



# VALUE

OF VOCATIONAL  
REHABILITATION SERVICES

Mississippi Department of Rehabilitation Services

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# EXECUTIVE SUMMARY

## INTRODUCTION

The Mississippi Department of Rehabilitation Services (MDRS) commissioned this study to evaluate and document the benefits of the services they provide to the state. MDRS offers a comprehensive and diverse set of employment programs and resources to Mississippians with disabilities through two major offices: the Office of Vocational Rehabilitation (VR) and the Office of Vocational Rehabilitation for the Blind (VRB). The services provided by these two offices include vocational evaluation, counseling and guidance, educational assistance, job training, job placement, and assistive technology. All services are aimed at helping individuals maximize their likelihood of employment or increase their earnings. By helping an individual with a disability gain employment, retain employment, or realize increased earnings, the public benefits in two important ways. First, positive employment outcomes increase tax revenue. Second, positive employment outcomes decrease social costs. With the reward of improved quality of life for individuals and increased tax revenue and decreased social costs for Mississippi, helping all adults (ages 18-65) with disabilities actively participate in the labor force is vitally important.

## MDRS CONSUMER HIGHLIGHTS.

**More than 267,000 adults (ages 18-65) have some form of disability in Mississippi.**

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**Approximately 80 percent of adults with disabilities in Mississippi participate in the labor force.**

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**Adults with disabilities in Mississippi who participate in the labor force have a median income of \$18,939.**

**PARTICIPANT ROI: 7.8   STATE ROI: 2.6   FEDERAL ROI: 1.3**

## STUDY OBJECTIVE

The objective of this study is to measure the return on state and federal investments (ROI) in services provided by MDRS. The ROI is determined by addressing three fundamental questions:

- 1) What is the impact of programs provided by MDRS on the likelihood of employment and increase of earnings?**
- 2) To what extent do benefits from employment and increased earnings outweigh the state costs?**
- 3) To what extent do benefits from employment and increased earnings outweigh the federal costs?**

Addressing these three questions allows for the calculation of an ROI measured as the net benefits-to-cost ratio.

## RETURN ON INVESTMENT HIGHLIGHTS

**Participant return on investment is 7.8.** That is, for every state dollar invested in a program participant, an estimated additional \$6.80 is returned to the state in the form of tax gains and public assistance savings.

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**State return on investment is 2.6.** That is, for every state dollar invested in VR, an estimated additional \$1.60 is returned to the state in the form of state tax gains and public assistance savings.

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**Federal return on investment is 1.3.** That is, for every federal dollar invested in VR, an estimated additional \$.30 is returned to the federal government in the form of federal tax gains.<sup>1</sup>

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<sup>1</sup> The Federal ROI does not include public assistance savings due to a reduction in Social Security Disability Insurance (SSDI) benefits or Supplemental Security Income (SSI).

# RESEARCH DESIGN

## SAMPLE SELECTION

This study implements a quasi-experimental design with two groups:

### 1) Program group

### 2) Comparison (control) group

The program group includes individuals who participated in a VR/VRB plan and/or received VR/VRB services during a federal fiscal year. The control group includes individuals who were deemed eligible to receive services during an initial meeting with a VR/VRB counselor but closed the application prior to entering a plan or receiving services. Individuals for both groups were selected from 9,792 closed cases in federal fiscal year 2010-2011. Of the 9,792 closed cases, 2,194 were not eligible to receive services and were not included in the study. Of the 7,598 eligible to receive services, 5,713 actually received VR/VRB services. These individuals comprised the program group. The remaining 1,885 who did not receive services comprised the control group.

## DATA

The data came from two sources: (1) the Mississippi VR/VRB data maintained as required by the U.S. Department of Education's Rehabilitation Services Administration (RSA) for regulatory and federal reporting purposes and (2) three years of quarterly wage records **before** case closure and three years of quarterly wage records **after** case closure from the Mississippi Department of Employment Security's unemployment insurance system database. Both sources of data are part of Mississippi's

state longitudinal data system (SLDS), LifeTracks (see [www.lifetracks.ms.gov](http://www.lifetracks.ms.gov)).

The RSA data were used to generate information on an individual's background and services received from MDRS, while the quarterly wage records were used to create an individual's earnings record. The two datasets were concatenated to generate an individual's quarterly records. This procedure was done to assess earnings changes and the likelihood of employment in the short and long term.

## ANALYTICAL STRATEGY

The analytical strategy was first to examine the differences in wages between individuals in the program group and individuals in the control group one quarter after closure of the individual's case. Next, we used several mixed-fixed effect models to estimate quarterly wages of the program and control groups 12 quarters after closure, adjusted for other factors such as individual background and type of disability. In doing so, we were able to control for any differences between the program and control groups and, therefore, minimize the threat to the validity and reliability of the study. We also estimated a set of logistic regression models to determine differences in likelihood of employment between the program and control groups while controlling for several other factors (e.g., individual background, type of service, type of disability, etc.).

