

Examining Pathways of Economic Stability among VR applicants with Intellectual and
Developmental Disabilities: A Mediation Analysis of Education, Employment, and Social Security
Benefits

Bridgette Schram, MS

Center for Leadership in Disability

School of Public Health, Georgia State University

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ABSTRACT

Economic stability is considered an upstream social determinant of health, therefore is highly associated with numerous health outcomes, as well as improved independence and quality of life. Several factors contribute to economic stability including income, education, family wealth, and social class. Over a quarter of people with disabilities live below the poverty line, almost 2.3 times that of individuals without disabilities. This rate increases for individuals with cognitive and intellectual disabilities. People with IDD also face extreme disparities in both employment and education, with employment rates and participation in post-secondary education less than half that of their peers without disabilities. Social Security benefits have a complex relationship with work and employment, especially for people with IDD. Individuals with IDD make up about 14% of all Social Security, where they are almost two times more likely to have current or recent work experience compared to other beneficiaries and more likely to have recently used employment services. The purpose of this study was to further examine the relationship between education, employment, and Social Security benefits in individuals with IDD, controlling for demographic characteristics. Improved understanding of the pathways and complex relationship between these factors could support improved outcomes related to economic stability, where people with IDD face extreme disparities. A secondary data analysis was conducted using the RSA-911 dataset of applicant to Vocation Rehabilitation services in the US. The study included 58,485 applicants who have an intellectual disability and were between 22 – 65 years old at the time of application. Multiple regression analyses were conducted to establish relationships between the variables and determine demographic covariates (including and interaction terms with severity of disability). A mediation analysis between the variables was then used to explain the relationship between the three main variables. Higher levels of education was positively associated with employment status and wage earned. Average wage earned was reported across all levels of education and degree types. Higher levels of education also predicted lower odds of receiving SSI and SSDI. Wage earned mediated the relationship between education and receipt of SSI/SSDI across all education levels. However, the magnitude of that indirect effect varied across the different levels of education, demonstrating the complex relationship between these factors for economic stability. Further studies need to consider level of education and wage earned, versus dichotomous categories, to match the trends of the field and abilities of individuals with IDD. Studies should also further examine the relationships between factors of economic stability in people with IDD in order to create better programs and supports that could fully support their financial independence.

INTRODUCTION

Over a quarter of people with disabilities live below the poverty line, almost 2.3 times that of individuals without disabilities (Paul et al., 2020). This rate increases for individuals with cognitive and intellectual disabilities. Around 33% of adults with cognitive disabilities living in non-institutional settings live below the poverty line (Paul et al., 2020). Economic stability is considered an upstream social determinant of health, therefore is highly associated with numerous health outcomes, as well as improved independence and quality of life (Bharmal et al., 2015). There are several factors that contribute to economic stability, including income, education, family wealth, and social class (Braveman et al., 2005). Evidence suggests that multiple factors should be considered to fully account for the various aspects that contribute to economic stability due to the unique contributions of each measure and the complex relationship that often exists between the factors (Lahelma et al., 2004). This study examined the relationship between wage earned, level of education, and receipt of Supplemental Security Income (SSI) and Social Security Disability Insurance (SSDI) — three factors that support economic stability in individuals with intellectual and developmental disabilities (IDD) who applied for Vocational Rehabilitation services.

Employment and Wage Earned

Employment status and income earned are commonly used factors to measure economic stability. People with IDD face extreme disparities in both measures. People with IDD are employed at less than half the rate (30.4%) than people without IDD (78.6%; Paul et al., 2020). Additionally, those who are employed, people with IDD earn 66 cents to every dollar earned by someone without a disability (Cheeseman Day & Taylor, 2019), with 44 states allowing for people with IDD to be paid below the federal minimum wage (Kimbrough, 2021). People with IDD have cited numerous barriers to employment. Using focus groups consisting of multiple stakeholders, including individuals with IDD, family members, and employers, Khayat-zadeh-Mahani and colleagues (2019) identified three main barriers to employment for people with IDD: 1) knowledge, capacity, attitudes, and management of employers; 2) a late introduction to pre-employment activities that prepare for the workforce; and 3) stigma and limited expectations of the abilities. These three themes demonstrate the barriers to work faced by people with IDD at the individual, institutional, and societal level which can affect an individual's economic stability. Economic stability can not only improve quality of life for individuals with IDD but can provide opportunity for improved autonomy and independence.

Social Security Benefits

Supplemental Security Income (SSI) and Social Security Disability Insurance (SSDI) are federal and state social assistance programs designed to supplement income for individuals, including individuals with IDD (*Introduction to Social Security Disability Benefits, Work Incentives and Employment Support Programs*, n.d.). SSI is designed to provide supplemental income for individuals with limited resources who are aging or have disabilities to help cover the costs of food, housing, transportation, and other costs of daily living. SSI payments are decided based on federal guidelines and are need-based, considering the individuals' earned and unearned income. SSDI is a supplemental insurance program. Eligibility for SSDI is

determined by the work history of the individuals or the work history of a family member in which they are a dependent, therefore, current earned and unearned income is not considered (*Introduction to Social Security Disability Benefits, Work Incentives and Employment Support Programs*, n.d.).

Individuals with IDD are also more likely to rely on public supports, such as Supplemental Security Income (SSI) and Social Security Disability Insurance (SSDI), for financial stability (Migliore et al., 2009). In fact, individuals with IDD make up about 14% of all SSI and SSDI beneficiaries (Livermore et al., 2017). Social Security benefits have a complex relationship with work and employment. Individuals with IDD are almost two times more likely to have current or recent work experience compared to other beneficiaries and more likely to have recently used employment services (Migliore et al., 2009). This demonstrates that many individuals with IDD are able and willing to work. However, Nord & Nye-Lenegerman (2015) found that receiving public benefits might limit access to participating in the workforce and restrict hours worked. Additionally, mean hourly wages for beneficiaries with IDD are less than other beneficiaries, with individuals with IDD earning an average of \$5.54 an hour compared to \$9.18 an hour. Half of individuals with IDD using SSI or SSDI are paid below minimum wage (Livermore et al., 2017). This demonstrates that the relationship between SSI/SSDI and weekly wage is complex. A better understanding of this relationship could help ensure supports are developed to lead to long-term economic stability and independence for individuals with IDD.

Education

There is a strong correlation between academic degrees and the ability to secure employment that provides a living wage (Moon et al., 2011; Ryan, 2011). There is also a strong inverse relationship between education and enrollment in SSI and SSDI; individuals with higher education levels make up a lower percentage of those receiving Social Security benefits (Poterba et al., 2017). Additionally, only 2.2% of individuals with IDD that are beneficiaries of SSI and SSDI have a degree beyond a secondary (high school) degree (Livermore et al., 2017). Although earning a postsecondary degree is associated with job security, wages earned, and use of public supports in individuals with IDD, a large disparity exists in participation in these programs.

Individuals with disabilities are almost half as likely to obtain a degree beyond high school, compared to those without a disability (Paul et al., 2020). Individuals with IDD are even less likely than those with other types disabilities to participate in postsecondary education opportunities (Grigal & Dwyre, 2010). Postsecondary education opportunities are any education an individual participates after secondary school, including degree programs, such as an associates, bachelors, or graduate education, as well as non-degree and certificate programs. Recent trends show that opportunities for participation in postsecondary opportunities are increasing in part because of the reauthorization of the Higher Education Opportunity Act in 2008 (HEOA), which supported the development of networks and funding to support efforts in postsecondary education for people with IDD (Vinoski Thomas et al., 2020).

Postsecondary education has been shown to improve multiple outcomes, including employment rate, wages earned, and independent living (Migliore et al., 2009, Moon et al., 2011; Ryan et al., 2019; Zafft et al., 2004). However, past studies have only assessed the difference between no postsecondary education and having any postsecondary education.

There is a need to gain a better understanding on the effect different levels of postsecondary education have on employment. Additionally, literature has demonstrated a relationship between education and public supports like SSI and SSDI (Dutta et al., 2008; G. A. Livermore et al., 2017b; Prince et al., 2018). However, little has been explored about the relationship between all three variables: Education, employment and receipt of SSI or SSDI supports. Specifically, we do not know to what extent employment may explain the relationship between education and public support use.

Vocational Rehabilitation Services

The Vocational Rehabilitation (VR) program provides support and services to individuals with disability with a goal of improving employment outcomes in the United States. It is state and federally funded, with services offered through state agencies. Participating in VR services can improve employment rates and wages for individuals with IDD (Dutta et al., 2008; Nord & Hepperlen, 2016; Rosenthal, 2015). Not only is improved economic stability through employment the main goal of VR services, but factors associated with economic stability can lead to bias and inequities within these interventions (White et al., 2009). Therefore, it is important to understand the relationship between the factors of economic stability in applicants for VR services with IDD in order to better assess the mechanisms that could lead to more improved outcomes.

