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Return on Investment and Economic Impact: Determining and Communicating the Value of Vocational Rehabilitation



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Return on Investment and Economic Impact: Determining and Communicating the Value of Vocational Rehabilitation

Rehabilitation Services Administration U.S. Department of Education

The Council of State Administrators of Vocational Rehabilitation

The George Washington University

Dedicated to Dr. David Dean

This document is dedicated to the memory of our friend and colleague, David H. Dean, who passed away on August 11, 2013. His research into the economics of disability spanned his entire career of more than 30 years, and his firm commitment to rigorous research provided solid, useful information for policymakers and program administrators. His work on the effectiveness of vocational rehabilitation (VR) programs for jobseekers with disabilities, combined with his now legendary work ethic and unwavering focus on high quality research, is having an enormous impact on methods for evaluating the long-term outcomes of VR, including methods for estimating VR's return on investment.

Special Thanks to Co-Chairs Betsy Hopkins and Butch McMillan

The Prime Study Group members wish to thank co-chairs, Betsy Hopkins and H.S. "Butch" McMillan, for their outstanding leadership and commitment. They kept the group focused on its goal of producing a document that would both advance VR's collective knowledge of how to conduct rigorous return on investment analysis and be of practical use to VR professionals. At the same time, they were willing to "roll up their sleeves" and work on drafting, reviewing, and editing this document. Thank you. When reproducing or utilizing information provided, proper citation of the source is appreciated.

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Executive Summary

This document was prepared to assist vocational rehabilitation (VR) executives and professionals in calculating a credible return on investment (ROI) for agencies and agency programs and services. As funding levels for state and federal programs are under increased scrutiny, the timing and need for ROI information has never been greater. A properly developed ROI is a powerful tool that a VR director can use to defend and demonstrate the efficiency of a program that assists in employing people with disabilities, especially in an environment that emphasizes performance-based budgeting.

Many directors would like to have an easy template, a cookbook if you will, where specific data could be plugged into a set formula and an ROI number could be spit out at the other end. This document is not that cookbook. In fact, the consensus of the Prime Study Group was that such a cookbook is probably not feasible given the many variables and assumptions that are necessary to conduct an ROI study.

Calculations of ROI can be done for nearly any entity where costs and benefits can be determined. Such calculations have been used for many years in the private sector and to some extent in the public sector. This document describes how ROI would apply to a VR agency, the assumptions that must be considered for a credible ROI study, and resource considerations for conducting an ROI analysis.

This document explains ROI and many of the assumptions and calculations that must be used to make an ROI determination. ROI is defined as the ratio of the net benefits from an investment to the cost of the investment. However, the net benefits from providing VR services must include a discount rate to properly account for the present value of future benefits. The beneficiaries of the public VR program are the participants, employers, and the rest of society. Additionally, the benefits of VR may be of significant noneconomic value, which leads to a concept called social return on investment (SROI) that applies to society as a whole.

There are differences between private-sector ROI and public-sector ROI. Since ROI is gaining recognition as a means of evaluating accountability, the history of its use in the public sector is addressed, beginning with the use by President Johnson in performance budgeting until its present use by the Office of Management and Budget in cost-benefit and cost-effectiveness analyses. For public-sector programs and projects, ROI considers all benefits for which a value has been estimated in determining the social net benefit. When considering public programs such as VR, an appropriate discount rate is utilized, which poses a challenge for economists since they are forced to estimate future behavior with imperfect information. In addition to the use of ROI in VR programs, the document reviews its uses in education, workforce development, and VR of veterans with disabilities.

A strong methodology is a must in determining credible ROI estimations. Key elements must be defined, including the treatment and analysis population, the time period of analysis, the observed outcomes, the costs, and statistical uncertainty. The cost information should include all costs, such as direct, indirect, and administrative costs of services provided by the VR agency. Many ROI studies have been conducted using varied techniques and sources of data. The methodology chapter presents an overview and critique of VR ROI studies conducted by Massachusetts, Utah, Virginia, Washington, and West Virginia, showing how these studies applied some or all of the key ingredients in their ROI estimate.

Aside from methodology, the usefulness and accuracy of an ROI study hinge greatly on the data sources used. Although the Rehabilitation Services Administration (RSA) develops and provides important data sets necessary for inclusion in an ROI, deficiencies exist in the reporting system when evaluating the impact of VR. These deficiencies include a lack of longitudinal employment data on applicants before and after the VR application period, a lack of longitudinal data on the costs and specific types of VR services provided, and a lack of information on the local labor market. To make up for these deficiencies, additional data elements from individual state case management systems (in agencies where relevant data are captured) can be extracted, or survey data or non–VR administrative data can be used. The pros and cons of using three administrative sources of earnings data unemployment insurance records, Social Security earnings, and tax records—are discussed in this document.

While some VR ROI assessments have been conducted by VR agencies, others have been developed in collaboration with external organizations. As presented in this document, there are advantages and disadvantages to both an "in-house" and an external analysis approach and each VR agency must look at its own resources to determine the best approach to conducting an ROI analysis. Even though VR agencies may prefer to conduct the study in-house, they may lack the necessary expertise to conduct valid analyses. Considerations include cost, data acquisition and storage, staff capabilities, confidentiality, and perceptions of bias.

Any ROI study needs to be considered with a "healthy skepticism." Therefore, strategies for effective internal and external communications should be developed for relaying the ROI results to stakeholders. Information should emphasize the key findings and include recommendations. The reports should be accessible in several formats, including electronic and print. Policy briefs may be especially appropriate for legislators.

Introduction

Leaders and public policy influencers in the United States have been concerned about how much money the government spends in relation to the service it provides. They look for the appropriate balance of services that must be provided in relation to the cost and effort required. The view is consistent with that of any person, family, or organization that puts forth an effort and wants to see the investment of that effort yield some type of positive result. People want the best value for their investment in cars, homes, and their vacation experiences. People also want to see the best value for their investment of tax dollars for the services being provided by government agencies. In today's national and worldwide economic climate, government agencies of all types are being asked by elected officials, the public, and the media: What kind of positive impact is being delivered by your agency's service, and how much are those services costing taxpayers? Return on investment (ROI) studies are one of several powerful tools for vocational rehabilitation (VR) to demonstrate relevance and continue to improve performance, both strategically and operationally.