# RESULTS

## NET BENEFITS

The data show that one quarter after case closure, individuals in the program group earn, on average, \$1,420 more than their counterparts in the control group. The data also show that individuals in the program group are 2.4 times more likely to gain employment than those in the control group. In the long run, the benefits of employment and increased earnings are realized in two important ways: (1) increased state tax revenue and reduction in public assistance costs and (2) increased federal tax revenue.

First, the state experiences a significant tax gain. Since the average age of individuals in the study is 39, we assume that they will continue to work 27 years beyond case closure. Over a working lifetime, an individual who receives VR/VRB services makes \$45,035 more than those who do not receive services. Through this net income, VR/VRB contributes to the state economy by adding an additional \$257,284,955 (\$45,035 x 5,713 program participants). State tax gains from net income are then calculated based on the amount of (1) state income tax, (2) local income and sales tax, and (3) average property tax estimated to be collected from the average net earnings for program participants who received services. According to 2014 statistics from the Bureau of Economic Analysis (BEA) and the U.S. Census Bureau, the average tax burden for FY 2011 in Mississippi is 8.7 percent. By applying this tax burden rate to the estimated earnings, the average state tax gain per individual is estimated to be \$3,918. Employment and increase of income also lead to a reduction of public assistance. The results show that an individual receiving VR/VRB services is expected to save an

average of \$1,314 in public assistance payments. Thus, the net benefit from a program participant's tax gains and reduction in public assistance is estimated to be \$5,232. The state total net benefit is estimated to be \$29,892,425. Tax gains account for \$22,383,791 of this total, while reduction in public assistance accounts for \$7,508,634.

Second, the federal government experiences a significant tax gain. Federal tax gains from net earnings are calculated based on the amount of (1) federal income tax, (2) social security tax, and (3) Medicare tax estimated to be collected from the average net earnings of participants who received services. According to 2015 data from the Internal Revenue Service, the federal tax rate for the income bracket of the average program participant (single filer earning between \$9,226 and \$37,450) is 15 percent, and Social Security and Medicare taxes add an additional 6.2 percent and 1.45 percent, respectively, or a total amount of 22.65 percent in federal income taxes. By applying this tax burden rate to the estimated average net earnings from program participants receiving services (\$45,035), the average federal tax gain per individual is estimated to be \$10,200. The federal total net benefit is estimated to be \$58,275,042.

## RETURN ON INVESTMENT (ROI)

The ROI is calculated as the net benefits-to-cost ratio. The average cost for a participant in federal fiscal year 2010-2011 was \$3,161. Federal funding for VR/VRB requires approximately a 21.3 percent state match. Therefore, the state component of this cost was \$673 per participant. For federal fiscal year 2010-2011, the total VR/VRB state

appropriation was \$11,452,428, and the total federal appropriation was \$45,622,213.

**Participant ROI** =  $\$5,232/\$673 = 7.8$ . That is, for every dollar invested in a program participant, an estimated additional \$6.80 is returned to the state in the form of tax gains and public assistance savings.

**State ROI** =  $\$29,892,425/\$11,452,428 = 2.6$ . That is, for every state dollar invested in MDRS for VR/VRB services, an estimated additional \$1.60 is returned to the state in the form of tax gains and public assistance savings.

**Federal ROI** =  $\$58,275,042/\$45,622,213 = 1.3$ . That is, for every federal dollar invested in MDRS for VR/VRB services, an estimated additional \$0.30 is returned to the federal government in the form of tax gains.

## BACKGROUND

Leaders and decision-makers in Mississippi are interested in how much money the government spends in relation to the services it provides. The objective is to achieve the appropriate balance of services that must be provided in relation to the cost and effort required. Taxpayers also want to see the best value for their investment. As a result, government agencies of all types, more than ever, are being asked to demonstrate the positive impact of their services. MDRS has commissioned this study as part of its commitment to evaluate the value of the VR services they provide.

### MDRS

The Mississippi Department of Rehabilitation Services has two major offices that provide vocational assistance: the Office of Vocational Rehabilitation (VR) and the

Office of Vocational Rehabilitation for the Blind (VRB). These offices provide a diverse set of services to assist the disability population in Mississippi with improving their employment outcomes. Services provided by these offices include vocational evaluation, counseling and guidance, educational assistance, job training, job placement, and assistive technology.

Within the VR and VRB offices, several programs are offered that target different disability populations. In addition to the general vocational rehabilitation services, the VR office offers several specialized programs, including the following: (1) Deaf Services, (2) Supported Employment, and (3) Transition Services. Deaf Services provides all components of the general VR programs and services, such as communication devices and interpreting services. Supported Employment provides specialized job placement and training to individuals with the most significant disabilities who require intensive and ongoing support to prepare for employment. The Transition Services program targets eligible secondary school students with disabilities to enable them to transition from school to subsequent work environments. This program includes opportunities to participate in vocational technical programs and on-the-job training.