The purpose of this study is to improve understanding of the relationship between factors of economic stability in individuals with IDD who applied for services with their state VR agency. A secondary data analysis will assess the three aims of the study:

- 1) What is the relationship between different types of postsecondary education and employment among people with IDD?
Hypothesis: Participation in postsecondary education will improve employment outcomes for people with IDD, compared to those who did not participate in postsecondary education.
- 2) What is the relationship between different types of postsecondary education and the receipt of SSI or SSDI received among people with IDD?
Hypothesis: There is a relationship between participation in different levels of postsecondary education and the receipt of SSI or SSDI among people with IDD.
- 3) Does employment mediate the relationship between types of education and the receipt of SSI or SSDI received among people with IDD?
Hypothesis: Employment will mediate the full effect found between education and receipt of SSI and SSDI received by people with IDD

Methods

Dataset

This cross-sectional, secondary data analysis uses the Rehabilitation Services Administration's Case Service Report (RSA-911) publicly available dataset from the program years 2017-2019 (*Case Service Report (RSA-911)*, 2021). The RSA-911 is sponsored by the Office of Special Education and Rehabilitation Services Administration in the United States Department of Education and reports all applicants who have exited within that program year. It reports data from the application through their closure date, including personal and

demographic data and services received. This study combines the datasets from program years 2017-2019, which includes 1,495,099 cases. This study has been approved by the Georgia State Institutional Review Board (IRB) as non-human subjects research.

Sample

The analytic sample of this study was delimited to 58,485 applicants who have an intellectual disability and are 22 years old and over at the time of application. In the RSA-911, applicants identify a primary and secondary disability, where applicable, and the type of impairment and source of impairment for both. The type of impairment is grouped into 3 categories (sensory/communicative, physical, and mental), with specific impairments identified within each. The specific impairments are chosen from a list of 37 potential diagnoses (plus “other”) that identify the source of impairment. Only participants who have reported intellectual disability as their source of impairment for either their primary or secondary disability were included in this study. The analytic sample will also be delimited to individuals between 22 - 65 years old, excluding individuals who would still be covered under the Individuals with Disabilities Education Act at time of application (21 and under) or near retirement age.

Variables

Predictor and Outcome Variables

Education. This variable is the main predictor variable in all three research questions and will be treated as a categorical, ordinal variable. There are multiple questions regarding education included in the RSA-911 dataset assessing if and when individuals participated in and or completed different levels of education (RSA Questions IX.F.1-17). These questions are updated until the individual exits. This study created a categorical variable based on the responses to these questions. Categories include: (a) completed secondary school diploma or equivalent, (b) completed some postsecondary education, (c) attained a non-degree certificate, (d) attained an associate’s degree, (e) attained a bachelor’s degree, or (f) attained a degree beyond a bachelor’s degree.

Employment. This variable is the outcome variable in research question one and the mediating variable in research question three. Employment was calculated by multiplying the applicant’s weekly wage at exit with their weekly hours worked, creating a weekly wage variable. If the applicant marked unemployed at exit, the weekly wage was set at \$0. For those who may not have received services, therefore, did not complete the exit survey, the individual’s weekly wage was calculated from their responses at application. This variable had a large number of 0’s, meaning a large number of individuals who do not receive a wage or were unemployed.

Supplemental Security Income (SSI). In this study, the variable of SSI was a dichotomous categorical variable stating if the applicant did or did not receive SSI each month. This study will use the responses to this variable in the exit portion of the RSA-911 dataset. For those who did receive services, therefore may not have completed the exit survey, the individual’s SSI status was calculated from their response at application.

Social Security Disability Insurance (SSDI). Similar to the SSI variable, the variable of SSDI was as a dichotomous categorical variable stating if the applicant did or did not receive

SSDI each month. This study will use the responses to this variable in the exit portion of the RSA-911 dataset. For those who did not receive services, therefore may not have completed the exit survey, the individual's SSDI was calculated from their response at application.

Covariates

Multiple co-variables were considered in the analysis of all three research questions to help account for individual factors that could influence the analysis.

Demographic Characteristics. Demographics covariates considered include age, sex, race, ethnicity and severity of disability. *Age* is determined using the person's year of birth and the date of their application. The *sex* of the applicant was measured using a binary male or female option. *Race* is measured by asking individuals if they identified as American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or other Pacific Islander; and/or White. Due to limited sample size, only individuals who identified as Black or White were included in this study. Applicants were also asked to identify their *ethnicity* (i.e., if they identified as Hispanic or Latino) within this same question. *Severity of disability* is measured using an ordinal classification on a scale of 0 (no significant disability), 1 (significantly disabled), and 2 (most significantly disabled).

Interaction terms. Disability severity is often a predictor of access and participation in interventions and services which could interact with social inequities as a result of sex, ethnicity, and race (Hassiotis, 2020). Interaction terms show how individual differences in one demographic characteristic may vary based on their identity with another demographic characteristic (Bauer et al., 2021). Therefore, this study is intentionally including interaction terms between disability severity and sex, ethnicity, and race.

State employment rate. There are differences between states that could influence the VR agencies and their outcomes. The state unemployment rate has shown to be one consideration that influences these outcomes (Alsaman & Lee, 2017; Honeycutt et al., 2015; Sannicandro et al., 2018). Therefore, states were divided into four quantiles based on their employment rates in 2018. (see Appendix B).

Data Analysis

R Studio (version 2021.09.02) was used to conduct all analyses (R Core Team, 2021). Sensitivity analyses ($n = 58485$) conducted during the analysis for research questions 1 and 2 revealed differences in outcomes based on if applicants were employed (weekly wage $> \$0$) and those who were unemployed (weekly wage = $\$0$). Therefore, this study chose to assess the mediated relationships between education level, week wage, and receipt of SSI/SSDI in individuals who earned more than $\$0$ each week. This decision was made in efforts to report results that more clearly outline the complex relationship and the significance that can be associated with improved wages, as opposed to only employment status. Therefore, the sample of this study of applicants who exited their VR Agency in 2017-2019, identified as having an intellectual disability, were between the ages of 22-65, and were employed *and receiving a wage* was 29,920.

In cases of missing data, list-wise deletion was implemented. Missing data from any variable in this analysis (e.g., education, employment, and/or the public support) were excluded from analysis. The remaining sample, excluding variables with missing data, is 27,090, eliminating approximately 9.1% of observations. The level of missing data was below 10%,

therefore, no additional missing data methods were utilized in this study (Jakobsen et al., 2017; Langkamp et al., 2010).

Research Question 1: Education and Employment

The current literature has established a relationship between education and employment for people with IDD, however the differences in different levels of postsecondary education needs to be explored. A multiple linear regression analysis was used to assess the relationship between applicant education level and their wage at time of exit from their VR Agency. The analysis included demographic variables (e.g., age, sex, race, ethnicity, severity of disability, and three interaction terms) and their state unemployment rate as a control variable. An ANOVA assessed the bivariate relationship between weekly wage and education level. Bivariate analyses with the linear outcome and control variables were conducted using Pearson correlation, t-tests, and ANOVAs. Chi-square tests of independence assessed for multicollinearity among demographic predictor variables.

The outcome of weekly wage is continuous, however, contained a large number of 0's, meaning the individual did not have a job that paid them a wage each week. Therefore, a sensitivity analysis was conducted testing for a differences in the predictor and control variables between those who did (>\$0) and did not (\$0) earn a weekly wage. A binomial logistic regression comparing the two groups revealed that there are differences between the two groups. As a result, the final analysis only included individuals who earned > \$0 weekly wage, leaving a sample size of 27,090 applicants.

Model evaluation and specification. Simple linear regressions between education level and each control variables were conducted to help inform variables used in model building. Interaction terms that had a significant relationship at an a priori $\alpha=0.05$ or lower in the simple regression models were included in the modeling process. Hierarchical modeling was used to determine the final model. The first model included only state employment rate. The second model added demographic variables. Interaction terms from the demographic variables were added in the third model. In the fourth model, the main predictor of education level was added. Subsequent models were run, excluding any variables with parameter estimates that did not have a statistically significant relationship with the outcome. This model was then compared to the full model using a nested F-test. The R-squared and parameter estimates of the final model are reported.

The assumptions of linear regression were tested on the final model. Residuals were analyzed to assess for the assumptions of normality, homoscedasticity, and linearity, all assumptions were held. Multicollinearity between variables was measured using tolerance. No variable had a tolerance under 0.40 (disability severity), therefore no threat to multicollinearity was detected.

Research Question 2: Education and SSI/SSDI

Two multivariable binomial logistic regressions were used to answer the second research question by examining the relationship between different levels education and receipt of SSI support and receipt of SSDI support, controlling for demographic co-variables and the state employment rate. Chi-square tests of independence were conducted to assess the bivariate relationships between education level and if they did or did not receive SSI and SSDI. A

t-test was conducted to compare the mean age between the binomial outcome variable of those who did receive SSI support and SSDI support and those who did not. Chi-square tests of independence assessed all other categorical demographic control variables. Multi-collinearity was assessed using Chi-square test of independence between all predictor variables, none was detected.