However, this guidebook is still only a "piece of the picture." Value and performance are also demonstrated in other forms. For example, VR program performance may be shown through consumer surveys and testimonials, Rehabilitation Services Administration (RSA) 911 data, performance dashboards, global informational systems, documented results of targeted performance improvement activities, and other tools. VR decision makers, program evaluators, and improvement professionals can use the approaches and tools in this publication in conjunction with an array of other performance improvement and communication tools. It should be noted that no one tool, or combination of tools, will create "overnight" major changes in VR performance. Realistic timeframes must always be considered when implementing major changes to the VR system of operations and programs.

The federal-state partnership with state VR agencies to assist people with disabilities in obtaining and retaining employment has been around for over 90 years. There have been various attempts to compute ROI for at least the last 60 years, with some limited success. The ability of a state agency to demonstrate the economic impact of the investment in people with disabilities is needed now more than ever as individual states and the federal government struggle with funding priorities during the "Great Recession" and its lingering effects.

This struggle with funding is shown, for example, in the federal dollars that remain unused by the states. Some states receive full federal fund matching, while others do not, because they do not have enough state matching funds to draw down the federal grant. (The Rehabilitation Act of 1973, as amended, requires a 21.3% match rate in state or nonfederal funds.) A process is in place in which RSA reallocates these unmatched funds to states that are able to come up with additional state matching dollars. Based on data received from the RSA, states were unable to match approximately \$137 million in federal fiscal year (FFY) 2010, \$160 million in FFY 2011, and \$144 million in FFY 2012 (Table I.1). In combination with Maintenance of Effort penalties during those years, the RSA had funding available for reallotment to states requesting additional funding. In spite of the reallotment effort, all the available funding was not utilized by state VR agencies. Essentially, \$16 million, \$71 million, and \$96 million were not used by state VR agencies during the same time period. While most of the funds remaining were used for the PROMISE program (Promoting Readiness of Minors in Supplemental Security Income), an initiative designed to help child SSI recipients achieve postsecondary education and employment outcomes, or were used for the American Indian Rehabilitation Services program, the point is that the money was not used by the state VR agencies.

			Total		
		Relinquish	funds	Total	
	Maintenan	ed	available	requested	
	ce of	through	for	through	Balance of
FF	effort	reallotmen	reallotmen	reallotmen	federal
Y	penalties	t	t	t	funds
201	\$7,185,76	\$136,929,1	\$144,116,8	\$135,800,4	\$8,316,407
0	1	19	90	83	
201	\$24,100,3	\$160,355,0	\$184,457,4	\$119,143,5	\$65,313,87
1	18	71	00	21	9*
201	\$42,645,3	\$146,052,7	\$188,700,1	\$90,828,57	\$97,871,59
2	88	63	63	2	1**

Table I.1Federal Funds Not Used by States from FFY 2010 to 2013

*\$5,000,000 of FFY 2011 funds went to RSA's American Indian Vocational Rehabilitation Services program.

**FY 2012 and FY 2013 funds remaining after reallocation were used to fund PROMISE.

Deficit reduction is likely to be a priority for the federal government now and well into the future. With all the unknowns in the current U.S. economy, VR agencies never know what to expect in terms of budgets and budget shortfalls. Faced with such dire budgetary circumstances, it is imperative that VR, through robust and credible ROI and economic impact studies, demonstrate that its programs are worthwhile.

Currently, ROI reports and impact evaluation materials are available from a number of states. For example, Utah and West Virginia officials aver that ROI outcomes have been an effective and strategic tool with legislators to secure limited state funds or to reduce budget cuts. But ROI studies are not the only approach that can show the value of VR organizations, and therefore they should not be the only approach for demonstrating value to legislators. It should be noted that conducting and reporting ROI studies could result in a positive outlook for the agency, or they could result in a negative outlook. However, knowing and understanding this information and being able to address it are major steps in improving VR performance and funding overall. The first ROI study that an agency conducts becomes a baseline for financial performance and value. As subsequent studies continue, decision makers can compare outcomes and strategize ways to improve the agency's cost-effectiveness and value over time.

By undertaking such efforts, VR agencies can demonstrate their value to customers and stakeholders. How long can any organization, private or public, last if it can't demonstrate its impact and worth? This is an issue that VR organizations must address in the short term and the long term. For VR, the short term is now. The accumulation of credible ROI results could build trust and support from federal and state legislators, prevent further state budget cuts, and pave the way for VR agencies to continue to provide core services necessary for people with disabilities to obtain employment.

The purpose of this document is to provide VR agencies with a set of guidelines for calculating, communicating, and demonstrating the value of their programs in relation to the resources that their programs use. In other words, it addresses the question: How can VR programs calculate and report the economic impact, in general, and the ROI, in particular, of services provided? In researching and writing about this issue, the authors agreed on several key goals:

- 1. Provide practical guidelines that agencies can use according to their unique needs and circumstances.
- 2. Suggest standardized approaches to the greatest degree possible, keeping in mind that these studies are not strictly about numbers, but also include human and social aspects.
- 3. Ensure that the logic and approaches are easy to understand by all individuals, not just those with advanced understanding of economics and statistics.

So, what does this "guidebook" provide for VR agencies? Keeping in mind the principles of practicality, standard approaches, and ease of understanding, we discuss and answer the following questions:

- Why do an ROI? What is the purpose or value of an ROI?
- What are the key elements of a credible ROI study?
- What are the decision points that a management team must make in determining what is to be a part of the final equation?

- What role does an ROI study play in strategic planning and program advocacy?
- How can VR agencies use ROI results to identify opportunities for improvement?
- What are the pros and cons of having either an internal or external evaluator complete an ROI study? By understanding the pros and cons, state agencies can determine which option is the best fit for them.
- If a state agency decides to conduct an ROI internally, what design, methodology, data collection, computation, and reporting approaches should be followed so that the end product will be seen as credible?
- If a state agency decides to conduct an ROI externally, what are some criteria that VR staff can use to determine whether they are getting a quality study that will hold up under legislative scrutiny?
- What are some recommendations and examples of how to present and communicate ROI outcomes to legislators, employers, and consumers so that they have a maximum impact?

While there are extensive references to ROI approaches from outside the field of VR, the work within VR has been sporadic, with greater attention placed on the concept during tougher economic times when funding was harder to secure. Pursuing this approach, then, is important and practical to both of VR's major stakeholders: persons with disabilities who seek employment and independence, and federal and state legislators who fund VR programs and seek to ensure maximum service to constituent taxpayers at the best cost. With this IRI document, VR agencies can utilize comparable tools and approaches for their own ROI study or know how to communicate their requirements to a research or consulting group to complete their study. A Latin phrase attributed to Sir Francis Bacon, "scientia est potential," translates to "knowledge is power." This IRI document gives state VR directors and staff the knowledge to conduct studies and use results to make a powerful case for the continuation of meaningful services to people with disabilities.

