

# Archived Information

## **Basic Skills and Labor Market Success: Findings from the VR Longitudinal Study**

by

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As noted in recent research on education and labor force participation, completion of a postsecondary degree is a major contributor to a person's subsequent success in the labor market (Boesel, 1998; Grubb, 1998). Access to postsecondary education and to the accommodations that can facilitate completion of a course of study have historically been problematic for youth with disabilities (Price-Ellingstad and Berry, 2000); this lack of access can limit the career prospects of individuals with disabilities. Our current research indicates that educational deficits at other levels can also have seriously deleterious effects on the employment and earnings experiences of individuals with disabilities. This research addresses the question: to what extent do basic skills deficits limit employment or earnings potential among individuals with disabilities, and what interventions can Vocational Rehabilitation agencies use to ameliorate these deficits?

In this paper, we examine data from the Longitudinal Study of the Vocational Rehabilitation (VR) Services Program, sponsored by the Rehabilitation Services Administration (RSA); these data indicate that basic skills deficits are a major deterrent to VR consumers' ability to achieve living earnings even when they succeed in entering competitive employment as a result of VR services. These findings lead to our recommendation that the state-federal VR

program, with support from RSA, explore strategies for improving the basic skills achievement among consumers in need of such assistance. We suggest that services to improve basic skills can facilitate entry into further education and training and subsequently lead to improved employment and earnings among a significant subset of individuals who enter VR services.

### **Overview of the VR Longitudinal Study**

Commissioned by RSA and mandated by the Congress in the 1992 Rehabilitation Act Amendments, the Longitudinal Study of the VR Services Program is a national impact evaluation that investigates the effects of VR services on economic and other outcomes for individuals with disabilities who receive such services. The study's design, reflecting the typical service patterns of VR program participants, called for repeated contacts with individuals over a three-year period to obtain comprehensive information to support judgments about the benefits the VR system provides to consumers and society. The findings contained in this article come from two primary sources. First is information abstracted from VR case files of study participants, including reading and mathematics achievement levels where reported. Second is a series of detailed interviews administered to all study participants at the time of entry into the study and at annual intervals for a subsequent three-year period. These interviews obtain information on work history, functional status, vocational interests, attitudinal characteristics, perspectives on the VR experience, and retention of earnings and employment, as well as such other outcomes as independence and community integration, over time.

The longitudinal study drew a nationally representative sample of over 8,000 respondents, including applicants for VR services (some of whom were not accepted for services), VR consumers, and former VR consumers. Weighted, this sample represents 1,001,870 individuals with disabilities who applied for or received VR services.

Data from this study provide insight into the relationship between educational experiences and employment outcomes. In this paper, we consider the characteristics and experiences, including educational experiences, of VR consumers who achieved a competitive employment outcome at exit from VR. We are particularly interested in predicting whether the earnings levels of these persons are sufficient to enable them to achieve financial independence, as well as the interventions that may improve the likelihood of earning a living wage. Here, we define earnings greater than \$9.00 per hour as a living wage.

To examine this issue, we first describe the educational status of VR consumers at entry to VR along dimensions of demographic and disability characteristics. We then examine relationships between these characteristics and earnings of consumers who obtain competitive employment as a result of VR services, as well as relationships among earnings, educational characteristics, measures of functional status, and attitudes (e.g., self-esteem, internality) that may affect employment success. Finally, we report findings on the relative contribution of educational status and receipt of educational services from VR to the earnings levels that consumers achieve as a result of VR.

### **Study Findings**

We conducted three sets of analyses. In the first analyses, we examined demographic characteristics and type and significance of disability by educational status measures (grade level achievement in reading, grade level achievement in math, and number of years of education consumers have completed when they enter VR) and average earnings; results from these analyses appear in Tables 1 and 2. Next, we looked at the relationship of demographic, disability, attitudinal, and educational factors to hourly earnings. For this analysis, we categorized hourly earnings into four levels X up to \$5.00, between \$5.01 and \$7.00, between \$7.01 and \$9.00, and

greater than \$9.00. We focus on differences between individuals who earn very low earnings (up to \$5.00 per hour) and those who earn a living wage (greater than \$9.00 per hour). Tables 3 through 6 present these results. Finally, to explore further important differences revealed in these tables, we present a correlational analysis of selected factors and then a regression analysis that predicts earnings levels from educational characteristics.