The final model from this question was used to conduct the mediation analysis in research question 3. Therefore, a sensitivity analysis was conducted to compare the outcomes of if the applicants were recipients of SSI or SSDI supports each month based on if they were employed and received a wage each week or not. If there was a difference in SSI/SSDI outcomes, then the final model would not accurately represent the needed model for the mediation analysis. The results show that there was a difference in SSI and SSDI between the two employment groups. Therefore, the dataset for this research question was delimited to the 27,090 applicants who were employed and did receive a weekly wage.

Model evaluation and specification. Individual simple binomial logistic regression analyses between education level and SSI/SSDI receipt were conducted to better understand associations. Individual binomial regressions were also conducted with each of the control variables, including interaction terms. Interaction terms that had a significant relationship at an a priori $\alpha=0.05$ or lower in the simple regression models were included in the modeling process. Modeling building used hierarchical regression methods. The first model included only the state employment rate. The second model added all demographic co-variables. The third model added interaction terms. The fourth model adds education level. Any variables with a parameter estimate above the a priori $\alpha=0.05$ were removed, and a new model excluding those variables was tested. This model was then compared to the full model using model fit statistics, including AIC, to determine the model that best fits the data. Results of the final model are reported, including odds ratios and confidence intervals.

Research Question 3: Mediation Analysis

The final research question assesses the relationship between the three variables of education, employment, and receipt of SSI and receipt of SSDI. We know that all three variables are associated with each other, however, we don't fully understand their complex relationships. Therefore, a mediation analysis determines how much the association between education level and receipt of SSI and of SSDI is explained through their association with wage (Figure 1). Through this analysis, there are two different outcomes including SSI and SSDI, therefore two mediation analyses will be conducted and reported. The Imai and colleagues (Imai, Tingley, et al., 2010) approach using the mediate package in R Studio was used to evaluate these potential mediating effects. The Imai, Keele, & Tingley (2010) approach has an improved ability to detect a mediation effect. It also has the ability to accommodate a variety of variable types, including non-linear and non-parametric measures.

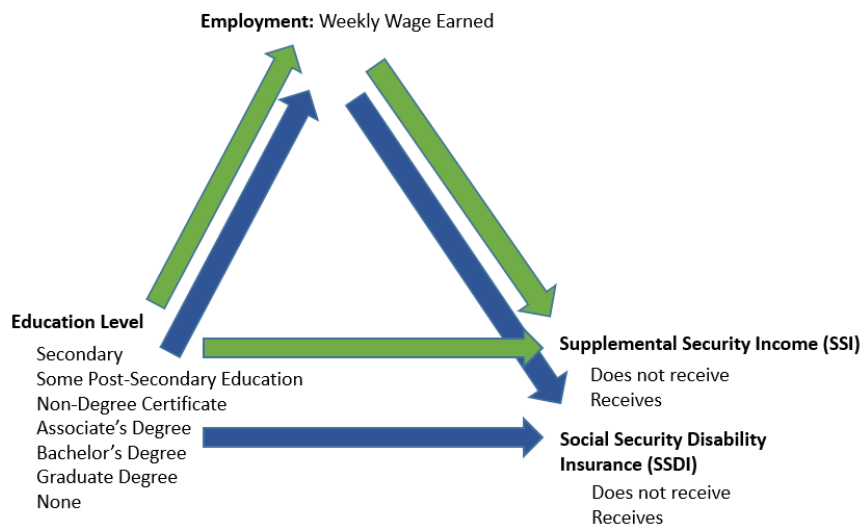


Figure 1. Conceptual Graph of the Mediation Pathways for Economic Stability

Model evaluation and specification. Results from research questions 1 and 2 in this study will inform the final models for the mediation analysis. The findings in the sensitivity analysis in research question 1 identified differences in the predictors and control variables between those who did and not receive a weekly wage (are unemployed), therefore, the sample in this analysis only includes those who are employed. The results examine the relationship between education, wage earned, and receipt of SSI/SSDI in those who are employed and receive a wage each week. The final model from research question 1 was used as the mediator model in the analysis, including the control variables (demographic co-variates, interaction terms, and state employment rate). The final model from research question 2 was used as the outcome model in the analysis, also including the control variables (demographic co-variates, interaction terms, and state employment rate).

The main predictor variable in the mediation analysis is a categorical variable with 7 ordinal levels. The mediation analysis using the approach outline by Imai and colleagues (Imai, Keele, et al., 2010) only compares two levels in the predictor variable. Therefore, six separate mediation analyses compared each level to the reference category for education (*Secondary School*). All mediation analyses were conducted using non-parametric bootstrapping at the standard 1000 resamples (Tingley et al., 2014). Parameter estimates, 95% confidence intervals, and p-values from the final analysis are reported for the average casual mediation effect (ACME), average direct effect (ADE), total effect, and proportion of the effect that was explained through the mediator comparing those who did and not have paid employment. Full descriptive results can be seen in Table 1, including a breakdown of demographics between those who did and did not have paid employment.

Results

The sample for this study was 58,485 individuals with IDD who applied to receive services from their state VR agency and exited the program in the years 2017-2019. In the whole sample, 57% of applicants were male, 69% identified as White, 91% identified as being

non-Hispanic, and 83% of applicants had a most significant disability. Over half of the applicants (53.7%) earned a weekly wage, indicating they had some type of paid employment. There were statistically significant differences in sex, race, ethnicity, and severity of disability when comparing those who did and not have paid employment. Full descriptive results can be seen in Appendices C, D, and G including a breakdown of demographics between those who did and did not have paid employment and by SSI/SSDI receipt.

Research Question 1

A sensitivity analysis comparing the demographic characteristics between those who did and did not earn a wage using a logistic regression, controlling for state, showed statistically significant differences between the two groups. Therefore, only those who earned a wage were used in the mediation analysis, to allow for more a better fitting model and improved specification of the results. Appendix E outlines the full results from the sensitivity analysis.

The average weekly wage in the final sample used in the analysis, excluding all applicants who earned \$0, was \$222.79 (\$249.14). Sixty eight percent of wage earners had earned a secondary degree, with approximately 4% having earned a postsecondary certificate or degree and 5% having completed some postsecondary education (yet no degree or certificate). Appendix D provides mean wages across all categories of demographic characteristics and education, not controlling for other variables.

All levels of education had a statistically significant association with the outcome of weekly wage earned. Full results from the linear regression are reported in Appendix F. As level of education increased, so did the average weekly wage earned, except when comparing applicants with a secondary degree or certificate and those without a secondary degree or certificate. Applicants with a non-degree certificate earned an average \$67.23 more than applicants with a secondary degree. Earning a Bachelor's degree improved weekly wages for applicants by \$201.83, while a graduate degree led to a \$425.14 average increase in wage for applicants. Applicants who did not earn a secondary degree earned an average of \$16.08 more than those with a secondary degree. However, these results should be interpreted with caution due to potential incomplete reporting in the application process.

Females across all disability severity levels, on average, earned less each week than males. Those with a most significant disability made an average of \$18.62 less, while applicants with a significant disability made \$32.84 less and those with no significant disability made \$22.92 less, when controlling for all other variables. The pattern in wage earned for Black and Hispanic applicants wasn't as clear. Black applicants who had a most significant disability earned an average of \$39.73 more than White applicants with a most significant disability, while Black applicants with a significant disability and no significant disability on average earned less than White applicants with the same severity. This pattern was echoed in Hispanic applicants, where Hispanic applicants with a most significant disability earned an average of \$52.46 more than non-Hispanic applicants with a most significant disability. However, Hispanic applicants with a significant disability earned \$23.45 less each week than White applicants, when controlling for all other variables.

The final linear regression model explained 13.6% of the variance that occurs in weekly wage earned by individuals with IDD who were applicants for VR services ($p < .001$). The final model, including education level, explained 3.8% more of the variation than the model with

only demographic characteristics, controlling for state employment rate. Looking at the progression of the hierarchical model building process, demographic characteristics explained at least 6.7% of the variance with the interaction between severity of disability and the demographics explaining at least 0.5% more.

Research Question 2

Two separate analyses were conducted to answer this research question, one assessing the relationship between education level and receipt of SSI and the second assessing the relationship between education level and SSDI. A sensitivity analysis was conducted using Chi-square tests of independence to check for differences if applicants received SSI and if applicants received SSDI across those who earned a weekly wage and those who did not. The results confirmed the use of the subset sample of only individuals who earned a weekly wage in the analysis, finding statistically significant differences in receipt of both SSI and SSDI ([SSI: $\chi^2 = 961.8$; $df = 1$; $p < .0001$][SSDI: $\chi^2 = 235.87$; $df = 1$; $p < .0001$]).