The VRB office specializes in working with individuals who are blind or visually impaired to optimize their opportunities for inclusion into the workforce. In addition to general VRB services, this office offers three specialized programs: (1) Addie McBryde Rehabilitation Center for the Blind, (2) the Business Enterprise Program (BEP), and (3) the Independent Living Services for the Blind Program. The Addie McBryde Rehabilitation Center is a personal adjustment center that assists individuals with managing the sight



they have and the use of technology to assist with sight. The Business Enterprise Program provides support for self-employment opportunities in the food service industry for those who are legally blind. The Independent Living Services for the Blind Program provides services that enable blind or visually impaired individuals to meet their independent living goals.

Across all of these programs, a variety of specific services are provided, including communications, orientation and mobility, independent living assistance, computer instruction, and vocational rehabilitation counseling.

## THE POPULATION WITH DISABILITIES IN MISSISSIPPI & THE NATION

In Mississippi more than 477,000 individuals have some form of disability, and they

account for 16.4 percent of the Mississippi population. More than half (56 percent) of the population with disabilities are adults between the age 18 and 65. Of the adult population, 80.6 percent work<sup>2</sup> and earn an annual median income of \$18,939. However, 26.9 percent live in poverty and rely on public assistance (see Table 1). There are some demographic and economic differences between the Mississippi and U.S. populations with disabilities. While the rate of childhood disability in Mississippi is comparable to the nation, the working age population (18-64) and elderly population (65 and over) are significantly more likely to be disabled in Mississippi. In Mississippi, more than 15.0 percent of the working age population and approximately 45.1 percent of the elderly population are disabled, compared to

Table 1: Demographic & Economic Characteristics of the Disability Population in Mississippi and the U.S., 2014

|                                 | MS         |          |          | UNITED STATES |            |          |
|---------------------------------|------------|----------|----------|---------------|------------|----------|
|                                 | Population | Disabled | %        | Population    | Disabled   | %        |
| Total Population                | 2,916,635  | 477,388  | 16.4     | 309,082,258   | 37,874,571 | 12.3     |
| <b>AGE</b>                      |            |          |          |               |            |          |
| Under 5                         | 201,453    | 1,417    | 0.3      | 19,971,525    | 161,265    | 0.4      |
| 5 to 17                         | 539,566    | 32,917   | 6.9      | 53,665,031    | 2,830,108  | 7.5      |
| 18 to 64                        | 1,785,788  | 267,347  | 56       | 193,574,369   | 19,703,061 | 52       |
| 65 and over                     | 389,828    | 175,707  | 36.8     | 41,871,333    | 15,180,137 | 40.1     |
| <b>GENDER</b>                   |            |          |          |               |            |          |
| Male                            | 1,396,809  | 228,128  | 47.8     | 150,888,088   | 18,192,086 | 48       |
| Female                          | 1,519,826  | 249,260  | 52.2     | 158,194,170   | 19,682,485 | 52       |
| <b>RACE</b>                     |            |          |          |               |            |          |
| Non-Hispanic White              | 1,735,776  | 291,476  | 60.5     | 228,624,830   | 28,975,110 | 68.4     |
| Black                           | 1,084,681  | 174,179  | 36.1     | 38,271,664    | 5,294,368  | 12.5     |
| Hispanic                        | 77,310     | 6,137    | 1.3      | 52,349,635    | 4,466,899  | 10.5     |
| Asian                           | 27,475     | 1,849    | 0.4      | 15,629,424    | 1,029,256  | 2.4      |
| American Indian                 | 12,715     | 2,687    | 0.6      | 2,502,365     | 408,497    | 1        |
| Hawaiian/Pac Islander           | 339        | 65       | 0        | 522,501       | 51,695     | 0.1      |
| Other                           | 22,223     | 5,684    | 1.2      | 23,531,474    | 2,115,645  | 5        |
| <b>ECONOMIC CHARACTERISTICS</b> |            |          |          |               |            |          |
| Poverty Rate                    |            |          | 26.9     |               |            | 21.5     |
| Employment Rate                 |            |          | 80.6     |               |            | 81.7     |
| Median Earnings                 |            |          | \$18,939 |               |            | \$20,815 |

Source: U.S. Census Bureau, 2014 American Community Survey

<sup>2</sup> The employment rate is calculated as the number of employed individuals with a disability divided by the total number of individuals with a disability in the labor force.

10.2 percent and 36.3 percent nationwide, respectively. While there is little difference between the male and female populations with disabilities in Mississippi and the nation, a higher percentage of whites and blacks are disabled in Mississippi than in the nation (16.8 percent vs. 12.7 percent and 16.1 percent vs. 13.8 percent, respectively), and a lower percentage of Hispanics are disabled in Mississippi (7.9 percent vs. 8.5 percent). Median earnings in Mississippi are almost \$2,000 lower than the national average, with earnings for males showing a greater discrepancy than those for females.