Overall, 78.4 percent of VR consumers who left VR with an employment outcome entered competitive employment. Table 1 shows the average years of education, reading and math achievement levels, and earnings at closure by demographic characteristics. Table 2 contains average years of education, reading and math achievement levels, and earnings at closure by type and significance of disability.

As shown in Table 1, competitively employed consumers overall average 12.1 years of education, a grade level reading achievement of 8.5, a grade level math achievement of 7.8, and hourly wages of \$7.56 (median of \$6.25). While men have lower basic skills achievement levels than women (8.1 versus 8.9 for reading, 7.6 versus 8.0 for math), they earn substantially higher wages (\$7.91, with a median of \$6.50, for men, versus \$7.18, with a median of \$6.00, for women). On average, white consumers earn higher than average hourly wages (\$7.73; median of \$6.45), while minority consumers earn lower than average (\$6.65; median of \$5.96). Additionally, minority consumers average fewer years of education (11.7 versus 12.2) and lower grade level achievement in reading and math (7.0 versus 8.8 for reading achievement, 6.6 versus 8.1 for math achievement) than white consumers.

Earnings, years of education, and achievement levels are all higher at higher age ranges through age 55, at which point they decrease slightly. For example, competitively employed consumers 25 years or younger earn an average \$5.97 (median of \$5.25) per hour compared to

**Table 1. Characteristics of Competitively Employed Consumers, by Race and Age**

Characteristic	Percentage of competitively employed consumers	Reading Achievement	Math Achievement	Years of education	Earnings at closure
<b>Percentage competitively employed of all consumers</b>	78.4%				
<b>Gender</b>		<i>Mean (Median)</i>	<i>Mean (Median)</i>	<i>Mean (Median)</i>	<i>Mean (Median)</i>
Male	52.8%	8.1 (8.0)	7.6 (7.0)	12.0 (12.0)	\$7.91 (\$6.50)
Female	47.2%	8.9 (10.0)	8.0 (7.2)	12.2 (12.0)	\$7.18 (\$6.00)
<b>Race/ethnicity</b>					
White	85.2%	8.8 (9.7)	8.1 (7.5)	12.2 (12.0)	\$7.73 (\$6.45)
Minority	14.8%	7.0 (7.0)	6.6 (6.0)	11.7 (12.0)	\$6.65 (\$5.96)
<b>Age</b>					
<=25	14.5%	6.0 (5.1)	5.4 (5.2)	11.1 (11.0)	\$5.97 (\$5.25)
26-35	25.5%	8.4 (9.0)	7.8 (7.0)	12.1 (12.0)	\$7.09 (\$6.00)
36-45	29.6%	9.3 (11.0)	8.5 (8.0)	12.4 (12.0)	\$7.82 (\$7.00)
46-55	20.5%	10.6 (12.0)	9.7 (10.0)	12.5 (12.0)	\$8.64 (\$7.00)
>55	9.8%	9.2 (10.0)	8.5 (8.0)	11.7 (12.0)	\$8.09 (\$6.49)
<b>Receipt of public benefits at entry</b>					
Yes	28.8%	8.2 (8.0)	7.4 (7.0)	12.2 (12.0)	\$6.94 (\$5.98)
No	71.2%	8.6 (9.0)	8.0 (7.6)	12.1 (12.0)	\$7.82 (\$6.50)
<b>All competitively employed consumers</b>	100.0%	8.5 (9.0)	7.8 (7.0)	12.1 (12.0)	\$7.56 (\$6.25)

Source: VR Longitudinal Study, November 1999

\$8.64 (median of \$7.00) per hour for those 46 to 55 years old and \$8.09 (median of \$6.49) for consumers over 55. The youngest consumers average 11.1 years of education, a grade level reading achievement of 6.0 years, and a math achievement level of 5.4 years, while those aged 46 to 55 have a mean of 12.5 years of education, a mean reading achievement level of 10.6, and a mean math achievement level of 9.7. Individuals over 55 average 11.7 years of education, a grade level achievement in reading of 9.2, and a math achievement level of 8.5.