Bivariate descriptive analyses for both the SSI and SSDI outcomes resulted in statistically significant differences in the distribution of if they received public support across levels of education level ([SSI: $\chi^2 = 961.8$; $df = 1$; $p < .0001$][SSDI: $\chi^2 = 235.87$; $df = 1$; $p < .0001$]). There were also statistically significant differences in all demographic characteristics between those who did and did not receive SSI and those who did and did not receive SSDI. Appendix G contains a table of all demographic characteristics by receipt of SSI and SSDI.

SSI model results

In the final model for the SSI outcome, all levels of education had a statistically significant relationship with status of SSI receipt. Full results are included in a table in Appendix H. All levels of education, except a graduate degree, showed lower odds of receiving SSI than those who had earned a secondary degree or certificate. Having a bachelor's degree showed the lowest odds of receiving SSI each month (OR: 0.78; 95% CI [0.73, 0.83]). Applicants with a graduate degree had slightly higher odds of receiving SSI than those with a secondary degree (OR: 1.01; 95% CI [1.00, 1.02]).

All demographic characteristics explained a statistically significant amount of the variance in the model. For each year older in age, the applicant's odds of receiving SSI decreased by 0.90 (95% CI [0.87, 0.92]). Black applicants had slightly higher odds of receiving SSI (OR: 1.02; 95% CI [1.01, 1.04]), with the interaction term between race and severity of disability not maintaining significance in the final model. Therefore, there is not enough evidence to say there were differences in SSI receipt in Black applicants across different severity of disability. Applicants who identified as Hispanic and had a most significant disability had 1.02 (95% CI [1.01, 1.03]) than non-Hispanic applicants of receiving SSI each month. However, Hispanic applicants with a significant disability had lower odds of receiving SSI each month than white applicants with a significant disability (OR: 0.91; 95% CI [0.86, 0.95]).

SSDI model results

In the final model for the SSDI outcome, all levels of education had statistically significant lower odds of receiving SSDI each month than those with a secondary education. Results of logistic regression are reported in Appendix I. Overall, the trend in the outcome was as level of education increased, the odds of receiving SSDI decreased. Applicants with a graduate degree had the lowest odds of receiving SSDI (OR: 0.769; 95% CI [0.67, 0.87]).

Applicants who did not have a secondary degree or certificate also had lower odds of receiving SSI than those with a secondary degree (OR: 0.933; 95% CI [0.92, 0.95]), which was different than the pattern demonstrated.

All demographic characteristics also had statistically significant relationships with if they received SSDI or not. Contrasting what was found in SSI, for each additional age of the applicant, their odds of receiving SSDI increased by 1.01 (95% CI [1.01, 1.01]). Females had 0.98 lower odds of receiving SSDI each month than males (95% CI [0.97, 0.99]). Black applicants with a significant disability had 0.92 lower odds of receiving SSDI than White applicants with a significant disability. However, when compared to White applicants with less severe disability, Black applicants had higher odds of receiving SSDI. A similar pattern occurred when comparing Hispanic applicants to non-Hispanic applicants. Hispanic applicants with a most severe disability had 0.88 lower odds of receiving SSDI, while Hispanic applicants with less severe disabilities had higher odds than White applicants at the same level of disability, controlling for all other variables.

Research Question 3: Mediation

This research question examined the relationships between level of education and receipt of SSI or SSDI as mediated by wage earned by applicants with IDD to receive services from their state VR agency. Separate analyses were conducted and for SSI and SSDI. The final models reported in questions 1 and 2 served as the model equations in the mediation analyses. Within the analysis for each outcome, separate analyses were conducted comparing the different levels of education to the reference level of applicants who earned a Secondary degree or certificate. Appendix J and K outline the full results of the mediation analyses for SSI. The results for the SSDI mediation analyses can be found in Appendix L and M. The mediated (indirect) effect refers to the amount of the effect of the relationship between education and SSI receipt can be explained through the applicant's weekly wage. The direct effect refers to the amount of the effect that is explained solely by the relationship between education and receipt of SSI. The total effect outlines how much of the variation in SSI receipt status explained through the direct and mediated effect combined.

SSI model results

Weekly wage was found to have a statistically significant mediating effect between level of education and receipt of SSI in all 6 analyses that compared each level of education to having a secondary degree or certificate. All mediating effects had negative relationships with SSI receipt, meaning that higher wages were associated with lower odds of receiving SSI. A similar relationship between level of education and SSI receipt was found in almost all analysis (except those who did not earn a secondary degree or certificate), showing that higher levels of education are associated with lower odds of receiving SSI. The largest amount of variation that was explained through the mediated effect was found when comparing applicants with who had earned a graduate degree, compared to applicants who had earned a secondary degree or certificate (ACME: -0.338; 95% CI [-0.44, -0.24]). However, the analysis that showed the highest amount of variation explained by both the mediated and direct effect was when comparing those with a Bachelor's degree to those with a Secondary degree or certificate.

SSDI model results

Weekly wage also had a statistically significant negative mediating effect on the relationship between education and receipt of SSDI for all analyses. Therefore, as wage increased, odds of receiving SSDI decreased. As level of education increased, the amount of variation explained through weekly wage also increased, with those who earned a graduate degree have the largest mediated effect of -0.27 (95% CI [-0.35, -0.18]) and no secondary education as the lowest mediated effect of -0.010 (95% CI [-0.01, -0.01]). In fact, the direct effect of education on receipt of SSDI became not statistically significant once adding the mediated effect of weekly wage in analysis comparing those who had a secondary education to those with any postsecondary degree or certificate (non-degree, Associate's, Bachelor's, graduate) reflecting that as education level increases, more of the relationship with SSDI is explained by wage.

Discussion

This study further examined the relationship between education, employment, and Social Security benefits in individuals with IDD, controlling for demographic characteristics. As factors of economic stability, improved understanding of the pathways and complex relationship between these factors could support improved outcomes related to economic stability, where people with IDD face extreme disparities. Higher levels of education was positively associated with employment status and wage earned. Higher levels of education also predicted lower odds of receiving SSI and SSDI. Wage earned mediated the relationship between education and receipt of SSI/SSDI across all education levels. However, the magnitude of that indirect effect varied across the different levels of education, demonstrating the complex relationship between these factors for economic stability.

Most studies assessing education in individuals with IDD, either as a predictor or an outcome variable, make comparisons across if they did or did not have any postsecondary education (Qian et al, 2018). This is often done due to sample size, which could contain cell counts that are too small to reliably run the statistical method. The same thing often occurs in employment, which often categorizes if they are employed or not, and if they are paid over minimum wage or not (Qian et al., 2018). However, these dichotomous categories allow for a wide range of variance in the variable. This study used non-dichotomous measures, which provide a baseline understanding of mean weekly wage earned by varying levels of education, controlling for demographics. Due to this current study, we can now say that in a sample of applicants to VR with IDD, those who had a non-degree certificate make an average of \$67.23 more a week than someone with IDD who only had a secondary degree. More so, someone with IDD who has a bachelor's degree earns an average of \$132.59 more than someone with a non-degree certificate. This information can now be leveraged to advocate for improved education opportunities beyond non-degree certificates for individuals with IDD. Similarly, these outcomes can be used to compare to other populations and detect differences in outcomes between people with IDD and people without IDD. Research focusing on improving education and employment with people with IDD need to align their research outcomes to match our goals and expectations as a field. Moving forward, research needs to match the growing demand for advanced education opportunities and competitive wages and include these different options for education within their studies. In order to receive funding to support more advanced education opportunities, we need data to demonstrate this need.

This study established that a complex relationship exists between the economic stability factors of level of education, wage earned, and receipt of Social Security benefits. Weekly wage earned explained a significant level of the effect between education and Social Security benefits, however the level of effect and the proportion of the effect explained by weekly wage varied by level of education. Specifically, with higher levels of education, SSI/SSDI use is increasing explained through wage and less through education level. Therefore, as education increases, wage earned becomes a more important predictor while at lower levels of education, variables are more equally important to consider. The findings of this study further point out the need to start considering level of postsecondary education when discussing employment and economic stability outcomes for people with IDD. Opportunities to participate in postsecondary education are continuing to improve for people with IDD through policies such as The Higher Education Opportunity Act of 2008, which first defined inclusive education and helped establish networks of inclusive education opportunities for individuals with IDD (Vinoski Thomas et al., 2020). As opportunities increase, understanding differences between the different levels and types will allow interventions to appropriately support participants at all levels, as well as support evaluation efforts for service provision. Having more information on the outcomes of education, as related to other factors of economic stability, will also allow individuals with IDD more autonomy and self-determination in life decisions.