Chapter 1: VR Context

The vocational rehabilitation (VR) program assists eligible individuals with physical or mental disabilities to prepare for and achieve an employment outcome. "Employment outcome" is defined in the Workforce Innovation and Opportunity Act, which passed in July 2014, as

> ... with respect to an individual, entering or retaining fulltime employment, or, if appropriate, part-time competitive employment, as defined in 34 CFR 361.5(b)(11), in the integrated labor market, supported employment, or any other type of employment in an integrated setting, including self-employment, telecommuting, or business ownership, that is consistent with an individual's strengths, resources, priorities, concerns, abilities, capabilities, interests, and informed choice. (34 CFR 361.5(16))

The word *integrated*, with respect to an employment outcome, means a setting typically found in the community in which applicants or eligible individuals interact with nondisabled individuals other than nondisabled individuals who are providing services to those applicants or eligible individuals, to the same extent that nondisabled individuals in comparable positions interact with other persons (34 CFR 361(b)(33)).

The VR process is based upon an individualized plan for employment, which is oriented to the achievement of a vocational goal. Services provided to individuals with disabilities must be necessary to overcome the vocational impediment and must be provided as cost effectively as possible and be of sufficient quality to meet individual needs.

State VR programs are operated in compliance with the Rehabilitation Act of 1973, as amended. The latest amendments are incorporated in Public Law 113-108, enacted on July 22, 2014,

as Title IV of the Workforce Innovation and Opportunity Act (WIOA). Although the VR program is one of the core programs under WIOA, VR is unique and different from other workforce programs. The public VR program is charged with the provision of services only to persons with disabilities, with an emphasis on serving persons with "significant and most significant disabilities," to help them achieve competitive employment outcomes and greater independence. The funding stream for public VR programs is separate from that of other federal workforce programs.

The VR program is unique in several ways, including its eligibility requirements, consumer characteristics, and the individualized service plans developed specifically to address each consumer's unique disability-related barriers and/or impediments to employment, service needs, and employment goals. The recognition of the uniqueness of public VR programs is essential in the development of a realistic VR return on investment (ROI) methodology.

Eligibility for VR services is determined based on federal regulations and consists of four requirements:

- (i) A determination by qualified personnel that the applicant has a physical or mental impairment.
- (ii) A determination by qualified personnel that the applicant's physical or mental impairment constitutes or results in a substantial impediment to employment for the applicant.
- (iii) A determination by a qualified vocational rehabilitation counselor employed by the designated State unit that the applicant requires vocational rehabilitation services to prepare for, secure, retain, or regain employment consistent with the applicant's unique strengths, resources, priorities, concerns, abilities, capabilities, interests, and informed choice.
- (iv) A presumption, in accordance with paragraph (a)(2) of this section, that the applicant can benefit in terms of an employment outcome from the provision of vocational rehabilitation services. (34 *CFR* 361.42)

The fourth point above means that the state VR agency must presume that an applicant who meets the eligibility

requirements in 34 CFR 361.42(a)(1)(i and ii) can benefit in terms of an employment outcome unless it demonstrates, based on clear and convincing evidence, that the applicant is incapable of benefiting in terms of an employment outcome from the provision of VR services due to the severity of the applicant's disability.

It is also the case that applicants who have been determined eligible for Social Security disability benefits are to be presumed eligible for VR services from state VR agencies so long as those individuals intend to achieve an employment outcome. The state VR programs are funded in part through formula grant awards from the federal government in order to support a wide range of services designed to help individuals with disabilities prepare for and engage in gainful employment consistent with their strengths, resources, priorities, concerns, abilities, capabilities, interests, and informed choices. Funds are distributed to states and territories based on a formula that takes into account population and per capita income to cover the cost of direct services and program administration. Grant funds are administered under an approved state plan by VR agencies designated by each state. The state matching requirement is 21.3%.

Even though VR is a federal program, each state has some leeway and flexibility in how it runs its own program. Because a state match is needed to draw down the federal funds, due to budget constraints some states may not be able to serve all eligible individuals, and will need to place eligible individuals on a waiting list. The state VR agencies must place eligible individuals on the waiting list according to an order of selection (OOS) that prioritizes serving those individuals with the most significant disabilities first.

This chapter discusses ROI estimates in the specific context of VR agencies, making four main points: (1) differences among VR agencies influence program costs and outcomes; (2) data regarding consumers' functional limitations are missing from the equation; (3) VR programs vary in their capacity to undertake a comprehensive study of ROI; and (4) despite differences among VR programs, credible ROI research is attainable and needed.

Differences Among VR Agencies Influence Program Costs and Outcomes

While VR agencies share a common mission, they differ in significant ways. At a broad level, distinguishing characteristics include agency type, agency size and status regarding OOS. VR agencies also have at their discretion the capacity to set priorities and objectives within their state plans regarding underserved or other special populations. Influencing both the cost of services and the character of rehabilitation outcomes, these differences invalidate the formulation of a single national model for the calculation of the VR program's ROI. Cross-agency comparisons and the identification of high performers would be fraught with program incompatibilities. The Prime Study Group believes strongly that these differences must be understood in any attempt to determine the value of VR's economic impact.

To illustrate, we examined some of the major differences among agencies. With regard to agency type, the Rehabilitation Act provides flexibility for a state to have two state VR agencies one for individuals who are blind and one for individuals with other types of disabilities. Across the 50 states—plus the District of Columbia, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands—there are a total of 80 VR agencies. While 24 states have separate agencies for the blind and for individuals with other types of disabilities (often referred to as "general" VR agencies), the remaining 32 agencies (often referred to as "combined" agencies) serve individuals with all types of disabilities.

Although agency size can be described in a number of ways, data from the most recent Annual Disability Statistics Compendium (http://disabilitycompendium.org/compendiumstatistics/vocational-rehabilitation), which includes agency-specific data for 76 of the 80 VR agencies, provide a quick snapshot of some of the size differences:

• The number of individuals who applied to each state VR agency ranged in federal fiscal year (FFY) 2011 from a low of 88 to a high of 40,619.

- The number of cases closed in FFY 2011 after VR services were initiated or completed by each VR agency ranged from 62 to 26,807.
- In FFY 2011, the total per-state expenditure for VR services ranged from about \$1.6 million to about \$98.9 million.