Individuals who received public benefits (including SSI, SSDI, AFDC, veteran’s benefits, and other disability benefits) average lower reading and math achievement levels (8.2 versus 8.6 for reading, 7.4 versus 8.0 for math) than other individuals, although their average years of education are very similar (12.2 versus 12.1). Additionally, these individuals earn much lower wages (\$6.94, with a median of \$5.98, versus \$7.82, with a median of \$6.50).

As Table 2 indicates, individuals with physical disabilities form the largest group of competitively employed consumers (40.2 percent); they also earn higher hourly wages than average (\$7.76, with a median of \$6.51) and have slightly more education (12.2) and higher grade levels of reading and math achievement (10.0 for reading achievement, 9.1 for math achievement) than the average. Those with mental retardation, on the other hand, constitute only 7.4 percent of competitively employed consumers, earn substantially less per hour (\$5.03; median of \$4.96), are less well educated (mean of 11.1 years), and have very low reading and math grade level achievement (3.9 for reading achievement, 4.0 for math achievement). Consumers with learning disabilities (8.5 percent of competitively employed consumers) also

**Table 2. Characteristics of Competitively Employed Consumers, by Disability Type and Significance**

<b>Characteristic</b>	<b>Percentage of competitively employed consumers</b>	<b>Reading Achievement</b>	<b>Math Achievement</b>	<b>Years of education</b>	<b>Earnings at closure</b>
<b>Percentage competitively employed of all consumers</b>	78.4%				
<b>Type of disability</b>		<b>Mean (Median)</b>	<b>Mean (Median)</b>	<b>Mean (Median)</b>	<b>Mean (Median)</b>
Mental illness	18.0%	9.8 (11.5)	8.6 (8.8)	12.4 (12.0)	\$7.33 (\$6.24)
Mental retardation	7.4%	3.9 (3.0)	4.0 (3.0)	11.1 (12.0)	\$5.03 (\$4.96)
Learning disability	8.5%	6.5 (5.7)	6.1 (6.0)	11.3 (12.0)	\$6.52 (\$5.98)
Sensory disability	16.7%	8.7 (9.0)	8.5 (8.0)	12.2 (12.0)	\$8.93 (\$7.20)

Physical disability	40.2%	10.0 (12.0)	9.1 (9.0)	12.2 (12.0)	\$7.76 (\$6.51)
Other	9.1%	9.5 (10.0)	8.3 (8.0)	12.1 (12.0)	\$7.68 (\$6.40)
<b>Significance of disability</b>					
Significant/most significant	77.0%	8.4 (8.7)	7.7 (7.0)	12.2 (12.0)	\$7.49 (\$6.24)
Not significant	23.0%	8.8 (10.0)	8.2 (8.0)	11.7 (12.0)	\$7.83 (\$6.50)
<b>Onset of disability</b>					
Congenital	29.5%	6.3 (5.1)	5.9 (5.6)	11.8 (12.0)	\$6.67 (\$5.50)
Acquired	70.5%	10.0 (12.0)	9.0 (9.0)	12.3 (12.0)	\$8.00 (\$6.60)
<b>All competitively employed consumers</b>					
	100.0%	8.5 (9.0)	7.8 (7.0)	12.1 (12.0)	\$7.56 (\$6.25)

Source: VR Longitudinal Study, November 1999

earn lower than average hourly wages (\$6.52; median of \$5.98), have fewer years of education

(11.3), and have lower reading and math achievement levels (6.5 for reading, 6.1 for math).