## PREVIOUS STUDIES ON ROI

Over the last decade or so, a growing body of research has examined the economic impact of services delivered by state departments of rehabilitation services. The main finding is that individuals with disabilities who participate in rehabilitation service programs produce a positive return on investment. These studies share several common factors. First, the data for these studies come from state departments of rehabilitation services and quarterly wage records from unemployment insurance state systems. Second, economic benefits of participants are typically measured as increased earnings and improved likelihood of employment. Third, public net benefits are measured as the tax gain from additional earnings and savings on public assistance. Fourth, return on investment is calculated as a net benefits-to-cost ratio. Differences in the value of ROIs between studies can be attributed to the different methodologies used to measure economic benefits, from which tax gains are calculated.

In 1999, Florida State University conducted a study that became a benchmark for examining the economic impact of state

departments of rehabilitation services. This study examined the differences in income before and after receiving rehabilitation services from the Florida department. The study also calculated the present value of the net income by projecting the net income forward as a gain in earnings until the participant retired. The public net benefit was measured as the tax gain obtained from the net income. The tax applied to the net income included federal, state, and local taxes, which reached a value of 19.4 percent. When the tax gain-to-cost ratio was calculated, the Florida Department of Rehabilitation Services produced an ROI of 6.97; that is, for every dollar invested in the department, an estimated additional \$5.97 was returned to the state in the form of tax gains and public assistance savings.

A 2004 Oregon study used a quasi-experimental design with two groups: a program group and control group. The program group included individuals who participated in a plan and/or received rehabilitation services during a federal fiscal year. The control group included individuals who were deemed eligible to receive rehabilitation services during an initial meeting with a counselor but closed the application prior to entering a plan or receiving services. Unlike the Florida study, the Oregon study used more sophisticated modeling to estimate participant earnings over a working lifetime. Specifically, the Oregon study estimated models that controlled for other factors that might have contributed to the differences in earnings between the program and control groups. This study also considered the difference in income between the program and control groups over a working lifetime. The total net income included actual increases in earnings and additional fringe benefits. By

applying personal income rates to the total net income, Oregon was able to produce an ROI of 4.3.

In 2010, Utah conducted a cost-benefit analysis and implemented a quasi-experimental design that included a program and a control group. This study introduced a more sophisticated research design that combined six years of quarterly wage records to examine changes in wages three years before and three years after case closure. The study also used logistic regression models to estimate the difference in likelihood of employment between the program and control groups. However, the study estimated the net income based on the entire population, which included individuals both from the program and control groups. Following this general rationale, the study produced a return on investment of 5.64.

## CURRENT STUDY

This study draws upon current research to examine the economic impact of the services provided by the Mississippi Department of Rehabilitation Services through the Vocational Rehabilitation program. Following the general rationale in the current literature, we implement a quasi-experimental design with a program group and control group. Like all previous studies, we use administrative data to examine increases in earnings and employment outcomes. In this regard, we use six years of quarterly wage records (three years before closure and three years after closure). In doing so, we were able to incorporate a

significant level of temporal variation into our analysis.

We estimate the net income using mixed-fixed effect models and using an exponential function that accounts for the convergence of earnings of the program and control groups over time. We estimate public net benefits by including state and federal tax gains and reduction of public assistance. Unlike other studies, tax gain is only based on net income (the difference in wages between the program and control groups), accounting for variation between the two groups and convergence of earnings between the two groups. To avoid an overestimation of tax gain, we did not include fringe benefits or any other element that would inflate net income. We use a mixed-fixed model to estimate the economic impact on earnings and logistic regression models to estimate likelihood of employment.

# RESEARCH DESIGN

## SAMPLE SELECTION

This study implements a quasi-experimental design with two groups:

### 1) Program group

### 2) Comparison (control) group

The program group includes individuals who participated in a VR/VRB plan and/or received VR/VRB services during a federal fiscal year. The control group includes individuals who were deemed eligible to receive services during an initial meeting with a VR/VRB counselor but closed the application prior to entering a plan or receiving services. Individuals for both groups were selected from 9,792 closed cases in federal fiscal year 2010-2011. Of the 9,792 closed cases, 2,194 were not eligible to receive services and were not included in the study. Of the 7,598 eligible to receive services, 5,713 actually received VR/VRB services. These individuals comprised the program group. The remaining 1,885 who did not receive services comprised the control group.

Table 2 reports descriptive statistics for the program and control groups. The two groups show several similarities but also some significant differences. The two groups are very similar in their gender makeup, with approximately 53.1 percent male and 46.9 percent female. The program group is more likely to be made up of older individuals, with more than 48.4 percent over the age of 40,

compared to 39.6 percent in the control group. Members of the program group also tend to have a higher level of education, with approximately 29.1 percent having at least some college education, compared to 22.7 percent in the control group. Finally, members of the program group are much less likely to have a significant disability compared to members of the control group (73.0 percent vs. 86.1 percent, respectively).

The largest disability category for the VR/VRB program participants and the control group is physical disability, comprising 22.7 percent of the program group and 23.4 percent of the control group. While 11.2 percent of VR/VRB program participants have a visual disability and 12.2 percent have a hearing impairment, only 2.0 and 3.6 percent of the control group have these disabilities, respectively. A greater percentage of the control group has cognitive impairments (25.9 percent) compared to the program participant group (17.1 percent).