In FFY 2012, 40 agencies were on an OOS. While the number of agencies on OOS varies from year to year, from FFY 2008 to FFY 2011, 20 states and the District of Columbia never had any agency on an OOS, while six states always had their agencies on an OOS. Because implementing an OOS often requires establishing a waiting list, and individuals with the most significant disabilities have the highest priority to receive services, agencies with an OOS may serve a different population of individuals with different needs than agencies without an OOS.

VR agencies also have discretion to set priorities and objectives within their state plans regarding underserved or other special populations. For example, many states, often with the encouragement of RSA, place an emphasis upon serving transitionage youth, typically defined as individuals between the ages of 14 and 24 at the time of application. By expanding outreach efforts and increasing the number of youth in the service population, agencies that focus on this population may experience increases in the average amount of time required to serve eligible individuals. Also, because transition-age youth usually do not enter the labor market until they have finished school, and because their wages tend to be lower than those of more experienced workers, the employment outcomes in VR agencies with large proportions of youth will be different from the outcomes in agencies serving primarily adult VR clients with more extensive work experience.

Data Regarding Functional Limitations Are Missing from the Equation

Considerable differences in cost and outcomes may also be observed at the case level, very often between two customers within the same disability category. This is because statutory requirements state that each VR customer will have an individualized plan that meets his or her specific goals and needs. These needs tie directly to the impediment to employment as characterized by the functional limitations of a disability. These limitations manifest differently for each individual and should not be assumed on the basis of the disability label. The customization of services is essential to an understanding of the VR program.

The reliability of the estimation of the VR program's ROI would be greatly enhanced by the capacity to control for individual differences in functional limitations that affect VR customers. Presently, this information is not a required part of the RSA core data and is therefore inconsistently recorded by states. Analysis of the costs and outcomes of VR customers using the current RSA coding system of disability types, even when combined with other available data, is widely seen as insufficient for this purpose.

As a result, available data from states do not speak to the severity of the condition nor do they provide enough information about multiple impairment situations. To adequately reflect the varying degrees of significance that a disability represents, data reflecting the specific functional limitations of VR customers are needed. Consider the likely circumstance in which the level of service received is indicative of the severity of a customer's impairment. If this is the case, it is understandable that the intensity of services provided would be negatively related to earnings gain.

VR Programs Vary in Their Capacity to Undertake a Comprehensive Study of ROI

In 2010, the 10 Technical Assistance and Continuing Education Centers at the request of RSA surveyed VR programs concerning their efforts in ROI research (see Appendix B). While 10 agencies did not post a reply, 18 of the respondents indicated that they were not currently engaged in any type of ROI study. The remaining 43 responded affirmatively that they were conducting some type of ROI research; however, many of these expressed dissatisfaction over existing techniques. Methods reported in response to the survey varied from simple calculations of data at hand, to complex analyses with pre- and post-program earnings data and/or contracted support from a qualified researcher. These data provide support for the claim that smaller agencies with fewer resources are less likely to engage in ROI studies.

The degree of sophistication and work that goes into the production of a credible study of ROI is considerable. Either through the allocation of existing staff or by contracting with an external provider, substantial resources are needed. Several members of the IRI Prime Study Group expressed the concern that some smaller VR programs will struggle to find sufficient means. Program evaluation assets vary considerably across VR programs. The ability to conduct the analyses required to measure value is a serious limitation. Much of the outcome data needed for a rigorous study is external to the agency, residing within the unemployment insurance data or within Social Security records. This information is not readily available to most agencies, and its acquisition requires a careful data sharing agreement across organizations. The lack of such data would be a nonstarter in efforts to achieve the level of rigor that this report recommends.

Despite Differences Among VR Programs, Credible ROI Research Is Attainable and Needed

In the present financial and political climate, VR agencies simply cannot ignore the growing cry for evidence of the program's ROI. The purpose of this chapter is not to argue that ROI is out of reach or too complicated to attain but rather to highlight the inherent challenges to be addressed. While VR programs may not begin from the same place on the path toward ROI research, the intended destination is one we share in common.

To get beyond the challenges presented above, the IRI Prime Study Group concluded that rather than detailing multiple methodologies for each VR agency's unique set of circumstances, another way forward is to identify a set of common principles to which credible VR ROI research should aspire. Agencies can then follow a common path, in which they begin at their own level of development and benefit from the exploratory work of others.

So that no agency is left behind, the Prime Study Group recommends creating a VR ROI community of practice to build upon the work of states that have taken the lead, adhering to the set of principles espoused in this document. The VR ROI community of practice could pick up the work of defining and communicating best practices, such as the steps necessary to compile and prepare the essential elements of an ROI data set. Subgroups within the VR ROI community of practice could be formed among, for example, agencies serving the blind or those combined or general agencies with similar demographic, funding, or departmental makeup. In addition, similar agencies might coordinate and embark on an ROI study simultaneously to facilitate shared learning and resources. While direct comparisons of one agency to agencies across the entire range of VR programs may not be helpful, comparison of like agencies may be instructive. A benchmarking study could be pursued among agencies sharing a similar composition. To attain a truly reliable and valid calculation of ROI, a consistent definition of VR customers with the most significant disabilities is needed.

There may be more than one purpose to undertaking an ROI study. The singular pursuit of a concise ratio for use in marketing ignores the potential of ROI research to provide valuable insight into the continuous improvement of service delivery. ROI research can also be utilized to provide a foundation for predictive modeling. At the same time, most VR agencies should not be expected to produce rigorous ROI studies in the near term. ROI research is an emerging discipline in the context of VR and, in fact, the public sector in general. Yet, to be certain, progress should be expected.

Chapter 2: What Is ROI?

The general clamor to rein in government spending at all levels—federal, state, and local—is causing program administrators to focus on return on investment (ROI). In theory, a prudent investor or a policymaker with fiduciary responsibility for taxpayer funds should use ROIs to guide investment/budgetary decisions. Their marginal dollars should be invested in assets or programs that have the greatest ROI. Thus, program advocates want to be able to show high ROIs in order to maintain or grow their programs.

The U.S. Department of Education (2011) noted:

Projects, initiatives and efforts should be prioritized based on the lifecycle return on investment to the agency while taking into account economic, environmental, social, and mission related costs and benefits. (p. 9)

This chapter begins by defining ROI and related concepts. An ROI is essentially a ratio, and so the numerator and denominator of that ratio (i.e., net benefits and costs) are introduced. The chapter goes on to enumerate the unique circumstances that arise when attempting to estimate an ROI for any workforce development program, but especially vocational rehabilitation (VR). Programs typically have multiple stakeholders, and the third section discusses how ROIs may be calculated for each stakeholder group. The chapter's fourth section reviews social ROIs.