Complex relationships have been found between Social Security benefits and wage that could be impacting results. Eligibility for SSI includes earned and unearned income, meaning that once the individual meets a certain income, their benefits decrease, or they may become no longer eligible to receive the supplemental support. This may lead some individuals to restrict hours they work in order for the individual to maintain the needed support and still meet the eligibility requirements (Nord & Nye-Lengerman, 2015). The federal income limit for individuals to maintain eligibility for SSI is approximately \$900/month (\$225/week), with work incentives and state supplements providing support at decreasing levels until income reaches a maximum of approximately \$1700/month (\$425/week) and the individual no longer qualifies (*Introduction to Social Security Disability Benefits, Work Incentives and Employment Support Programs*, n.d.). This study found that wages earned by individuals with IDD who had some post-secondary education (\$232/week), a non-degree certificate(\$243/week), or as Associate's degree (\$ 275/week) congregated near the lower eligibility limit for SSI. Similarly, wages for individuals with IDD who had a Bachelor's degree stayed slightly below the highest possible income before losing eligibility with an average income of \$375/week. This finding indicates that individuals may limit works hours or weekly wage in efforts to maintain their SSI eligibility.

Limitations

There are limitations to this study that should be considered when interpreting the results. First, the results of the mediation analysis should be applied for explanatory purposes, rather than causal inferences. Although mediation analyses are often used to establish causality, this study used a mediation for an explanatory approach. Therefore, caution needs to be taken with any considerations of causation. Mediation for explanation allows us to better understand the relationships between variables and potential underlying mechanisms, opposed to a mediation by design approach helps ensure any confounding variables are controlled, allowing for a better environment to detect causality (Fairchild & McDaniel, 2017).

The use of a cross-sectional dataset also limits causal inferences. This study assesses the relationship between factors of financial stability in individuals who applied for VR services. Therefore, individuals with IDD who did not apply for these services were not included in this analysis. Future studies should identify differences in VR applicants with IDD compared to the population. Future studies should also identify large datasets that would allow for analysis of the relationships between factors of financial stability.

This study assessed economic stability using an individual's education level, weekly wage earned, and receipt of Social Security benefits. However, it is important to recognize that these three variables alone may not fully represent the construct of economic stability. Factors of SES have been shown to have confounding effects (Lahelma et al., 2004), which this study supports. There are several factors that could be considered measures of economic stability, this study used three, controlling for the social components of demographic characteristics. These three variables are centered on economic factors on the individual level, excluding supports that could exist on interpersonal or community levels. For example, household income earned by parents or other family members or family wealth were not included. Future studies should assess how factors on different systems levels may interact.

Implications

Opportunities for people with IDD to participate in education and employment are growing (Wehman et al., 2018). This growth could support an increasing number of individuals with IDD to become independently and/or financially secure. However, in order to maximize these opportunities, research and practice needs to match trends of the field. Data and research needs to start supporting studies that examine outcomes for people with IDD beyond a simple dichotomous measure of post-secondary education and employment. Programs and surveillance data need to also support this effort by ensuring they are accurately collecting the full level of achievement and participation for people with disabilities.

The relationship between the three factors of economic stability in this study are complex. This study found that as level of education improved, receipt of SSI/SSDI was explained increasingly by the wage earned and less by education. This may indicate that those with lower educational levels are more limited by their education and experience. Further analysis of this pathway could help identify ways to support independence from Social Security benefits when possible, the best ways to properly support individuals during that transition, and/or support development of sustainable long-term support plan with improved independence for people with IDD.

Additionally, this study showed a concentration of the average wages earned by education level to balance near common SSI cut-offs for eligibility. The dataset used for this study was individuals who had applied for VR services in their state, meaning they were interested in getting supports for work. Future studies need to identify if these SSI cut-offs are leading to limiting the income received by the individuals, and if so, what challenges they face in gaining employment and wages to support an economic stability without SSI support. Efforts to improve inclusive and accessible job opportunities that could provide stability for individuals with IDD without need for SSI are needed. Additionally, educational opportunities to teach individuals with IDD how to communicate their needs and advocate their strengths may also support their motivation and ability to decrease their dependence on SSI/SSDI.

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APPENDIX

Appendix A: Matrix of RSA-911 Questions and Measures used for Study Analysis

<i>Variable in Manuscripts</i>	<i>RSA-911 Question</i>
Week Wage (Hours worked * Hourly wage)	XVII.D.4 Hourly Wage at Exit XVII.D.5 Hours Worked in a Week at Exit <i>If above was NA, then:</i> IX.C.3 Hourly Wage at Initial IPE IX.C.4 Hours Worked in a Week at Initial IPE
Education Level	
Secondary	IX.F.3.1 Highest Educational Level Completed IX.F.3.1 Individual attained a secondary school diploma. IX.F.3.2 Individual attained a secondary school equivalency. Individual has a disability and attained a certificate of attendance/completion as a result of successfully completing an Individualized Education Program (IEP). IX.F.3.3 Individual completed one or more years of postsecondary education.
Some Post-Second	IX.F.3.4 Enrolled in Postsecondary Education or career or technical training IX.F.11 Completed Some Postsecondary Education, No Degree or Certificate IX.F.13 Enrolled in a Career or Technical Training Program, Not Leading to a Recognized Credential IX.G.1 Enrolled in a Career or Technical Training Program, Leading to a Recognized Credential IX.G.2 Individual attained a postsecondary certification, license, or educational certificate (non-degree). IX.F.3.5 Date Attained Other Recognized Credential
ND cert	IX.F.3.6 Individual attained an Associate's Degree. IX.G.5 Date Attained Associate Degree
Associate	IX.F.3.7 Individual attained a Bachelor's Degree. IX.F.14 Date Attained Bachelor's Degree
Bachelor	IX.F.3.8 Individual attained a degree beyond a Bachelor's Degree. IX.F.15 Date Attained Master's Degree
Graduate	IX.F.3.8 Individual attained a degree beyond a Bachelor's Degree. IX.F.16 Date Attained Graduate Degree IX.F.17 Date Attained Graduate Degree
None	IX.F.3.9 No educational level was completed.

Supplemental Security Income (SSI)

	XVII.E.2	SSI at exit <i>If above was NA, then:</i>
	IV.G.2	SSI at Application
Social Security Disability Insurance (SSDI)		
	XVII.E.1	SSDI at exit <i>If above was NA, then:</i>
	IV.G.2	SSDI at Application
Age	IV.B	
Sex	IV.C.1	
Male	1	Male
Female	2	Female
Race		
White	IV.C.6	White
Black	IV.C.4	Black
Ethnicity	IV.C.7	
Not Hispanic	0	Not Hispanic
Hispanic	1	Hispanic
Severity of Disability	VII.C	
Most Significant Disability	1	Most Significant Disability
Significant Disability	2	Significant Disability
No Significant Disability	3	No Significant Disability

Appendix B: Table of State Unemployment Rates by Quartile

		<i>Rate</i>	<i>Ranking</i>
National Average		3.9	
Quartile 1	Hawaii	2.4	1
	North Dakota	2.5	2
	Iowa, New Hampshire, Vermont	2.6	3
	Idaho	2.8	6
	Nebraska, South Dakota, Utah, Virginia	2.9	7
	Colorado, Minnesota, Wisconsin	3.0	11
Quartile 2	Maine	3.1	14
	Missouri	3.2	15
	Kansas, Oklahoma	3.3	16
	Indiana, Massachusetts, South Carolina	3.4	18
	Tennessee	3.5	21
	Florida	3.6	22
	Arkansas, Delaware	3.7	23
	Maryland, Montana	3.8	25
Quartile 3	Alabama, Connecticut, Texas	3.9	27
	Georgia, New Jersey, North Carolina, Oregon, Wyoming	4.0	30
	New York, Rhode Island	4.1	35
	Kentucky, Michigan	4.2	37
	California	4.3	39
	Quartile 4	Illinois, Nevada, Pennsylvania, Washington	4.4
Ohio		4.5	44
Arizona, Louisiana		4.8	45
New Mexico		4.9	47
Mississippi		5.0	48
West Virginia		5.2	49
District of Columbia		5.7	50
Alaska		5.9	50

Appendix C: Table 1. Demographic Descriptives: All recipients and by wage (n = 58,485)