## DATA

The data came from two sources: (1) the MDRS database maintained as required by the Federal Rehabilitation Services Administration (RSA) and (2) three years of quarterly wage records before and after case closure from the Mississippi Department of Employment Security's unemployment insurance system database. Both sources of data are part of Mississippi's state longitudinal data system (SLDS), LifeTracks (see [www.lifetracks.ms.gov](http://www.lifetracks.ms.gov)). The RSA data were used to generate information on individual background and services received from MDRS, while the

Table 2: Program Participant and Control Group Characteristics

|                                     | Program Participant Group | Control Group |
|-------------------------------------|---------------------------|---------------|
| Sample size                         | 5,713                     | 1,885         |
| <b>Gender</b>                       |                           |               |
| Male                                | 53.09%                    | 51.41%        |
| Female                              | 46.91%                    | 48.59%        |
| <b>Age</b>                          |                           |               |
| 16-20                               | 12.80%                    | 17.14%        |
| 21-30                               | 21.55%                    | 22.65%        |
| 31-40                               | 17.29%                    | 20.58%        |
| 41-64                               | 48.36%                    | 39.63%        |
| <b>Education</b>                    |                           |               |
| Less than high school               | 35.34%                    | 42.92%        |
| High school                         | 35.60%                    | 34.38%        |
| Post-secondary education, no degree | 14.23%                    | 13.63%        |
| Associate degree or certificate     | 7.28%                     | 3.82%         |
| Bachelor or higher                  | 7.54%                     | 5.25%         |
| <b>Race</b>                         |                           |               |
| White                               | 55.61%                    | 39.42%        |
| Black                               | 43.67%                    | 59.58%        |
| Other                               | 0.72%                     | 1.01%         |
| Significant Disability              | 73.03%                    | 86.05%        |
| <b>Type of Disability</b>           |                           |               |
| Visual Impairment                   | 11.15%                    | 2.02%         |
| Hearing Impairment                  | 12.29%                    | 3.61%         |
| Mobility Impairment                 | 18.01%                    | 23.18%        |
| Physical Impairment                 | 22.67%                    | 23.40%        |
| Cognitive impairments               | 17.12%                    | 25.89%        |
| Other Mental Impairments            | 17.54%                    | 17.19%        |
| Other Impairment                    | 1.23%                     | 4.72%         |

quarterly wage records were used to create a participant's earnings record. The two datasets were concatenated to generate a participant's quarterly records. This procedure was done to assess earnings changes and the likelihood of employment in the short and long term.

## ANALYTICAL STRATEGY

We first examine the differences in wages between individuals in the program group and individuals in the control group one quarter after closure of the individual's case. Next, following the rationale and logic developed by the University of Utah's Center for Public Policy and Administration, we used several mixed-fixed effect models to estimate level of income and net income (i.e., present and projected differences of income between program and control groups over a working lifetime). In doing so, we were able to control for any differences between the program and control groups and, therefore, minimize the threat to the validity and reliability of the study. The model is presented in the following equation:

$$y_{ij} = \beta_0 + \beta \cdot X_{ij} + \tau_i + \varepsilon_{ij}.$$

In this model,  $y_{ij}$  is quarterly earnings for  $i$ th individual at time  $j$ .  $X_{ij}$  is the vector of explanatory variables.  $\tau_i$  denotes the individual specific random effect on earnings, accounting for any variability in individual characteristics (between the program and control groups) that are not included in the model.  $\varepsilon_{ij}$  is the random error term.  $\beta_0$  is the intercept, and it represents the average earning when  $X_{ij} = 0$ .  $\beta$  is a vector of regression parameters that account for the differential impact of factors on earnings. The main parameters for this model are reported in Table 3.

Table 3: Key Variable Description

| VARIABLE                 | DESCRIPTION  |
|--------------------------|--|
| <b>Time</b>              | The quarter number prior to eligibility or post closure. If $j \leq 12$ it indicates the $(13 - j)$ th quarter prior to eligibility; while if $j > 12$ it indicates the $j$ th quarter after closure of service. |
| <b>Epoch</b>             | 1 = post closure, 0 = prior to eligibility   |
| <b>Service</b>           | 1 = received service (program group), 0 = not received service (control group)   |
| <b>Disability</b>        | 1 = significant disability, 0 = no significant disability  |
| <b>Length Of Service</b> | Length of service from eligibility determination to closure (in month)   |
| <b>Unemployment Rate</b> | The unemployment rate for Mississippi for the quarter  |

