially higher than the MR group (73%). Age was distributed much more uniformly among individuals with other impairment causes (OIC). About 80% of the ASD and SLD groups had a high school education or less. Most individuals with mental retardation (64%) had not completed high school or finished special education programs. The OIC group had the highest percentage of people with more than a high school education.

Access to Services

Table 1 shows the number of individuals in each disability category whose cases were closed to a disability too severe to benefit from services; 4.3% of individuals with ASD had a case closed for this reason, compared with 2.0% of those in the MR, 0.4% of those in the SLD, and 2.2% of those in the OIC categories. These differences persisted in the adjusted analysis (Table 2), in which individuals with ASD were much more likely to have a case closed for this reason compared with the MR (OR = 0.4, $p < 0.0001$), SLD (OR = 0.1, $p < 0.0001$) and OIC (OR = 0.3, $p < 0.0001$) groups. Being older, female, having less than a high school education, and having a previous case closure within the past 3 years also were associated with having a case closed due to disability too severe to benefit from services. Blacks were less likely to have a closure for that reason than Whites.

Cost of Services

Table 1 shows the number of individuals in each disability category who were enrolled in VR services but had no associated costs; 28.0% of individuals with ASD no associated costs, compared with 25.3% of those in MR, 34.8% of those in SLD, and 25.8% of those in the OIC categories. The average expenditure for purchased services was highest for individuals with ASD (Mean (SD) = 3,324 (5,662)) and MR (Mean (SD) = 2,910 (5,236)), and considerably lower for individuals with SLD (Mean (SD) = 1,864 (4,417)) and OIC (Mean (SD) = 2,467 (6,205)). Compared with the ASD group, individuals with SLD had lower odds of having any state-funded VR expenditures (OR = 0.6, $p < 0.0001$). The odds of having any VR expenditures were not significantly different for individuals with MR and OIC, when controlling for demographics, previous case closure and length of eligibility. The results of the regression predicting expenditures among those with any expenditure are presented in Table 3. Total expenditures for individuals with ASD were significantly higher, on average, than those of individuals

Table 1 Sample characteristics

	ASD		MR		SLD		OIC	
	(N = 1,707)		(N = 30,728)		(N = 33,155)		(N = 316,471)	
	%	N	%	N	%	N	%	N
Male*	84.0	1,434	54.5	16,734	60.0	19,880	53.5	169,444
Race*								
Black	12.8	216	30.3	9,233	24.0	7,870	23.3	72,830
White	84.0	1,417	67.2	20,494	73.3	24,055	74.0	231,883
Others (including multiracial)	4.3	74	3.2	991	3.6	1,202	3.6	11,281
Hispanic ethnicity*	4.2	72	8.0	2,461	12.5	4,149	9.2	28,967
Age (years)*								
18–25	73.4	1,253	52.6	16,178	75.6	25,078	18.0	57,123
25–34	15.5	265	20.4	6,257	12.3	4,091	20.3	64,195
35–44	8.1	138	15.5	4,763	7.4	2,449	28.4	89,957
45–54	2.5	43	9.2	2,822	3.8	1,253	24.4	77,313
55–65	0.5	8	2.3	711	0.9	299	8.9	28,025
Education at closure*								
<High school	43.7	739	63.6	19,406	39.6	12,809	20.4	63,297
High school or GED	38.0	642	32.6	9,944	39.7	12,844	38.8	120,389
>High school	18.3	309	3.8	1,166	20.7	6,690	40.9	126,876
Previous closure*	22.4	382	25.9	7,966	14.3	4,740	17.9	56,657
Case deemed too severe to benefit from services*	4.3	74	2.0	623	0.4	145	2.2	6,884
Expenditures								
Enrolled but no billed services*	28.0	478	25.3	7,763	34.8	11,549	25.8	81,538
Median expenditures among those with any expenditures*	\$2,380	1,229	\$2,160	22,965	\$1,108	21,606	\$1,280	234,933
Vocational outcomes at closure*								
Not employed	55.7	909	57.2	17,221	62.0	20,466	63.6	196,973
Employed in a sheltered setting	2.1	35	3.3	1,002	0.5	175	1.4	4,170
Competitively employed	42.2	689	39.4	11,885	37.5	12,384	35.1	108,586