Definition of ROI

The mathematical expression of an ROI is simple: it is the ratio of the net benefits from an investment to the cost of the investment. The 36th IRI provided this definition and equation:

A return on investment (ROI) is a performance measurement used to evaluate the efficiency of an investment or to compare efficiency of different investments. To calculate the basic ROI, the benefit of an investment is divided by the cost of the investment and is expressed by a percentage or ratio.

The basic return on investment formula is:

ROI = (Gains from Investment – Cost of Investment) / Cost of Investment. (Uchida, 2011, p. 46)

But what exactly is this ratio that we refer to as an ROI? Let's take the last word first. An *investment* is a transaction in which the investor exchanges resources at a point in time in the expectation of obtaining a payoff in the future. The transaction may be financial, in which an investor exchanges money in return for the right of ownership to an asset that is expected to increase in value in the future. The transaction may involve time, such as an individual spending the time to listen to his or her friend's issues with the expectation that the time and interest will help the friend resolve the issue. The transaction may involve program services such as a rehabilitation agency providing an individual with services, with the expectation that the individual will enhance his or her labor market outcomes. Note that the investor can be an individual, a corporation or firm, a government agency, or even society as a whole.

The first word in ROI, i.e., return, refers to the payoff that occurs after the investment is made. It is the raison d'être for the investment. As with the investment itself, the return may be financial or nonfinancial. An example of the former would be proceeds from the sale of a financial asset that appreciated in value. An example of the latter would be the improved selfconfidence and functioning of an individual who has participated in a rehabilitation program. It should be noted that returns accrue to an investor after a period of time, and so they may or may not achieve their expected value. Furthermore, it is possible for a return to be negative, that is, less than the investment. When a dollar value is assigned to the benefits of an investment and a dollar value is given to the costs of an investment, then the ROI is measured as the ratio of the payoff of the investment to the investment cost. It is the net benefit of the investment and can be expressed as a percentage in an annualized manner, as a gross return in dollars per dollar invested, or as a payback period.

Benefits

As the word suggests, the benefits of an investment are the positive outcomes that result from the investment. Benefits have a couple of characteristics. First, they are either financial (sometimes referred to as pecuniary) or nonfinancial. Financial benefits are denominated in dollars (or other currency). If an investment is the purchase of a financial asset such as a stock or mutual fund share, then its financial benefits will be dividends or proceeds from the sale of the asset. If an investment involves lending such as a bond purchase, loan, or mortgage, then its financial benefits will be interest earned and repayments of the principal. If an investment is in real property, then its financial benefits will be rents or proceeds from the sale of the property. Nonfinancial benefits span a wide gamut, but their commonality is that they are difficult to value. They may include cognitive payoffs such as learning skills or knowledge, or they may include noncognitive improvements in attitudes such as self-confidence or locus of control.

The second characteristic of benefits is that they involve uncertainty. In the parlance of statistics, they are stochastic. At the time that the investment is made, the investor may have an expectation about the size or direction of the benefits, but intervening events may occur that cause them to increase or decrease in size.

As described below, financial benefits from VR services often take the form of increases in earnings that accrue because customers become employed, change jobs, get increases in hours of employment, get increases in wage rates, or get increases in benefits.

Costs

Two types of costs are or may be present in an investment and its payoff(s). The first cost is the investment cost, which is the resource cost of initiating the investment. The second type of cost is the ongoing costs that occur after the investment is made. For example, a VR program may provide a customer with training (the investment cost) and then offer him or her job coaching in order to maintain employment (an ongoing cost). An individual may invest in a mutual fund (the investment cost) and then have to pay annual maintenance fees (ongoing costs). Ongoing costs are typically considered "negative benefits" and, when they are monetized, they are subtracted from benefits in order to calculate net benefits.

Just like benefits, costs may be financial or nonfinancial. Investment costs are usually thought of as financial, but they may involve individuals' time. For example, VR participants invest their time, which is a cost over and above the financial cost of providing services.

In general, in workforce development programs, investment costs comprise the cost of providing services, the cost of providing supplemental services such as child care or transportation, and the value of time that the customer invests in receiving the services. This time value is often estimated by forgone earnings.

Time and Present Value

We typically think of investments being made in a current period and the returns on those investments accruing to the investors at a later time period. But, in general, a dollar in the future is worth less than a dollar today. This is because a dollar today can be saved and earn interest, and because the purchasing power of a dollar today is greater than a dollar in the future, assuming that there is some inflation. For a financial investment, we use interest rates to adjust for the changing time value of money. To make a fair and even comparison of the benefits and costs of an investment, we adjust the future returns with an interest rate.

In very simple mathematical terms, let \$I be an investment made in 2012 and let \$R be the return to that investment in 2013. To calculate the ROI of this investment, we need to compare *R* to *I*. But even though both *I* and *R* are measured in dollars, we cannot directly compare *R* to *I* because a 2012 dollar is worth more than a 2013 dollar. In particular, the 2012 dollar is worth (1 + r) times the 2013 dollar, where r > 0. Consequently, if we were to calculate the ratio of benefits to costs, i.e., *R/I*, we would adjust the 2013 dollars by (1 + r). We define the *present value* of *R* as [1 / (1 + r)] * R. If the payoff of *R* happened in 2014, then we would adjust it by $(1 + r)^2$ because the investment in 2012 would have 2 years of interest and purchasing power.

The general formula for the present value of an investment that yields monetary returns in the future that are adjusted at an interest rate r is as follows¹:

(1) $PV(I) = R_1/(1+r) + R_2/(1+r)^2 + R_3/(1+r)^3 + \ldots + R_t/(1+r)^t$

where I = investment made $R_t =$ return that is received in period t r = interest rate

As discussed above, sometimes the costs of an investment—not just the benefits—flow into the future. In that case, the returns in Equation 1 should be net returns, i.e., benefits minus costs.

A simple example may help to explicate this equation. Suppose an investor lends \$1000 today to a borrower who promises to repay the investor \$600 a year from now and another \$600 2 years from now. Furthermore, suppose that the investor could place the money in a bank deposit that pays 2% in interest per year. The present value of this investment would be $\frac{600}{(1.02)} + \frac{600}{(1.02)^2} = $1,164.94.$

Net Present Value

The net present value of an investment *I* that generates a stream of future net benefits, *R*, is simply the present value of *R* minus *I*. The usual decision rule is that an investment is rational if its net present value is greater than or equal to 0. It is irrational to invest if the net present value is negative, a sign that the investment does not even result in a payoff that is as large as the investment is \$164.94 (\$1,164.94 – \$1,000). The ROI is 16.494%. Since the ROI was earned over a 2-year period, one might want to report it as an annual percentage, which in this case is 7.93%.²

¹ A more general version of this formula would allow the interest rate to vary across time periods. Because in practice this is usually not done and for ease of exposition, we present the less general version here.