The model also includes a series of two- and three-way interaction terms to estimate earnings. More specifically, detailed models can be written as:

$$\begin{aligned}
 y_{ij} = & \beta_0 + \beta_1 time_{ij} + \beta_2 time_{ij}^2 + \beta_3 epoch_{ij} \\
 & + \beta_4 epoch_{ij} * time_{ij} + \beta_5 epoch_{ij} \\
 & * time_{ij}^2 + \beta_6 service_{ij} * time_{ij} \\
 & + \beta_7 service_{ij} * time_{ij}^2 \\
 & + \beta_8 service_{ij} * epoch_{ij} \\
 & + \beta_9 epoch_{ij} * service_{ij} * time_{ij} \\
 & + \beta_{10} epoch_{ij} * service_{ij} * time_{ij}^2 \\
 & + \beta_{11} disability_{ij} * epoch_{ij} \\
 & + \beta_{12} service_{ij} * disability_{ij} \\
 & * epoch_{ij} + \beta_{13} lengthofservice_{ij} \\
 & * epoch_{ij} + \beta_{14} lengthofservice_{ij} \\
 & * epoch_{ij} * service_{ij} \\
 & + \beta_{15} unemployment\ rate_{ij} + \tau_i \\
 & + \varepsilon_{ij}.
 \end{aligned}$$



The first three terms  $\beta_0, \beta_1, \beta_2$  represent the earnings trajectory prior to eligibility determination. The next three terms  $\beta_3, \beta_4, \beta_5$  represent change in earnings trajectory after case closure. The following two terms  $\beta_6, \beta_7$  represent the change in earnings for those who receive services (program group). The terms  $\beta_8, \beta_9, \beta_{10}$  represent the change in earnings for those who receive services after case closure; these parameters address the extent to which earnings change as a result of receiving services. The next two parameters  $\beta_{11}, \beta_{12}$  account for the differential impact of disability on earnings, while  $\beta_{13}, \beta_{14}$  account for the differential impact of the length of service on earnings. Finally,  $\beta_{15}$  represents the differential impact of unemployment rate on earnings.

We also estimated a set of logistic regression models to determine differences in likelihood of employment between the program and control groups while controlling for several other factors (e.g., individual background, type of service, type of disability, etc.). The general model can be described as:

$$\log \frac{P(y_i = 1|X_i)}{1 - P(y_i = 1|X_i)} = \beta_0 + \beta \cdot X_i.$$

In the model, the binary response variable  $y_i$  indicates whether  $i$ th individual is employed one quarter after closure (with 1=employed and 0=otherwise).  $X_i$  is the vector of explanatory variables.  $\beta_0$  is the intercept parameter, and  $\beta$  is a vector of regression coefficients explaining their differential effects on probability of  $y_i = 1$ . Table 4 reports the variables in this model.

Table 4: Variable Description

| VARIABLE                                     | DESCRIPTION   |
|--|---|
| <b>Service</b>                               | 1 = receive service, 0=not receive service  |
| <b>Gender</b>                                | 1 = male, 0 = female  |
| <b>Age</b>                                   | Continuous variable   |
| <b>Race</b>                                  | 1 = white, 0 = otherwise  |
|  | 1 = black or African American, 0 = otherwise  |
|  | 1 = American Indian or Alaska Native, 0 = otherwise                                     |
|  | 1 = Asian, 0 = otherwise  |
|  | 1 = native Hawaiian or other Pacific Islander, 0 = otherwise                            |
|  | 1 = Hispanic or Latino, 0 = otherwise   |
| <b>Disability</b>                            | 1 = significant disability, 0 = no significant disability                               |
| <b>Education</b>                             | 1 = no formal schooling, 0 = otherwise  |
|  | 1 = elementary education, 0 = otherwise   |
|  | 1 = secondary education, 0 = otherwise  |
|  | 1 = special education certificate of completion/diploma or in attendance, 0 = otherwise |
|  | 1 = high school graduate or equivalency certificate, 0 = otherwise                      |
|  | 1 = post-secondary education, no degree, 0 = otherwise                                  |
|  | 1 = associate's degree or vocational/technical certificate, 0 = otherwise               |
|  | 1 = bachelor's degree, 0 = otherwise  |
| 1 = master's degree or higher, 0 = otherwise |   |

# RESULTS

## EMPLOYMENT AND EARNINGS

The results show that individuals in the program group are 2.4 times more likely to gain employment than those in the control group, net of all other factors (the parameters for the full regression are reported in Appendix A). The results also show that one quarter after closure, individuals in the program group earn, on average, \$1,420 more than those in the control group. Specifically, individuals in the program group make, on average, \$5,115, while individuals in the control group make, on average, \$3,695 one quarter after exit (see Figure 1 below).