Consumers with significant or most significant disabilities (77.0 percent of all consumers) have

lower earnings than do persons with nonsignificant disabilities (\$7.49, with a median of \$6.24,

versus \$7.83, with a median of \$6.50), as well as lower reading and math achievement (8.4

versus 8.8 for reading, 7.7 versus 8.2 for math); however, they average more years of education

(12.2 versus 11.7). Consumers with congenital disabilities have lower reading and math

achievement (6.3 versus 10.0 for reading, 5.9 versus 9.0 for math) fewer years of education (11.8

versus 12.3), and lower wages (\$6.67, with a median of \$5.50, versus \$8.00, with a median of

\$6.60) than do those with acquired disabilities.

To look more closely at factors that influence earnings +levels, we analyzed demographic,

disability, attitudinal, and educational characteristics by earnings levels. These results appear in

Tables 3 through 6. We conducted significance tests<sup>1</sup> to detect differences on these factors

between individuals earning no more than \$5.00 per hour and those earning more than \$9.00

per hour.

<sup>1</sup>The longitudinal study involved a complex sampling design that necessitates the use of specialized statistical software

Table 3 reports differences in earnings levels at closure by consumers= demographic characteristics. While we found no significant difference between the percentage of men earning low, versus high, wages (25.8 percent versus 26.2 percent), women are almost twice as likely to be in the low wage group as in the high wage group (32.6 percent versus 17.2 percent). On average, earnings increase as consumers age; the mean age for those earning \$5.00 or less per hour was 37.5, while the mean age for consumers earning more than \$9.00 per hour was 43.0. Race also has a significant relationship to earnings levels: African-Americans and Hispanics are

**Table 3. Demographic Characteristics, by Earnings Levels**

Characteristic	EARNINGS LEVELS				Total
	Less than or equal to \$5 per hour	\$5.01 - \$7.00 per hour	\$7.01 - \$9.00 per hour	Greater than \$9.00 per hour	
<b>Percentage of all competitively employed consumers</b>	29.0%	31.9%	17.2%	21.9%	100.0%
<b>Gender</b>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
Male	25.8%	30.9%	17.1%	26.2%	100.0%
Female*	32.6%	33.0%	17.3%	17.2%	100.0%
Total*	29.0%	31.9%	17.2%	21.9%	100.0%
	<i>Mean (median)</i>	<i>Mean (median)</i>	<i>Mean (median)</i>	<i>Mean (median)</i>	<i>Mean (median)</i>
<b>Age*</b>	37.5 (36.0)	38.0 (37.0)	41.0 (40.0)	43.0 (42.0)	39.4 (39.0)
Range	18-91	18-86	20-77	19-78	18-91
<b>Race/ethnicity</b>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
White	28.4%	30.3%	17.6%	23.7%	100.0%
African-American*	34.3%	41.5%	15.0%	9.3%	100.0%
Alaska Native or American Indian	27.9%	40.4%	13.1%	18.6%	100.0%
Asian or Pacific Islander*	10.5%	30.6%	19.2%	39.8%	100.0%
Total*	28.9%	31.8%	17.3%	22.0%	100.0%
Of Hispanic origin*	36.3%	37.2%	16.7%	9.9%	100.0%
	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
<b>Receipt of public benefits at entry*</b>	35.4%	30.0%	17.1%	17.5%	100.0%

for significance testing and modeling; we used SUDAAN for these analyses.

\* Indicates a significant difference in means or percentages between those earning less than or equal to \$5.00 per hour and those earning more than \$9.00 per hour ( $p < .05$ ).

Source: VR Longitudinal Study, November 1999

three times as likely to earn low wages as high wages (34.3 versus 9.3 percent for African-Americans; 36.3 versus 9.9 percent for Hispanics), while Asians are almost four times as likely to earn high wages as low wages (39.8 percent versus 10.5 percent). Finally, those who received public benefits at entry to VR (including SSI, SSDI, AFDC, veteran's benefits, and other disability benefits) were twice as likely to earn low wages as high wages (35.4 percent versus 17.5 percent).