Note: * $p < 0.001$

Table 2 Logistic regression predicting case closure because disability was too severe to benefit from VR services

Parameter	Odds ratio	95% Conf. Interval
Centered age (years)	1.03	1.03–1.03
Male (vs. Female)	0.93	0.89–0.98
Race (reference is White)		
Black	0.79	0.74–0.84
All other races (including multiracial)	1.12	0.99–1.25
Hispanic ethnicity	0.93	0.86–1.01
Impairment cause (reference is autism)		
MR	0.38	0.29–0.48
SLD	0.10	0.08–0.14
OIC	0.33	0.26–0.42
Education at closure (reference is > high school)		
Less than high school	1.24	1.16–1.32
High school	1.05	0.99–1.11
Previous case closure	1.26	1.20–1.34

with SLD and OIC and not significantly different than those of the individuals with MR. Being male, having longer service tenure and a previous case closure in the past 36 months was associated with higher expenditures; being black or of “other” race or ethnicity and having less education were associated with lower expenditures.

Figure 1 displays average expenditures within each quintile of expenditure. For each impairment group, the average cost of services in the first quintile was close to zero. In the remaining quintiles, the plot was consistent with the regression findings above. The cost of services received by individuals with ASD was always the highest on average, and the expenditures on the mental retardation group were the second highest. The expenditures on the SLD group were consistently the lowest.

Competitive Employment

Table 1 presents the unadjusted employment outcomes for each group. Those with autism were most likely to be competitively employed at closure (42%), followed by those in the MR (39%), SLD (38%) and OIC (35%) groups. As shown in Table 4, these differences diminished in the adjusted analysis. There were no significant differences between the ASD group and individuals with MR and SLD in the probability of competitive employment; individuals with OIC had significantly lower odds (OR = 0.7, $p < 0.0001$) of obtaining competitive employment than those with ASD. In addition, being older, male, having more education, a previous closure, and greater service expenditures all positively predicted competitive employment. Non-Whites were less likely to obtain competitive employment than Whites.

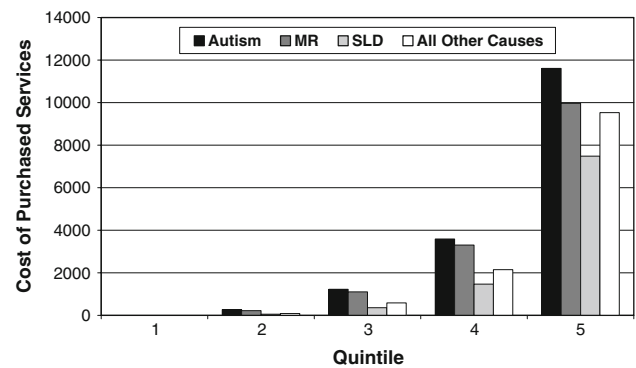


Fig. 1 Average expenditures for vocational services by quintile

Because of this surprising finding regarding competitive employment outcomes, we conducted some post hoc analyses regarding the use of on-the-job supports to investigate. People with ASD (32%) and MR (34%) were much more likely than those in the SLD (9%) and OIC (10%) impairment cause groups to have received on-the-job supports at any time. We also compared the use of on-the-job supports at any point in time by employment outcome at closure and impairment cause. These results are presented in Table 5; 57% of competitively employed individuals with autism and 57% of competitively employed individuals with MR received on-the-job supports. These numbers were about three times higher than for SLD (19%) and OIC (18%).