Variables	ALL Service Recipients		Week Wage			
	<i>(n = 58,485)</i>		<i>No (n=31,395)</i>		<i>Yes (n=27,090)</i>	
	<i>Mean(SD)</i>		<i>Mean(SD)</i>		<i>Mean(SD)</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Age	35.56 (11.38)		35.54 (11.53)		35.58 (11.21)	
Sex			***			
<i>Male</i>	33,413	0.57	17,578	0.56	15,835	0.58
<i>Female</i>	25,072	0.43	13,817	0.44	11,255	0.42
Race			***			
<i>White</i>	40,467	0.69	20,926	0.67	19,541	0.72
<i>Black</i>	18,018	0.31	10,469	0.33	7,549	0.28
Ethnicity			***			
<i>Not Hispanic</i>	53,339	0.91	28,465	0.91	24,874	0.92
<i>Hispanic</i>	5,146	0.09	2,930	0.09	2,216	0.08
Severity of Disability			***			
<i>Most Significant Disability</i>	48,559	0.83	25,928	0.83	22,631	0.84
<i>Significant Disability</i>	8,715	0.15	4,602	0.15	4,113	0.01
<i>Not Significant Disability</i>	1,211	0.02	865	0.03	346	0.15
State Region			***			
<i>Q1</i>	10,968	0.19	5,581	0.18	5,387	0.20
<i>Q2</i>	12,620	0.22	7,299	0.23	5,321	0.20
<i>Q3</i>	20,214	0.35	10,410	0.33	9,804	0.36
<i>Q4</i>	14,683	0.25	8,105	0.26	6,578	0.24
SSI			***			
<i>No</i>	38,145	0.54	15,521	0.49	16,857	0.62
<i>Yes</i>	32,282	0.46	15,874	0.51	10,233	0.38
SSDI			***			
<i>No</i>	47,267	0.67	21,792	0.69	17,176	0.63
<i>Yes</i>	23,160	0.33	9,603	0.31	9,914	0.37
Education Level			***			
Secondary	36,139	0.51	14,149	0.45	18,314	0.68
Some Postsecondary	2,760	0.04	1,014	0.03	1,349	0.05
Non-Degree Certificate	1,271	0.02	501	0.02	650	0.02
Associate's Degree	413	0.01	129	0.00	243	0.01
Bachelor's Degree	301	0.004	83	0.003	170	0.006
Graduate Degree	68	0.001	17	0.001	46	0.002
None	29,475	0.42	15,502	0.49	6,318	0.23

Note. * Average mean weekly wage calculated using sample of applicants who earned a wage >\$0 each week

Appendix D: Table 2. Demographic Descriptives Across Weekly Wage and Education Level in Applicants who Earned a Wage (n = 27090)

Variables	Weekly Wage ⁺	Education													
		Secondary (n=18,314)		Some Postsecondary (n=1,349)		Non- Degree Certificate (n=650)		Associate' s Degree (n=243)		Bachelor's Degree (n=170)		Graduate Degree (n=46)		None (n=,6318)	
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	
Age															
Sex	***	***													
Male	232.07 (156.02)	10741	0.59	706	0.52	349	0.54	119	0.49	90	0.53	20	0.43	3810	0.60
Female	209.72 (137.83)	7573	0.41	643	0.48	301	0.46	124	0.51	80	0.47	26	0.57	2508	0.40
Race	***	***													
White	211.61 (149.18)	13598	0.74	931	0.69	515	0.79	189	0.78	127	0.75	28	0.61	4153	0.66
Black	251.71 (145.11)	4716	0.26	418	0.31	135	0.21	54	0.22	43	0.25	18	0.39	2165	0.34
Ethnicity	***	***													
Not Hispanic	217.99 (145.99)	16908	0.92	1190	0.88	553	0.85	225	0.93	153	0.90	40	0.87	5805	0.92
Hispanic	276.64 (171.86)	1406	0.08	159	0.12	97	0.15	18	0.07	17	0.10	6	0.13	513	0.08
Severity of Disability	***	***													
Most Significant Disability	208.12 (135.65)	15426	0.84	991	0.73	523	0.80	182	0.75	101	0.59	26	0.57	5382	0.85
Significant Disability	292.29 (186.90)	220	0.01	33	0.02	15	0.02	6	0.02	7	0.04	2	0.04	63	0.01
Not Significant Disability	356.71 (183.00)	2668	0.15	325	0.24	112	0.17	55	0.23	62	0.36	18	0.39	873	0.14
State Region	***	***													
Q1	198.20 (154.23)	3894	0.21	232	0.17	121	0.19	66	0.27	32	0.19	22	0.48	1020	0.16
Q2	214.93 (132.22)	3283	0.18	238	0.18	80	0.12	34	0.14	23	0.14	2	0.04	1661	0.26
Q3	256.77 (159.25)	6632	0.36	566	0.42	314	0.48	87	0.36	93	0.55	13	0.28	2099	0.33
Q4	198.62 (131.68)	4505	0.25	313	0.23	135	0.21	56	0.23	22	0.13	9	0.20	1538	0.24

SSI	***															
No	252.44 (162.40)	11121	0.50	974	0.53	433	0.49	201	0.58	156	0.58	44	0.67	3928	0.52	
Yes	173.94 (107.73)	7193	0.32	375	0.23	217	0.28	42	0.14	14	0.07	2	0.04	2390	0.30	
SSDI	***															
No	251.34 (164.86)	11196	0.38	990	0.42	473	0.42	170	0.41	146	0.46	39	0.46	4162	0.40	
Yes	173.32 (99.15)	7118	0.28	359	0.21	177	0.20	73	0.26	24	0.13	7	0.15	2156	0.25	
Education Level	***															
Secondary	210.09 (137.11)															
Some																
Postsecondary	278.33 (177.70)															
Non-Degree																
Certificate	285.51 (179.79)															
Associate's																
Degree	324.13 (193.91)															
Bachelor's																
Degree	437.75 (306.92)															
Graduate																
Degree	650.39 (462.24)															
None	228.50 (144.25)															

Note. * Average mean weekly wage calculated using sample of applicants who earned a wage >\$0 each week

Appendix E: Table 3. Sensitivity Analysis Comparing VR Applicants by if They Earned a Wage

Variable	Estimates	SE	Statistic	p-value	OR	95% CI
Intercept	0.309	0.036	8.589	0.000	1.350	[1.27, 1.46]
Age	0.004	0.001	4.748	0.000	1.000	[1.00, 1.01]
Gender						
Male	<i>reference</i>					
Female	-0.130	0.017	-7.418	0.000	0.880	[0.85, 0.91]
Race						
White	<i>reference</i>					
Black	-0.213	0.022	-9.908	0.000	0.810	[0.77, 0.84]
Ethnicity						
Not Hispanic	<i>reference</i>					
Hispanic	-0.260	0.035	-7.480	0.000	0.770	[0.72, 0.83]
Severity of Disability						
Most Significant Disability	<i>reference</i>					
Significant Disability	-0.810	0.094	-8.604	0.000	0.440	[0.37, 0.53]
No Significant Disability	0.013	0.033	0.386	0.699	1.010	[0.95, 1.08]
State (by Unemployment Rates)						
Quartile 1	<i>reference</i>					
Quartile 2	-0.139	0.028	-5.037	0.000	0.870	[0.82, 0.92]
Quartile 3	0.014	0.025	0.541	0.589	1.010	[0.96, 1.07]
Quartile 4	-0.086	0.027	-3.238	0.001	0.920	[0.87, 0.97]
Education Level						
Secondary	<i>reference</i>					
Some Postsecondary	0.058	0.043	1.337	0.181	1.060	[0.97, 1.15]
Non-Degree Certificate	0.010	0.061	0.168	0.867	1.010	[0.90, 1.15]
Associate's Degree	0.369	0.110	3.356	0.001	1.450	[1.17, 1.80]
Bachelor's Degree	0.446	0.135	3.302	0.001	1.560	[1.20, 2.04]
Graduate Degree	0.734	0.285	2.574	0.010	2.080	[1.21, 3.74]
None	-1.130	0.019	-59.619	0.000	0.320	[0.31, 0.34]
Race*Severity						
White*Significant Disability	<i>reference</i>					
Black*Significant Disability	0.581	0.139	4.193	0.000	1.790	[1.36, 2.35]
White*No Significant Disability	<i>reference</i>					
Black*No Significant Disability	0.064	0.051	1.254	0.210	1.070	[0.96, 1.18]
Ethnicity*Severity						
Not Hispanic*Significant Disability	<i>reference</i>					
Hispanic*Significant Disability	0.585	0.259	2.263	0.024	1.790	[1.07, 2.96]
Not Hispanic*No Significant Disability	<i>reference</i>					
Hispanic*No Significant Disability	0.141	0.084	1.667	0.095	1.150	[0.98, 1.36]
Model Statistics						
df	5,846					
AIC	76,078					