² Let ROI_t be an ROI that is earned over a t-year time period. The annual ROI = $(1 + \text{ROI}_t)^{1/t} - 1$. In the example, the annual ROI = $1.16494^{.5} - 1 = .0793$, or 7.93%.

The federal Office of Management and Budget (1992) emphasized the importance of using net present value (essentially the numerator in an ROI calculation) in executive branch decision making. It stated the following:

> The standard criterion for deciding whether a government program can be justified on economic principles is *net present value*—the discounted monetized value of expected net benefits (i.e., benefits minus costs). Net present value is computed by assigning monetary values to benefits and costs, discounting future benefits and costs using an appropriate discount rate, and subtracting the sum total of discounted costs from the sum total of discounted benefits. Discounting benefits and costs transforms gains and losses occurring in different time periods to a common unit of measurement. Programs with positive net present value increase social resources and are generally preferred. Programs with negative net present value should generally be avoided. (Paragraph 5a)

Internal Rate of Return

Related to the concept of an ROI is the internal rate of return (IRR) of an investment. The IRR is the rate of interest that equilibrates the returns from an investment to the cost of the investment. In Equation 1, it is the *r* that would make the present value equal to the investment cost. In other words, it is the discount rate that makes the net present value equal to 0. From an investor's perspective, the IRR represents the minimum interest rate that the investor would be willing to accept in order to proceed with the investor would have loaned \$1,164.94 and gotten payments of \$600 in year 1 and in year 2, then the minimum interest rate that the investor would have accepted from the borrower was 2.0%. This makes sense because any interest rate lower than 2.0% would not be as favorable as depositing the money in the bank.

³ Derived by using Equation 1 and solving for *r*. The $PV_{stream} =$ \$1,164.94 (the present value of the investment) and R_1 and $R_2 =$ \$600.

ROI in the VR Context

As noted above, an investment is a commitment to allocate resources to make a purchase or undertake an activity with the expectation of getting benefits from the purchase or activity. The costs of an investment are typically borne before the benefits are received, although both the costs and the benefits may be flows that occur over time.

There are many types of *financial investment*, but in general they may be characterized as an investor using cash (or liquidating an asset) in order to make a loan or to buy an asset that is expected to appreciate in value. The purpose of the investment is to directly increase the wealth of the investor. The investor's motive is to be rewarded with loan repayments or ownership of assets that will appreciate in value. Of course, investments may be risky, and returns may not be positive. The ROIs for financial investments are typically easy to calculate because the investments and returns are denominated in dollars.

Another type of investment is *capital investment*. The investment takes the form of a tangible item of real property (equipment, land, buildings, infrastructure). The investments are factors of production, and the wealth motive of the investor is indirect. The investments are intended to ultimately increase profits or social benefits. The calculation of ROI involves estimation of the extent and timing for which the capital will yield financial benefits. Benefit-cost analysis is appropriate for capital investments to model the timing of the flow of benefits.

A third type of investment, which may be thought of as a subset of capital investment, is *human capital investment*, or workforce development. Using public funds for VR fits in this category. Individuals, or investors on behalf of individuals, invest resources in endeavors intended to increase their human capital, i.e., skills and knowledge that are productive in the workforce. The financial payoff for the individual comes from higher levels of earnings (through employment, hours, or wage rates), but there are generally substantial nonfinancial or intangible benefits as well. In many cases, the investors are not the same as the individuals undertaking the human capital–enhancing endeavors. Taxpayers fund education and many workforce development programs, for example. The ROIs for human capital investments are complicated by nonfinancial benefits, by the fact that participants and investors are different entities, and by the vagaries of the labor market that add considerable uncertainty to the payoffs.

Calculating the ROI for VR programs is slightly different from the calculations noted above because the context is not a lender getting repayments from a borrower, but rather a service provider spending resources so that a customer can receive benefits. Thus, we slightly change Equation 1 as follows:

(2) PV (C) = $B_1/(1 + d) + B_2/(1 + d)^2 + B_3/(1 + d)^3 + ...$ + $B_t/(1 + d)^t$

where $C = \cos t$ of providing VR services to an individual

 B_t = individual's benefit from the VR services received in period td = discount rate

a =discount rate

Note that Equation 2 is a framework intended to show that the present value calculation for the receipt of program services is analogous to the present value calculation for a financial investment. The B_t terms are the net monetized value of benefits received in period t. The "art" of an ROI calculation is to estimate the future value of benefits, especially when intangible benefits are included. However, it should be noted that a conservative approach is to use increased earnings as the B_t terms. If the ROI is positive with earnings as the only benefits received, then it would be even larger if other benefits could be monetized.

In Equation 2, future benefits from the VR services provided are *discounted* at rate d,⁴ rather than adjusted by an interest rate r. The principle is analogous. Benefits are not worth as much in the future as those dollars would be worth today. However, determining what discount rate to use in calculating an ROI is not as easy as looking up an interest rate. The discount rate d should appropriately reflect the future weight society will place on costs and benefits in the current time period. It is usually assumed that society has a positive rate of time preference, which

⁴ The discount rate used in calculating a program's ROI for taxpayers or society is often referred to as a social discount rate.

indicates that costs and benefits today are more valuable than in the future. Moore, Boardman, Vining, Weimer, and Greenberg (2004) noted several problems with existing program evaluation studies that have used or should have used discount rates. These include (1) an inconsistent use of discount rates across studies; (2) a lack of use of discount rates; (3) a lack of consensus on the appropriate discount rate to use; and (4) skewed project assessments due to use of varied discount rates. However, the main challenge is the uncertainty of the future, which forces economists to estimate future behavior with imperfect information.

Moore et al. (2004) attempted to tackle the inconsistency of discount rates. Through their research, they concluded that the correct method for social discounting is the consumption-based discount rate. Their recommendation is that projects with shorter-term impacts (most impacts within 50 years) should be discounted at 3.5%. In fact, most extant VR ROI studies use discount rates in the 0.03 (3.0%) to 0.05 (5.0%) range.