Figure 1: Wages One Quarter After Case Closure

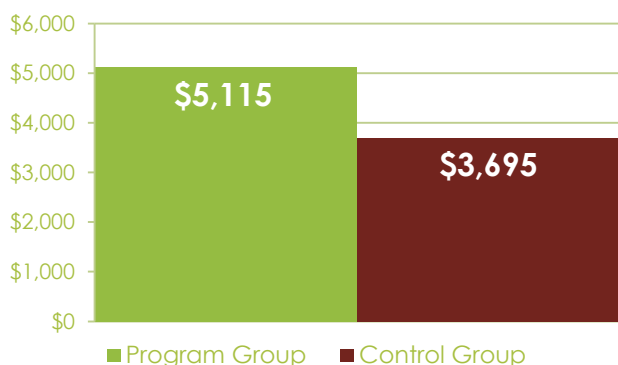
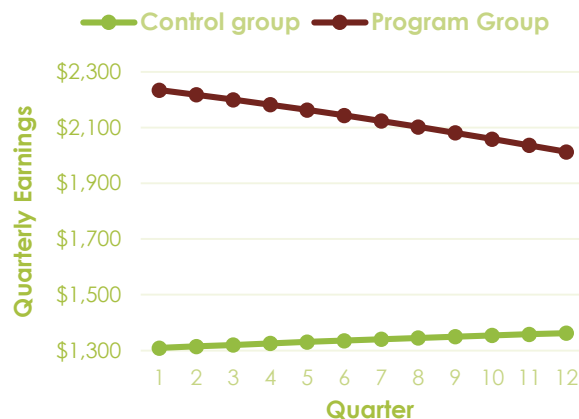


Figure 2 reports the quarterly average estimates after 12 quarters of closure, controlling for other factors (see Appendix B for the full parameters of the mixed-fixed effect models). It is important to note that the decrease of the difference of income between the program and control groups is not due to a diminished advantage of receiving services, but rather due to the fact that the control group tends to close the gap in earnings. We use these estimates to

Figure 2: Quarterly Earnings After Case Closure Closer

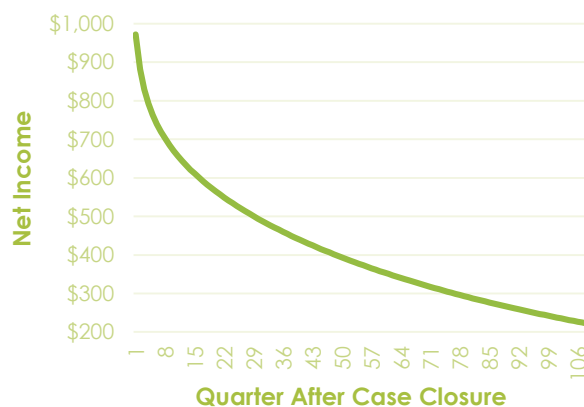


calculate the working lifetime differences in earnings between the program and control groups. Since the average age of individuals in the study is 39, we assume that they will continue to work 27 years after case closure. The fitted exponential model is presented by the following equation:

$$Net\ Income = 980 * quarter\ after\ closure^{-0.1299}$$

Figure 3 reports the results of the working lifetime differences in quarterly wages between the program and control groups. The present value is based on a 3.25 percent discount rate. Over a working lifetime, an individual who receives services makes \$45,035 more than those who do not receive services. MDRS contributes to the state economy by adding an additional \$257,284,955 (\$45,035 x 5,713 program participants).

Figure 3: Working Lifetime Net Income





## ROI = NET BENEFIT/COST

**State net benefits** = state tax gain + savings from public assistance payments

- **State tax gain** = individual net income x state tax burden =  $\$45,035 \times 0.087^3 = \$3,918$
- **Total state tax gain** = total net income x state tax burden =  $\$257,284,955 \times 0.087 = \$22,383,791$
- **Savings from public assistance payments** =  $\$1,314$
- **Individual net benefits** = individual state tax gain x individual public assistance savings =  $\$3,918 + \$1,314 = \$5,232$
- **State net benefits** = total state tax gain x total public assistance savings  $\$22,383,791 + \$7,508,634 = \$29,892,425$

**Federal net benefits:** federal tax gain

- **Federal tax gain** = individual net income x federal tax burden =  $\$45,035 \times 0.2265^4 = \$10,200$
- **Total federal tax gain** = total net income x federal tax burden =  $\$257,284,955 \times 0.2265 = \$58,275,042$

The average cost for a program participant in federal fiscal year 2010-2011 was \$3,161. The state component of this cost was approximately 21.3 percent or \$673 per program participant. For fiscal year 2010-2011, the state appropriation was \$11,452,428, and the federal appropriation was \$45,622,213.

**Participant ROI** =  $\$5,232/\$673 = 7.8$ . That is, for every state dollar invested in a program participant, an estimated additional \$6.80 is returned to the state in the form of tax gains and public assistance savings.

**State ROI** =  $\$29,892,425/\$11,452,428 = 2.6$ . That is, for every state dollar invested in MDRS, an estimated additional \$1.60 is returned to the state in the form of state tax gains and public assistance savings.

**Federal ROI** =  $\$58,275,042/\$45,622,213 = 1.3$ . That is, for every federal dollar invested in MDRS, an estimated additional \$.30 is returned in the form of federal tax gains.<sup>5</sup>

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<sup>3</sup> According to 2014 statistics from the Bureau of Economic Analysis (BEA) and the U.S. Census Bureau, the average tax burden in Mississippi for FY 2011 is 8.7 percent.