As Table 4 shows, disability characteristics also affect earnings levels. Individuals with mental illness, learning disabilities, and mental retardation are more likely to earn low wages than high wages (30.3 percent versus 18.5 percent for those with mental illness; 33.2 percent

**Table 4. Disability Characteristics, by Earnings Levels**

Characteristic	EARNINGS LEVELS				Total
	Less than \$5 per hour	\$5.00 - \$7.00 per hour	\$7.00 - \$9.00 per hour	Greater than \$9.00 per hour	
<b>Type of disability</b>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
Mental illness*	30.3%	31.8%	19.4%	18.5%	100.0%
Mental retardation*	64.0%	32.9%	1.7%	1.4%	100.0%
Learning disability*	33.2%	43.0%	11.9%	11.9%	100.0%
Sensory disability	19.7%	28.7%	21.3%	30.2%	100.0%
Physical disability	25.8%	30.1%	18.6%	25.6%	100.0%
Other	24.5%	35.4%	17.0%	23.1%	100.0%
Total	29.0%	31.9%	17.2%	21.9%	100.0%
<b>Significance of disability</b>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
Significant/most significant*	30.0%	31.9%	17.6%	20.6%	100.0%
Nonsignificant	25.9%	31.7%	16.1%	26.4%	100.0%
Total*	29.0%	31.8%	17.2%	21.9%	100.0%
<b>Onset of disability</b>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
Congenital*	37.5%	35.2%	12.6%	14.7%	100.0%
Acquired	25.2%	29.9%	19.3%	25.6%	100.0%

Total*	28.9%	31.5%	17.3%	22.3%	100.0%
<b>Functional limitations at entry<sup>a</sup></b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>
Gross motor function	1.88	1.86	1.86	1.87	1.87
Cognitive function*	1.83	1.89	1.93	1.93	1.89
Personal care function	1.98	1.99	1.98	1.98	1.98

\* Indicates a significant difference in means or percentages between those earning less than or equal to \$5.00 per hour and those earning more than \$9.00 per hour ( $p < .05$ ).

<sup>a</sup> Based on the results of a factor analysis, we created these three composite scales of functional status from ADL and IADL questions. Each scale ranges from 1 to 2, with a higher score indicating higher levels of functioning, and all three scales have acceptable levels of reliability (alpha greater than .80).

Source: VR Longitudinal Study, November 1999

versus 11.9 percent for those with learning disabilities; 64.0 percent versus 1.4 percent for those with mental retardation X the largest difference of all). Additionally, consumers with significant or most significant disabilities and those with congenital disabilities are more likely to earn low wages than high wages (30.0 percent versus 20.6 percent for consumers with significant or most significant disabilities; 37.5 percent versus 14.7 percent for consumers with congenital disabilities). Although there were no significant differences in gross motor functioning or in personal care functioning between these two groups, those earning high wages scored significantly higher on the cognitive functioning scale than did those earning low wages (1.93 versus 1.83).

Consumers' self-esteem and locus of control are also strongly related to earnings levels at closure for VR consumers who entered competitive employment (Table 5). Those with high earnings have significantly higher self-esteem scores at entry to VR (2.64 versus 2.46) and are less likely to believe that chance or other people determine their experiences and outcomes (1.51 versus 1.75 for chance; 1.52 versus 1.76 for powerful others). The two groups did not differ significantly in terms of internality, although those in the high wage category were somewhat higher on this dimension (2.55 versus 2.49 for those in the low wage category).

**Table 5. Attitudinal Characteristics<sup>a</sup> at Entry, by Earnings Levels**

Characteristic	EARNINGS LEVELS				Total
	Less than or equal to \$5 per hour	\$5.01 - \$7.00 per hour	\$7.01 - \$9.00 per hour	Greater than \$9.00 per hour	
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	
<b>Self-esteem*</b>	2.46	2.51	2.54	2.64	2.53
<b>Locus of control:</b>					
Chance*	1.75	1.72	1.63	1.51	1.67
Powerful others*	1.76	1.70	1.64	1.52	1.66
Internality	2.49	2.49	2.51	2.55	2.51

\* Indicates a significant difference in means or percentages between those earning less than or equal to \$5.00 per hour and those earning more than \$9.00 per hour ( $p < .05$ ).