Suppose that a VR program in a state spends \$10,000 to provide services to a customer, and then the customer earns \$5,000 more per year for 5 years than if he or she had not received the services. Further suppose that this customer's discount rate is 0.05. The present value of these services using earnings as the only monetized benefit would be \$21,647.38. The net present value of the services would be \$11,647.38. The ROI of the services would be 16.47% for a 5-year period, or 3.10% annually.

The (fictitious) case history provided in Exhibit 2.1 is intended to provide the reader with another example of the present value concept.

Exhibit 2.1. Case History

Steve, age 41, lives in Millinocket, Maine. Eight years ago, Steve was injured on the job. He had worked at a paper mill, and a paper roll fell on his upper back and shoulder causing permanent damage. He received a worker's compensation lump sum award. At the time of his injury, Steve was making \$12.50 per hour and working full-time (2000 hours per year). He is no longer able to perform heavy physical work (lifting, bending, standing for more than 5 minutes at a time). He has a high school diploma, but also a documented learning disability with a fifth-grade reading level.

Six years ago, Steve applied for VR services. At the time, he was receiving \$1,800 a month in Social Security Disability Insurance and living off a lump sum worker's compensation payment, although he reported having difficulty paying bills. His wife works part-time in a day care facility, and they have three school-aged children and own their home. Steve was found eligible for VR and received services and payments during a 2-year span of time. He attended a 5-day career exploration workshop run by the VR office that cost \$425. He completed an occupational evaluation that cost \$1,600. He attended a 2-year technical college training program on entrepreneurship. He financed this with grants and student loans, but VR paid him \$1,500 for unmet needs, which helped to defray transportation costs. The Small Business Development Corporation (SBDC) assisted Steve with writing a business plan to establish an online business to buy and sell antique war memorabilia. VR paid Steve \$200 for transportation reimbursement to attend meetings with the SBDC. VR further reimbursed Steve \$4,000 for the cost of converting a hobby into a business, and reimbursed him \$1,200 for car repairs. All together, the VR cost for purchased services was \$8,925. In addition to purchased services, records showed that Steve received approximately 100 hours of guidance and counseling and other staff time, which cost the agency \$3,500 in direct total compensation and administrative expense. So the total VR cost for Steve was \$12,425.

At the time of closure, Steve was working 15 hours per week at his online business and netting about \$15.00 per hour. Over the 4 years after closure, Steve earned an average of \$15 to \$20 per hour and worked on average 20 to 25 hours per week at his online business. (Using the midpoints of \$17.50 per hour and 22.5 hours per week, this works out to \$20,475 per year.) Steve continues to receive full Social Security Disability Insurance benefits. An evaluator looked at Steve's case history and estimated that if he had not received services, then Steve would have worked intermittently at jobs that he could handle and would have earned about \$12,000 per year. (See Exhibit 4.1 in chapter 4 for a discussion of methods of estimation and how that was done for this example.)

For ease of exposition, we will assume that all the dollar figures in Steve's case history have been adjusted for inflation. By the end of the 4-year period following the closure of Steve's VR case, each dollar invested in Steve's VR had returned \$1.42 in increased (discounted) earnings. The annual ROI for this VR investment in Steve, at a discount rate of 0.05 (5%), is 9.14%. (Four years of net benefits of \$8,475 discounted at 5% has a present value of \$30,052. The net present value is \$17,627. The ratio of the net present value to VR cost is 1.42, and the one-fourth root of 1.42 is 1.0914.)

Multiple Perspectives

Calculating an ROI is basically the same as calculating a benefit-cost ratio. The essential task of a benefit-cost analysis (BCA) is to measure the benefits and costs of an action, place weights on each, and arrive at a conclusion as to the net benefits of the action. To conduct a BCA, it is necessary to measure the outcome (benefits) and costs in a common unit, usually dollars. Note that the benefits and costs may differ depending on the decision-making groups whose interests are affected by the action. In VR, three groups may be considered: the participants, employers of the participants, and the rest of society. The rest of society includes taxpayers other than participants and employers of participants.

Table 2.1 presents the components of a full BCA for a workforce development program such as VR. The final row of the table represents the net benefits to each of the parties and is derived by summing the columns. The final column of the table represents the total net benefits in society and is derived by summing across the rows. The entries in the table represent the expected costs (–) or benefits (+) to the group.

Program costs are in the first row. In most publicly funded workforce development programs such as VR, services are provided at no cost for individuals. VR statutory and regulatory provisions allow state agencies to establish criteria for financial
participation by individuals with disabilities in the cost of some services. So in some cases, individuals are offsetting the total cost of services out of their own pocket. In general, these costs are not captured in state agency data and generally have the effect of reducing the total cost of purchased services data for that individual. In the VR program, therefore, participants are investing their time and effort, may be contributing financially to the cost of services, and may be forgoing earnings while they are undertaking program activities. Thus, there is a cost in the participants' column. Forgone earnings, especially for individuals with considerable labor market experience, may be quite large if the length of services is substantial.

The table suggests that employers may bear some costs of participation. For example, with apprenticeships they may pay for the classroom training. Employers may provide on-the-job training that involves supervision or other costs. The rest of society usually pays the largest share of costs for programs because they are publicly funded through taxes.

Benefit or cost	Participants	Employers	Rest of society	All
1. Program costs	_	0/-	_	_
2. Productivity of individuals who are or become employed	0	+	+	+
3. Higher earnings	+	_	0/+	0/+
4. Fringe benefits	+	_	0	0/+
5. Less unemployment/ lower turnover	_	+	+	+
6. Lower income maintenance transfers	-	0	+	0

Table 2.1Components of a Benefit Cost Analysis

7. Higher taxes	_	0/-	+	0
8. Net benefits	+	+	0/+	+

Rows 2–7 of the table represent potential benefits from program services. Participation in program services is intended to lead to job placement. When individuals become employed, they become productive members of the workforce. If program participants are incumbent workers, then program activities will improve their productivity. In row 2, we show that employers benefit because they are able to sell more and higher-quality goods and services, and society benefits from the availability of the additional goods and services. Row 3 shows that rehabilitated workers receive higher earnings (through increased employment, wages, and hours). Those earnings are a cost to employers. We have added a potential benefit for the rest of society in this row because of the multiplier effect that program participants' higher earnings may engender.

The fourth row shows that program participants who become employed, or who were employed but have higher earnings, will typically receive fringe benefits over and above their earnings. We indicate that the additional fringe benefits may be a net benefit to society, which assumes that workers value the fringe benefits more than what employers pay for them. This would be true if workers were risk averse and employers were risk neutral. In the fifth row, we show reduced levels of unemployment and turnover due to skills learned or accommodations received. We theoretically presume this is a cost to program participants because they are losing nonwork or leisure time plus they may be losing unemployment compensation benefits. The reduction in unemployment and turnover is a benefit to employers because they will have lower hiring costs and unemployment compensation payments. It is a benefit to society if lower levels of general taxes are needed to support nonemployed individuals.