Note: SE = standard error; OR = odds ratio; CI = confidence intervals

Quartile 1	<i>reference</i>				<i>reference</i>				
Quartile 2	12.314	2.759	4.462	0.000	13.331	2.710	4.918	0.000	
Quartile 3	40.882	2.474	16.527	0.000	40.693	2.422	16.799	0.000	
Quartile 4	-0.125	2.616	-0.048	0.962	0.940	2.561	0.367	0.714	
Sex*Severity									
Male * Significant Disability	<i>reference</i>				<i>reference</i>				
Female * Significant Disability	-28.924	4.859	-5.952	0.000	-32.844	4.756	-6.906	0.000	
Male * No Significant Disability	<i>reference</i>				<i>reference</i>				
Female * No Significant Disability	-13.154	15.752	-0.835	0.404	-22.924	15.414	-1.487	0.137	
Race*Severity									
White * Significant Disability	<i>reference</i>				<i>reference</i>				
Black * Significant Disability	-39.027	5.144	-7.587	0.000	-37.083	5.034	-7.367	0.000	
White * No Significant Disability	<i>reference</i>				<i>reference</i>				
Black * No Significant Disability	-91.547	15.948	-5.740	0.000	-86.342	15.606	-5.533	0.000	
Ethnicity*Severity									
Not Hispanic * Significant Disability	<i>reference</i>				<i>reference</i>				
Hispanic * Significant Disability	-22.522	8.363	-2.693	0.007	-23.453	8.185	-2.865	0.004	
Not Hispanic * No Significant Disability	<i>reference</i>				<i>reference</i>				
Hispanic * No Significant Disability	15.878	29.237	0.543	0.587	10.157	28.614	0.355	0.723	
Education Level									
Secondary					<i>reference</i>				
Some Post-Secondary					56.255	3.925	14.334	0.000	
Non-Degree Certificate					67.230	5.542	12.131	0.000	
Associate's Degree					110.601	8.959	12.346	0.000	
Bachelor's Degree					201.825	10.704	18.854	0.000	
Graduate Degree					425.139	20.502	20.737	0.000	
None					16.079	2.055	7.824	0.000	
Model Statistics									
Residual SE	141.7				138.6				
df	27,074				27,068				
Adjusted R ²	0.098				0.136				
F-statistic	196.5				204.7				
p-value	<.0001				<.0001				

1.1 Appendix G: Table 5. Demographic Descriptives for Applicants across Status of SSI and SSDI in Applicants who Earned a Wage (n = 27,090)

Variables	SSI				SSDI			
	No (n=16,857)		Yes (n=10,233)		No (n=17,176)		Yes (n=9,914)	
	Mean(SD)		Mean(SD)		Mean(SD)		Mean(SD)	
Age	37.46 (11.48)		***32.49 (10.01)		33.77 (10.87)		***38.72 (11.09)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Sex	***				***			
Male	9,994	0.59	5,841	0.57	9,882	0.58	5,953	0.60
Female	6,863	0.41	4,392	0.43	7,294	0.42	3,961	0.40
Race	***				***			
	12,23				11,76			
White	3	0.73	7,308	0.71	1	0.68	7,780	0.78
Black	4,624	0.27	2,925	0.29	5,415	0.32	2,134	0.22
Ethnicity	***				***			
	15,57				15,40			
Not Hispanic	6	0.92	9,298	0.91	9	0.90	9,465	0.95
Hispanic	1,281	0.08	935	0.09	1,767	0.10	449	0.05
Severity of Disability	***				***			
	13,29				13,74			
Most Significant Disability	7	0.79	9,334	0.91	7	0.80	8,884	0.90
Significant Disability	3,228	0.19	885	0.09	420	0.02	1,024	0.10
Not Significant Disability	332	0.02	14	0.00	3,089	0.18	6	0.00
State Region					***			
Q1	3,330	0.20	2,057	0.20	2,968	0.17	2,419	0.24
Q2	3,273	0.19	2,048	0.20	3,420	0.20	1,901	0.19
Q3	6,105	0.36	3,699	0.36	7,427	0.43	2,377	0.24
Q4	4,149	0.25	2,429	0.24	3,361	0.20	3,217	0.32
SSI					***			
No					9,443	0.56	7,733	0.76
Yes					7,414	0.44	2,500	0.24

Appendix H: Table 6. Logistic Regression Results of Relationship between Education and SSI

	Estimate	SE	Statistic	p-value	OR	95% CI
Intercept	0.73	0.01	62.62	0.00	2.08	[2.03, 2.13]
Age	-0.01	0.00	-35.53	0.00	0.90	[0.87, 0.92]
Gender						
Male	<i>reference</i>					
Female	0.02	0.01	4.27	0.00	1.02	[1.01, 1.04]
Race						
White	<i>reference</i>					
Black	0.02	0.01	2.76	0.01	1.02	[1.01, 1.03]
Ethnicity						
Not Hispanic	<i>reference</i>					
Hispanic	0.05	0.01	3.83	0.00	1.05	[1.02, 1.07]
Severity of Disability						
Most Significant Disability	<i>reference</i>					
Significant Disability	-0.18	0.01	-17.06	0.00	0.83	[0.82, 0.85]
No Significant Disability	-0.33	0.04	-8.89	0.00	0.72	[0.67, 0.77]
State (by Unemployment Rates)						
Quartile 1	<i>reference</i>					
Quartile 2	-0.01	0.01	-1.10	0.27	0.83	[0.82, 0.85]
Quartile 3	0.00	0.01	0.17	0.87	0.99	[0.97, 1.01]
Quartile 4	-0.02	0.01	-2.89	0.00	1.00	[0.99, 1.02]
Race*Severity						
White * Significant Disability	<i>reference</i>					
Black * Significant Disability	0.01	0.02	0.72	0.47	0.94	[0.85, 1.04]
White * No Significant Disability	<i>reference</i>					
Black * No Significant Disability	-0.06	0.05	-1.21	0.23	1.01	[0.98, 1.05]
Ethnicity*Severity						
Not Hispanic * Significant Disability	<i>reference</i>					
Hispanic * Significant Disability	-0.10	0.03	-3.65	0.00	0.91	[0.75, 1.10]
Not Hispanic * No Significant Disability	<i>reference</i>					
Hispanic * No Significant Disability	-0.09	0.10	-0.99	0.32	0.90	[0.86, 0.95]
Education Level						
Secondary	<i>reference</i>					
Some Postsecondary	-0.11	0.01	-8.25	0.00	0.90	[0.87, 0.92]
Non-Degree Certificate	-0.06	0.02	-3.19	0.00	0.94	[0.91, 0.98]
Associate's Degree	-0.19	0.03	-6.34	0.00	0.83	[0.78, 0.88]
Bachelor's Degree	-0.25	0.04	-6.98	0.00	0.78	[0.73, 0.83]
Graduate Degree	-0.24	0.07	-3.48	0.00	1.01	[0.99, 1.02]
None	0.01	0.01	1.60	0.11	0.99	[0.99, 0.99]
Model Statistics						
Residual Deviance	35,857					
df	27,070					
AIC	3,5429					

Appendix I: Table 7. Logistic Regression of Relationship between Education and SSDI

	<i>Estimate</i>	<i>SE</i>	<i>Statistic</i>	<i>p-value</i>	<i>OR</i>	<i>95% CI</i>
Intercept	0.201	0.011	17.646	0.000	1.220	[1.20, 1.25]
Age	0.009	0.000	35.479	0.000	1.009	[1.01, 1.01]]
Gender						
Male	<i>reference</i>					
Female	-0.024	0.006	-4.217	0.000	0.977	[0.97, 0.99]
Race						
White	<i>reference</i>					
Black	-0.088	0.007	-12.477	0.000	0.916	[0.90, 0.93]
Ethnicity						
Not Hispanic	<i>reference</i>					
Hispanic	-0.126	0.011	-10.943	0.000	0.882	[0.86, 0.90]
Severity of Disability						
Most Significant Disability	<i>reference</i>					
Significant Disability	-0.143	0.010	-13.806	0.000	0.690	[0.64, 0.74]
No Significant Disability	-0.371	0.036	-10.184	0.000	0.867	[0.85, 0.88]
State (by Unemployment Rates)						
Quartile 1	<i>reference</i>					
Quartile 2	-0.071	0.009	-8.028	0.000	0.931	[0.92, 0.95]
Quartile 3	-0.160	0.008	-20.168	0.000	0.852	[0.84, 0.87]
Quartile 4	0.045	0.008	5.376	0.000	1.046	[1.03, 1.06]
Race*Severity						
White * Significant Disability	<i>reference</i>					
Black * Significant Disability	0.070	0.016	4.228	0.000	1.183	[1.07, 1.31]
White * No Significant Disability	<i>reference</i>					
Black * No Significant Disability	0.168	0.051	3.302	0.001	1.072	[1.04, 1.11]
Ethnicity*Severity						
Not Hispanic * Significant Disability	<i>reference</i>					
Hispanic * Significant Disability	0.072	0.027	2.677	0.007	1.216	[1.01, 1.46]
Not Hispanic * No Significant Disability	<i>reference</i>					
Hispanic * No Significant Disability	0.196	0.093	2.102	0.036	1.074	[1.02, 1.13]
Education Level						
Secondary	<i>reference</i>					
Some Postsecondary	-0.077	0.013	-6.009	0.000	0.926	[0.90, 0.95]
Non-Degree Certificate	-0.082	0.018	-4.506	0.000	0.922	[0.89, 0.95]
Associate's Degree	-0.088	0.029	-3.017	0.003	0.915	[0.86, 0.96]
Bachelor's Degree	-0.188	0.035	-5.373	0.000	0.829	[0.77, 0.89]
Graduate Degree	-0.265	0.067	-3.961	0.000	0.769	[0.67, 0.87]
None	-0.069	0.007	-10.287	0.000	0.933	[0.92, 0.95]
Model Statistics						
Residual Deviance	35,557					
df	27,070					
AIC	34,004					