<sup>a</sup> Based on the results of a factor analysis, we created a self-esteem scale and three locus of control scales from items on psychosocial functioning. Each scale ranges from 1 to 3, and all scales have acceptable levels of reliability (alpha greater than .80). Items were coded so that a higher score indicates more of the given characteristic. The chance scale measures the extent to which a person believes that chance has an important effect on his/her experiences and outcomes; the powerful others scale measures the extent to which a person believes that other people have a major influence on his/her experiences and outcomes, and the internality scale measures the extent to which a person believes that he/she has control over his/her own life.

Source: VR Longitudinal Study, November 1999

Table 6 reports our analyses of the relationship between educational characteristics at entry to VR and earnings levels at closure for persons who entered competitive employment. As shown, consumers who are in school at entry to VR are not significantly more likely to earn low

**Table 6. Educational Characteristics, by Earnings Levels**

Characteristic	EARNINGS LEVELS				Total
	Less than or equal to \$5 per hour	\$5.01 - \$7.00 per hour	\$7.01 - \$9.00 per hour	Greater than \$9.00 per hour	
	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	
<b>Still in school</b>	32.9%	31.0%	14.7%	21.5%	100.0%
<b>Received special education services*</b>	49.4%	33.1%	11.1%	6.4%	100.0%
	<i>Mean (median)</i>	<i>Mean (median)</i>	<i>Mean (median)</i>	<i>Mean (median)</i>	<i>Mean (median)</i>
<b>Years of education completed*</b>	11.4 (12.0)	11.9 (12.0)	12.3 (12.0)	13.1 (12.0)	12.1 (12.0)
<b>Reading achievement level*</b>	7.1 (6.0)	8.4 (9.0)	9.9 (11.0)	10.3 (12.0)	8.5 (9.0)

<b>Mathematics achievement level*</b>	6.4 (6.0)	7.6 (7.0)	9.0 (8.8)	9.9 (10.0)	7.8 (7.0)
	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>	<i>Percentage</i>
<b>Receipt of postsecondary education service through VR*</b>	16.0%	31.9%	21.2%	30.8%	100.0%
<b>Receipt of postsecondary education degree (of those who received a service)*</b>	14.4%	24.7%	24.1%	36.8%	100.0%

\* Indicates a significant difference in means or percentages between those earning less than or equal to \$5.00 per hour and those earning more than \$9.00 per hour ( $p < .05$ ).

Source: VR Longitudinal Study, November 1999

wages rather than high wages. However, consumers who received special education services in high school are more than seven times more likely to earn low wages than high wages (49.4 percent versus 6.4 percent). (We note that 31.0 percent of these consumers have mental retardation as their primary disability. As reported in Table 2, consumers with mental retardation have lower post-VR earnings than persons with other disabilities.) Furthermore, on average, persons who earn more than \$9.00 per hour have almost two more years of education than those who earn \$5.00 or less per hour (13.1 versus 11.4), and they average more than three grade levels higher in reading and math achievement (10.3 versus 7.1 for reading achievement, 9.9 versus 6.4 for math achievement). Again, higher basic skills achievement is associated with higher earnings for the jobs that consumers obtain as a result of VR services.

Individuals with low earnings levels also have low grade level achievement scores. As consumers' basic skills increase, their earnings also increase. Average reading achievement is over one grade level higher for the group earning between \$5.01 and \$7.00 per hour (8.4) than for the group earning up to \$5.00 per hour (7.1); while the group earning between \$7.01 and \$9.00 per hour has even higher reading achievement levels (from 8.4 to 9.9). On average, individuals earning over \$9.00 per hour have somewhat higher reading achievement levels than those earning between \$7.01 and \$9.00 per hour (10.3 versus 9.9). Increases in math achievement levels

follow a similar pattern, with a large jump between the first two wage groups (from 6.4 to 7.6), an even more substantial increase between the second and third groups (7.6 to 9.0), and a more modest increase between the third wage group and the highest wage group (9.0 to 9.9). As these findings demonstrate, the relationship between basic skills achievement and wages is strong at all earnings levels.