<sup>4</sup> According to 2015 data from the Internal Revenue Service, the federal tax rate for the income bracket of the average program participant (single filer earning between \$9,226 and \$37,450) is 15 percent, and Social Security and Medicare add an additional 6.2 and 1.45 percent in taxes, respectively. This results in a total federal tax burden of 22.65 percent.

<sup>5</sup> The Federal ROI does not include public assistance savings due to a reduction in Social Security Disability Insurance (SSDI) benefits or Supplemental Security Income (SSI).

# APPENDIX A

Logistic Regression on Likelihood of Employment

| ANALYSIS OF MAXIMUM LIKELIHOOD ESTIMATES |          |           |
|--|----------|-----------|
| PARAMETER                                | B        | SE        |
| Intercept                                | 0.3556   | 0.5455    |
| Service (1=Receive service)              | 0.8814   | 0.0623*** |
| Gender (1=Male)                          | 0.1728   | 0.0499*** |
| Age                                      | -0.00761 | 0.0020*** |
| White                                    | -0.259   | 0.4996    |
| Black                                    | -0.2619  | 0.5015    |
| Indian                                   | 0.1643   | 0.3393    |
| Asian                                    | -0.692   | 0.6322    |
| Pacific-Island                           | 0.8151   | 0.8165    |
| Hispanic                                 | 0.2127   | 0.3192    |
| Disability (1=Significant disability)    | -0.704   | 0.0587*** |
| Education (Ref=Master)                   |          |           |
| No formal schooling                      | -9.4916  | 169.6     |
| Elementary                               | -0.9369  | 0.2267*** |
| Secondary                                | -0.7133  | 0.1941*** |
| Special certificate                      | -0.8846  | 0.2069*** |
| High school                              | -0.3163  | 0.1886    |
| Post-secondary                           | -0.378   | 0.1951    |
| Associate                                | -0.181   | 0.2061    |
| Bachelor                                 | -0.0798  | 0.2105    |

Note: \*p-value<0.05; \*\*p-value<0.01; \*\*\*p-value<0.001.

| ODDS RATIO ESTIMATES AND WALD CONFIDENCE INTERVALS |          |                       |          |
|--|----------|-----------------------|----------|
| Effect   | Estimate | 95% Confidence Limits |          |
| Service (1=Receive service)                        | 2.414    | 2.137                 | 2.728    |
| Gender (1=Male)                                    | 1.189    | 1.078                 | 1.311    |
| Age  | 0.992    | 0.988                 | 0.996    |
| White  | 0.772    | 0.29                  | 2.055    |
| Black  | 0.77     | 0.288                 | 2.057    |
| Indian   | 1.179    | 0.606                 | 2.292    |
| Asian  | 0.501    | 0.145                 | 1.728    |
| Pacific Island                                     | 2.259    | 0.456                 | 11.194   |
| Hispanic   | 1.237    | 0.662                 | 2.312    |
| Disability (1=Significant disability)              | 0.495    | 0.441                 | 0.555    |
| Education (Ref=Master)                             |          |                       |          |
| No formal schooling                                | <0.001   | <0.001                | >999.999 |
| Elementary   | 0.392    | 0.251                 | 0.611    |
| Secondary  | 0.49     | 0.335                 | 0.717    |
| Special certificate                                | 0.413    | 0.275                 | 0.619    |
| High school  | 0.729    | 0.504                 | 1.055    |
| Post-secondary                                     | 0.685    | 0.467                 | 1.005    |
| Associate  | 0.834    | 0.557                 | 1.25     |
| Bachelor   | 0.923    | 0.611                 | 1.395    |

The odds ratio estimate for service comes to 2.414.

# APPENDIX B

Fixed and Random Effects from Hierarchical Linear Model (HLM) of Quarterly Wages

| EFFECT                          | B       | SE         |
|---------------------------------|---------|------------|
| Intercept                       | 1997.01 | 59.3976*** |
| Time                            | -115.62 | 23.473***  |
| Time <sup>2</sup>               | 5.6504  | 1.8065**   |
| Epoch                           | -592.25 | 729.81     |
| Epoch*Time                      | 123.52  | 82.5287    |
| Epoch*Time <sup>2</sup>         | -5.7318 | 2.7895*    |
| Service*Time                    | 191.6   | 24.6181*** |
| Service*Time <sup>2</sup>       | -12.23  | 1.9776***  |
| Epoch*Service                   | 1013.86 | 832.28     |
| Epoch*Service*Time              | -207.35 | 94.2579*   |
| Epoch*Service*Time <sup>2</sup> | 11.9781 | 3.1488***  |
| Disability*Epoch                | -281.72 | 89.4765**  |
| Service*Disability*Epoch        | 243.35  | 99.3821*   |
| Length of Service*Epoch         | -9.103  | 8.9671     |
| Length of Service*Epoch*Service | 18.9275 | 9.08*      |
| Unemployment Rate               | -41.556 | 11.23***   |

Note: \*p-value<0.05; \*\*p-value<0.01; \*\*\*p-value<0.001.