Appendix J: Table 8. Results of Mediation Analysis for assessing the Mediated effect of Weekly Wage on Receipt of SSI by Level of Education

Some Postsecondary vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.447	[-0.53, -0.04]	<.0001
<i>direct effect</i>	-0.641	[-0.87, -0.04]	<.0001
<i>total effect</i>	-0.109	[-0.13, -0.08]	<.0001
<i>proportion of effect</i>	0.411	[0.32, 0.54]	<.0001

Associate's Degree vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>ACME</i>	-0.088	[-0.11, -0.07]	<.0001
<i>direct effect</i>	-0.104	[-0.15, -0.05]	<.0001
<i>total effect</i>	-0.191	[-0.24, -0.14]	<.0001
<i>proportion of effect</i>	0.459	[0.34, 0.64]	<.0001

Graduate Degree vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>ACME</i>	-0.338	[-0.44, -0.24]	<.0001
<i>direct effect</i>	0.096	[-0.02, 0.23]	0.098
<i>total effect</i>	-0.242	[-0.31, -0.16]	<.0001
<i>proportion of effect</i>	0.779	[0.93, 2.18]	<.0001

Non-Degree Certificate vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>ACME</i>	-0.053	[-0.64, -0.04]	<.0001
<i>direct effect</i>	-0.006	[-0.04, 0.03]	0.75
<i>total effect</i>	-0.059	[-0.09, -0.02]	<.0001
<i>proportion of effect</i>	0.898	[0.56, 2.49]	<.0001

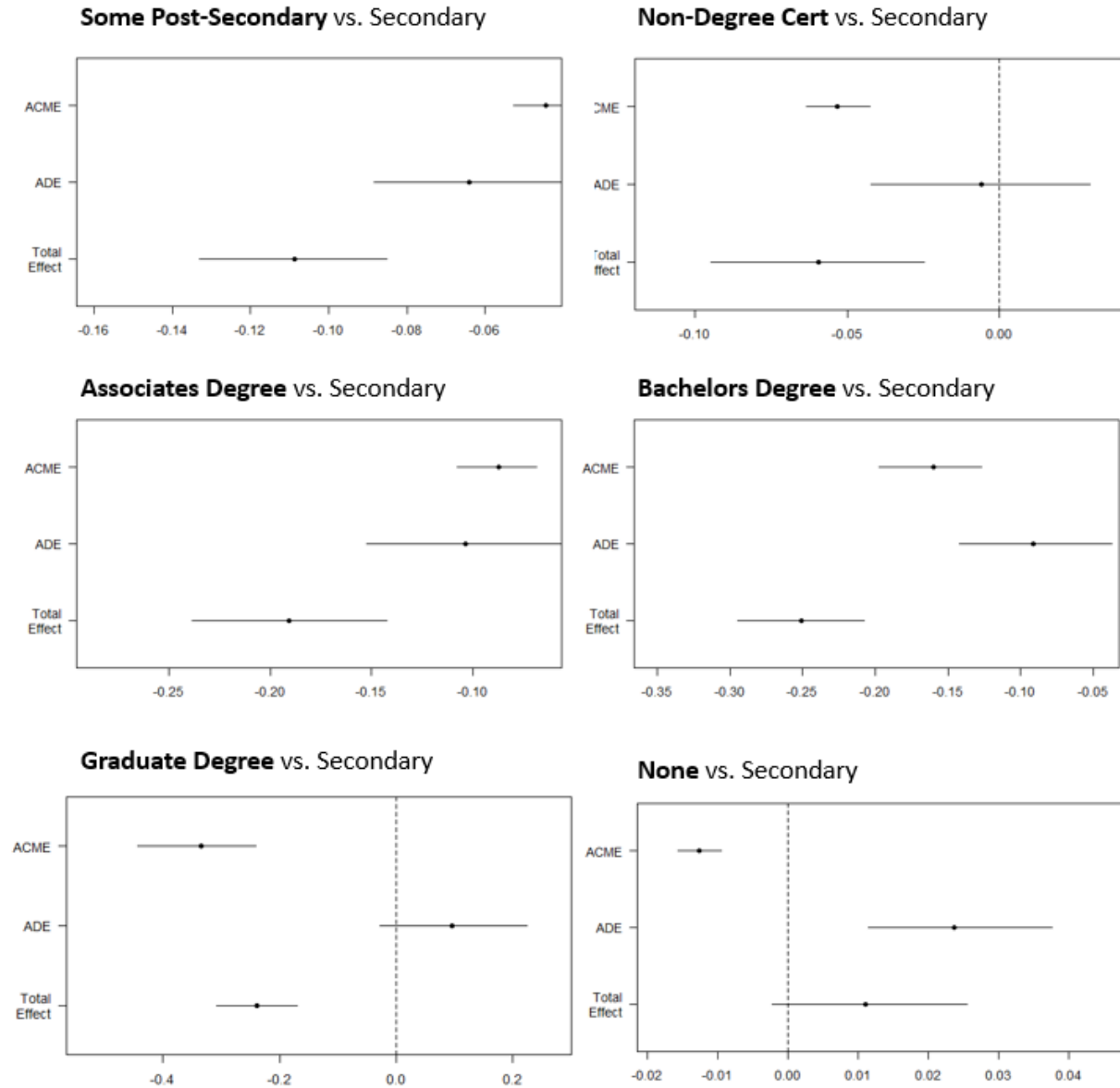
Bachelor's Degree vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>ACME</i>	-0.160	[-0.20, -0.13]	<.0001
<i>direct effect</i>	-0.091	[-0.14, -0.04]	<.0001
<i>total effect</i>	-0.252	[-0.30, -0.21]	<.0001
<i>proportion of effect</i>	0.637	[0.48, 0.82]	<.0001

None vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>ACME</i>	-0.013	[-0.02, -0.01]	<.0001
<i>direct effect</i>	0.024	[0.01, 0.04]	<.0001
<i>total effect</i>	0.011	[0.00, 0.02]	0.12
<i>proportion of effect</i>	0.351	[-13.04, 7.98]	0.12

Appendix K: Figure 2. Graphs of Mediation Results for SSI, comparing all education levels to Secondary



Appendix L: Table 9. Results of Mediation Analysis for assessing the Mediated effect of Weekly Wage on Receipt of SSDI by Level of Education

Some Postsecondary vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.036	[-0.04, -0.03]	<.0001
<i>direct effect</i>	-0.042	[-0.07, -0.02]	<.0001
<i>total effect</i>	-0.077	[-0.10, -0.05]	<.0001
<i>proportion of effect</i>	0.462	[0.34, 0.67]	<.0001

Associate's Degree vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.070	[-0.09, -0.05]	<.0001
<i>direct effect</i>	-0.019	[-0.07, 0.04]	0.462
<i>total effect</i>	-0.089	[-0.14, -0.03]	<.0001
<i>proportion of effect</i>	0.788	[0.48, 2.27]	<.0001

Graduate Degree vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.269	[-0.35, -0.18]	<.0001
<i>direct effect</i>	0.002	[-0.11, 0.13]	0.096
<i>total effect</i>	-0.267	[-0.38, -0.14]	<.0001
<i>proportion of effect</i>	0.993	[0.68, 1.71]	<.0001

Non-Degree Certificate vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.043	[-0.05, -0.03]	<.0001
<i>direct effect</i>	-0.039	[-0.07, -0.01]	0.024
<i>total effect</i>	-0.082	[-0.11, -0.05]	<.0001
<i>proportion of effect</i>	0.521	[0.36, 0.89]	<.0001

Bachelor's Degree vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.128	[-0.16, -0.10]	<.0001
<i>direct effect</i>	-0.061	[-0.12, 0.0]	0.04
<i>total effect</i>	-0.189	[-0.24, -0.14]	<.0001
<i>proportion of effect</i>	0.678	[0.49, 0.97]	<.0001

None vs Secondary Degree or Certificate

	<i>Estimate</i>	<i>CI</i>	<i>p-value</i>
<i>mediated effect</i>	-0.010	[-0.01, -0.01]	<.0001
<i>direct effect</i>	-0.059	[-0.07, -0.05]	<.0001
<i>total effect</i>	-0.069	[-0.08, -0.06]	<.0001
<i>proportion of effect</i>	0.147	[0.11, 0.19]	<.0001

Appendix M: Figure 3. Graphs of Mediation Results for SSDI, comparing all education levels to Secondary