Table 6 presents the results of a logistic regression where interactions of impairment cause and on-the-job supports were entered. While individuals with ASD who receive supports have considerably higher odds of being

Table 3 Regression predicting the cost of purchased services

Parameter	Coefficient	95% Conf. Interval
Centered age (in years)	1.06	−1.02 to 3.15
Male (vs. Female)	252.03	203.82 to 300.24
Race (reference is White)		
Black	−362.41	−420.71 to −304.10
All other races (including multiracial)	−142.86	−273.34 to −12.39
Hispanic ethnicity	−2.10	−85.75 to 81.54
Impairment cause (reference is autism)		
MR	−256.04	−623.08 to 111.00
SLD	−1,779.78	−2,147.34 to −1,412.22
OIC	−1,208.48	−1,568.11 to −848.85
Education at closure (reference is > high school)		
Less than high school	−592.29	−659.45 to −525.13
High school	−687.56	−744.18 to −630.93
Previous case closure	339.24	277.29 to 401.19
Length of eligibility (in months)	117.79	116.66 to 118.92
Intercept	2,220.27	1,856.44 to 2,584.10

Table 4 Regression predicting competitive employment outcomes

Parameter	Odds ratio	95% Conf. Interval
Centered age (in years)	1.01	1.01–1.01
Male vs. Female	1.06	1.04–1.07
Race (reference is White)		
Black	0.92	0.9–0.93
All other races (including multiracial)	0.76	0.73–0.79
Hispanic ethnicity	0.98	0.96–1.01
Impairment cause (reference is autism)		
MR	1.02	0.91–1.13
SLD	1.06	0.95–1.18
OIC	0.69	0.63–0.77
Education at Closure (reference is > high school)		
Less than high school	0.59	0.58–0.60
High school	0.75	0.74–0.76
Previous case closure	1.08	1.06–1.10
Total cost (in \$1,000)	1.17	1.17–1.17

Table 5 Individuals who received on-the-job supports at any time by employment outcome at closure and impairment cause

	Autism (<i>n</i> = 529; 31% of total)		MR (<i>n</i> = 10,345; 34% of total)		SLD (<i>n</i> = 3,104; 9% of total)		OIC (<i>n</i> = 29,263; 9% of total)	
	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>
Not at all employed	12.7	115	16.5	2,843	3.5	723	5.0	9,788
Not competitively employed	65.7	23	70.4	705	19.4	34	9.4	392
Competitively employed	56.8	391	57.2	6,797	19.0	2,347	17.6	19,083

Table 6 Post hoc regression predicting competitive employment outcomes

Parameter	Odds ratio	95% Conf. Interval
Centered age (in years)	1.01	1.01–1.01
Male vs. Female	1.05	1.04–1.07
Race (reference is White)		
Black	0.93	0.92–0.95
All other races (Including multiracial)	0.76	0.73–0.79
Hispanic ethnicity	1.04	1.02–1.07
Interaction of impairment causes and the presence of on-the-job supports (reference is autism × no supports)		
Autism × Supports	5.09	4.19–6.19
Autism × No Supports	0.93	0.81–1.07
MR × Supports	4.15	3.97–4.34
MR × No Supports	1.06	1.03–1.10
SLD × Supports	7.45	6.85–8.10
SLD × No Supports	1.51	1.47–1.55
All others x Supports	3.51	3.41–3.6
Education at closure (reference is > high school)		
Less than high school	0.53	0.52–0.54
High school	0.70	0.69–0.71
Previous case closure	0.98	0.97–1.00
Total VR expenditures (in \$1,000)	1.14	1.14–1.14

competitively employed than those with all other impairments without supports (OR = 5.1, $p < 0.0001$), those with ASD and no on-the-job supports did not have a statistically different odds of employment than those in the OIC category without on-the-job supports.

Discussion

The results are consistent with two of the three hypotheses under study. First, relative to other individuals served by the vocational rehabilitation system, individuals with ASD were more likely to be denied services because it was believed that their disability was too severe for them to benefit. Second, among those who receive services, people with ASD received a more expensive set of services than those with other impairments, although their service costs did not differ from individuals with mental retardation. Contrary to our third hypothesis, competitive employment rates among people with ASD did not differ from those with SLD or MR, and were much higher than those of people with other impairments. Post hoc analyses suggest that successful competitive employment for people with ASD and MR may depend on the presence of on-the-job supports, which include “job coaching, follow-up and follow-along, and job retention services.”