While it seems clear that the demographic, disability, attitudinal, and educational characteristics of consumers at entry to VR have a substantial influence on their earnings potential, we also examined selected VR experiences to assess the extent to which the services that VR consumers obtain have an effect on their subsequent earnings. Very few VR consumers (less than one percent) received basic literacy instruction while in VR, so we were unable to analyze the effects of such services on consumers' subsequent earnings. We looked specifically at the effects of receipt of postsecondary education services and of the receipt of a postsecondary education degree through VR. As other research has shown (Price-Ellingstad and Berry, 2000), postsecondary education positively affects earnings levels. Table 6 reports our findings on postsecondary education services. These services include enrollment in business or vocational technical school, a two-year community college, or a four-year college or university. As shown, individuals who received any postsecondary education service through a VR agency (32.6 percent of consumers) were almost twice as likely to earn high wages as low wages (30.8 percent versus 16.0 percent), and those who also completed a postsecondary degree (11.8 percent of consumers) were even more likely to earn high wages rather than low wages (36.8 percent versus 14.4 percent).

Since these analyses revealed significant differences among individuals who earned low wages versus those who earned high wages, we decided to explore these differences further by

computing the correlation coefficients between earnings and variables that we hypothesized were related to earnings. Each correlation coefficient describes the direction and magnitude of the linear relationship between two variables. If the coefficient is positive, individuals with a high value for one variable are likely to have a high value for the other variable. If the coefficient is negative, individuals with a high value for one variable are likely to have a low value for the other variable. The absolute value of the coefficient represents the magnitude of this relationship; pairs of variables with correlations close to 1 or -1 are more strongly related to each other than those with values close to zero.

Table 7 shows the correlation coefficients between earnings and years of education, reading and math achievement, receipt of postsecondary service, receipt of postsecondary degree, functional status measures, self-esteem, and three locus of control scales.<sup>2</sup> Reading and math achievement levels are more highly correlated with earnings (.29 for reading achievement and .34 for math achievement) than are years of education (.17); receiving special education services in high school is associated with lower earnings (-.25). Both receipt of postsecondary service and receipt of postsecondary degree have significant, but small, correlations with earnings (.08 for postsecondary service, .06 for postsecondary degree). All of the educational characteristics at

**Table 7. Correlations between Earnings and Educational Characteristics, Functional Status, and Attitudinal Characteristics**

<b>Characteristic</b>	<b>Correlation with Earnings</b>
<b>Educational Characteristics</b>	
Years of education	0.17*
Reading achievement	0.29*
Math achievement	0.34*
Special education	-0.25*
Receipt of postsecondary education service	0.08*
Receipt of postsecondary education degree	0.06*

<sup>2</sup>Since SUDAAN does not compute correlation coefficients, we used SAS to create this correlation matrix and to test each coefficient for significance. Thus, this analysis does not take fully take into account the sampling design of the study.

**Functional Limitation at Entry**

Gross motor function	0.01
Cognitive function	0.08*
Personal care function	-0.01

**Attitudinal Characteristics**

Self-esteem	0.07*
Chance	-0.06*
Powerful others	-0.07*
Internality	0.04

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\*Indicates that the correlation coefficient is significant ( $p < .05$ ).

Source: *VR Longitudinal Study, November 1999*

entry to VR relate more strongly to earnings at closure than do the functional status measures (.08 for cognitive function, nonsignificant correlations for gross motor function and personal care function) or the attitudinal measures (.07 for self-esteem, -.06 for chance, -.07 for powerful others, and a nonsignificant correlation for internality). As these correlation coefficients demonstrate, educational characteristics have the strongest relationship to earnings among the variables we examined. Therefore, we decided to look at the relative contribution of these variables to earnings.