At least three study limitations should be noted. First, there was no confirmation of the validity of various data elements, including diagnosis. While some studies suggest the high specificity of the autism diagnosis in medical and education records (Fombonne et al. 2004; Yeargin-Allsopp et al. 2003), this finding has not been replicated in VR data. A related limitation is that no information is available on co-occurring conditions, such as intellectual disability, that frequently accompany ASD and are probably also associated with employment outcomes. Third, a quarter of the sample appears to have received services reimbursed by sources other than the state VR system. This may have biased our estimate of service expenditures. At the very least, it means that the expenditure averages provided in this study are underestimates of total vocational expenditures.

Despite these limitations, the results suggest the very good news that the VR system appears as successful for people with ASD as for others. This result should inspire the belief that these individuals can participate in this valued social role. We cannot definitively estimate the effectiveness of VR services based on this study; however, previous studies have shown that the vocational rehabilitation program may be one of the most economically sound programs in the United States. Individuals who use vocational rehabilitation services return the investment through taxes within 2–4 years, on average (Mawhood and Howlin

1999). The results of this study suggest that adults with ASD who eventually receive supports do at least as well as persons with MR, and better than other disability groups, in achieving competitive employment. Our findings are also important in light of research indicating that supported employment through vocational rehabilitation programs may improve cognitive performance of adults with ASD (Garcia-Villamizar and Hughes 2007) and generally improves quality of life (Garcia-Villamizar et al. 2002). Combined, these findings suggest that people with ASD would likely benefit from this program and should be encouraged to participate.

While this result is encouraging, some study findings suggest challenges within the VR system to serving individuals with ASD and suggest areas for future research. Of particular concern is the fact that individuals with ASD were more likely than other groups to be denied services because it was believed that their disability was too severe to benefit. This finding also hints at the possibility that some individuals with ASD may never explore the use of VR services because they (or their families) do not see it as a viable option or have been discouraged from seeking services. If, in general, less severely affected individuals apply for VR services, then the proportion observed in this study of those who were turned away may actually underestimate what would be observed if more individuals with ASD applied. It may be the case that the relatively high rates of competitive employment may result partially from “creaming” and be higher than what would be expected if a more representative group accessed services. How and why people with ASD end up in the VR system and barriers to access are important questions for future studies.

A second area of interest relates to expenditures. Similar to what has been found in the healthcare and education systems (Croen et al. 2006; Liptak et al. 2006; Mandell et al. 2006; Government Accountability Office 2005), VR expenditures were much higher for individuals with ASD than for those with other impairments except people with MR. This difference may be due to the additional needs of people with ASD (Müller et al. 2003). Alternatively, the VR system may not be structured to provide services to individuals with ASD in the most cost-efficient manner (Hillier et al. 2007). Both potential explanations beg for additional research on the most cost-effective strategies for achieving competitive employment. Several models of employment services have been proposed for individuals with ASD. In particular, the TEACCH (Treatment and Education of Autistic and related Communication-handicapped Children) program has been shown in quasi-experimental studies to improve employment outcomes and related behaviors for adults with ASD (Keel et al. 1997; Van Bourgondien et al. 2003). More and more

rigorous research is needed to evaluate the outcomes of these types of programs on functional outcomes such as employment.

Work is among the most valued social roles in our society. Many individuals with ASD can achieve successful employment outcomes, despite questions about access and cost-effectiveness. Individuals with autism and their families should seek out supports and employment; other support providers should emphasize employment as a possible social role; and policymakers should continue to examine ways in which they can enhance the variety and accessibility of supports for adults with autism, including vocational services, in order to ensure that they have opportunities to live and contribute in their communities.

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