With the correlational analysis, it is not clear whether the effect of postsecondary services results from the services themselves or from an interaction between the educational characteristics at VR entry and receipt of these postsecondary services from VR. Therefore, we chose to look at the effects of receipt of any postsecondary service through VR and the subsequent attainment of a postsecondary degree after taking into account the educational characteristics that VR consumers bring to VR. To examine this issue, we conducted a multiple regression analysis to predict earnings at closure<sup>3</sup> from educational characteristics, including

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<sup>3</sup>The assumptions of multiple regression modeling require that the dependent variable (i.e., earnings) have a normal distribution. When this assumption is violated, researchers typically transform the variable into a form in which it has a normal distribution. In this case, since earnings were not normally distributed, we calculated the natural logarithm of each value and conducted the regression analysis using the transformed earnings as the dependent variable. Therefore, the

receipt of special education services in high school, number of years of education completed at entry, reading and math achievement levels, receipt of any postsecondary service through a VR agency, and receipt of a postsecondary degree through a VR agency. Results from this analysis appear in Table 8 and are depicted in Figure 1. Together, these educational characteristics account for 18 percent of the variance in earnings.<sup>4</sup> Among characteristics of consumers at entry to VR, both receipt of special education services (standardized weight of -0.10) and math achievement level (standardized weight of 0.24) are significant predictors of earnings: individuals who received special education in high school earn **significantly less** than other

**Table 8. Relationship of Educational Experiences and Post-VR Earnings ( $R^2 = .18$ )**

Factor	Unstandardized Weight	Standardized Weight
Receipt of special education services in high school	-0.07	-0.10
Number of years of education completed at entry to VR	NS	NS
Reading achievement <sup>a</sup>	NS	NS
Math achievement	0.03	0.24
Receipt of postsecondary service through VR agency	0.10	0.13
Receipt of postsecondary degree through VR agency	0.13	0.12

All listed values are significant at  $p < .05$ .

<sup>a</sup> Reading and math achievement levels are highly correlated (.77) with each other, probably because most measures of math achievement involve reading skills. This strong association is likely to be the reason that only math achievement is a significant predictor in this model.

Source: *VR Longitudinal Study, November 1999*

unstandardized and standardized weights presented on Table 8 refer to the effects of the independent variable on the natural logarithm of earnings rather than on actual earnings.

<sup>4</sup>We note that this model achieves a level of prediction that is quite strong, accounting for nearly 20 percent of the variance in outcomes. This level of prediction is unusual in social science research, especially when several of the measures were obtained at much earlier timepoints.

individuals, while those who have relatively higher levels of math achievement earn **significantly more**. As Hayward and Schmidt-Davis (1999) report, youth who received special education in high school have higher rates of significant, congenital disabilities, including mental retardation and other developmental delays; these characteristics are likely to account for lower earnings levels among individuals who received special education.<sup>5</sup> Both receipt of a postsecondary service through a VR agency (standardized weight of 0.13) and receipt of a postsecondary degree (standardized weight of 0.12) significantly predict higher earnings, even after other educational characteristics are taken into account.

Interestingly, in this model, math achievement level, rather than other characteristics at entry, makes the largest contribution to predicting earnings at closure among the educational variables that we tested, while special education status is also a significant (negative) influence. While receipt of a postsecondary service and of a postsecondary degree also contribute significantly to predicting earnings, the magnitude of their influence is much smaller than that of grade level achievement in math. (As noted previously, reading and math achievement are highly correlated, probably accounting for the fact that reading achievement does not appear to be a significant predictor in this model.) These results suggest that, while receiving postsecondary education is an important step towards achieving financial independence, improving basic skills may be equally important, particularly to the extent that such improvement increases VR consumers' ability to benefit from further education and training.

In sum, these findings suggest that VR agencies may need to offer basic skills improvement services to consumers whose basic skills are low when they enter VR. Such services might well improve consumers' ability to enter better paying jobs as well as increasing

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<sup>5</sup>While the effect of receiving special education on earnings is negative in this model, further research may well show

their likelihood to qualify for postsecondary education services or additional training that may further enhance their later labor market success.

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that receiving these services actually improves basic skills levels and employment outcomes.