The sixth row indicates that participants are likely to receive lower income maintenance transfers. This is a cost to them, but a gain to the rest of society. On net, the benefit is zero because these payments are transfers from the rest of society to recipients. With higher levels of earnings and employment come higher tax liabilities. These are denoted in row 7. Workers and employers will pay higher payroll taxes. The rest of society benefits because presumably the government will spend the money on social benefits or cut taxes.

Finally, we would expect net benefits to VR participants to be positive. Their increased earnings (net of taxes) will exceed their time and financial costs, if any, and reduced transfer income. We would expect the net benefit to employers to be positive. Employers' costs for programs are generally quite small, and their return from increased productivity will exceed their wage and benefit payments. We suggest that the rest of society may have a small net benefit. This sector of the economy bears the costs of providing a program, and their major return will take the form of lower transfer payments and higher levels of government spending/lower taxes.

In the empirical implementation of a BCA for a VR program, the main "drivers" of the results are the plus sign in the third row and the minus sign in the sixth row. The higher earnings in the third row result from increases in employment, increases in hours worked, and/or increases in wage rates. The costs in terms of lost public assistance are generally smaller in magnitude than increased earnings, but may occur if program participants receive reductions in payments from Temporary Assistance to Needy Families, the Supplemental Nutrition Assistance Program, Supplemental Security Income, Social Security Disability Income, or other programs because of increases in earnings. Lost public assistance could also include payments made on behalf of the individual with a disability for medical coverage or other services and supports through Medicaid if earnings result in loss of Medicaid eligibility. The "art" of a BCA and concomitant ROI estimation is the estimation of these benefits and costs.

Social ROI

The "all" column in Table 2.1 is intended to measure the benefits and costs of VR services to society as a whole (participants, employers, and taxpayers). However, in practice, the framework of that table is limited to easily measured outcomes and costs. Social return on investment (SROI) provides a framework to account for the broader social value of programs and activities beyond their contribution to economic outcomes. In effect, an SROI estimate tries to account for the nonfinancial benefits and costs that are not included in an ROI because they are not measured in dollars. It is an extremely important concept for VR because program services often lead to significant mobility, health, social, and psychological improvements that are not usually reflected in labor market outcomes. Unfortunately, there is no well-established methodology or standard approach to estimate SROI.

Emerson, Wachowicz, and Chun (2000) distinguished between economic value—which "is created by taking a resource or set of inputs, providing additional inputs or processes that increase [their] value" and generating "a product or service that has greater market value"—and social value, which "is created when resources, inputs, processes or policies are combined to generate improvements in the lives of individuals or society as a whole" (p. 137). As described by Nicholls, Lawlor, Neitzert, and Goodspeed (2012), "SROI is about value, rather than money. Money is simply a common unit and as such is a useful and widely accepted way of conveying value" (p. 8).

Pioneered in the 1990s by a venture philanthropy fund, the concept has been expanded to a wide range of both for-profit and nonprofit organizations, including government entities. SROI is sometimes described as a specialized type of cost-benefit analysis that attempts to place monetary value on the activities and outcomes that affect—or are affected by—a program's stakeholders (Hohler, 2010). Identification of the people and organizations that change, or are changed by, the activity that is the focus of the analysis is considered an integral part of the process.

Another key feature of SROI is the explicit recognition of unintended consequences, both positive and negative, and the possibility that an activity can not only create or increase value for some stakeholders, but reduce or eliminate value for others. According to Nicholls et al. (2012), SROI analysis is "concerned primarily with finding out how much value has been created or destroyed and for whom" (p. 20). Social Value UK (formerly The SROI Network), an international community of practice (<u>www.socialvalueuk.org</u>), has identified six stages in conducting SROI analysis:

- 1. Establishing the scope of the analysis and identifying key stakeholders. It is important to be clear about what the analysis will cover, as well as who will be involved in the process and how they will be involved. Identified stakeholders are then integrally involved in each remaining stage.
- 2. **Mapping inputs, outputs, and outcomes**. This stage involves developing an impact map or logic model that shows the relationship between inputs, outputs, and outcomes.
- 3. **Identifying outcome indicators and giving them a value**. This stage involves finding relevant data that can determine whether the intended outcomes have occurred and using appropriate proxy measures to assign a value to the outcomes (both positive and negative).
- 4. Establishing the impact of the program/activity. It is important to determine what changes happen as a result of the program/activity itself, to ensure that the positive and negative impacts attributed to the activity/program are not actually the result of something else and to ensure that the change would not have occurred anyway in the absence of the program or activity.
- 5. **Calculating the SROI**. This stage involves adding up the benefits that can appropriately be attributed to the program/activity, subtracting any negatives, and comparing the result to the investment that has been made.
- 6. **Reporting, using, and embedding**. Although this step is not always considered part of the process, it involves sharing findings with stakeholders and seeking external verification of SROI findings.

While these stages are relevant for any ROI analysis of a VR program and indeed any type of program evaluation, they are critical in carrying out an SROI assessment. The potential social benefits of VR—everything from increased self-esteem and self-advocacy skills to greater mobility and stronger social networks— are rarely considered in monetary terms, and the value placed on

such benefits by different stakeholders varies greatly. For example, the parents of a young adult with a significant disability may place a high value on the increased self-awareness and self-esteem that their son or daughter experiences as a result of their employment following participation in VR, while the young person may place a higher value on the increased social contacts and increased opportunities for independence that come with having a job.

Many individuals and organizations that conduct SROI analysis, or use its results to evaluate the worth of programs and activities, acknowledge that both the SROI framework and methods are continuing to evolve. As a 2010 *Wall Street Journal* article pointed out, SROI "still faces a number of practical challenges. Analysis is only as good as the information that is fed in, and most [organizations] don't yet collect all the relevant data. Then [they] have to try and work out which outcomes can be attributed to the . . . intervention, and which to external factors" (Hohler, 2010). Therefore, while SROI is a promising approach to help VR agencies measure their overall value to society, further refinement of methodologies and data sources is needed before reliable SROI estimates can be developed for the VR program.

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Chapter 3: Review of Relevant ROI Literature

As defined in the previous chapter, return on investment (ROI) is a metric used to assist in the evaluation of whether a specific investment can yield future returns or benefits. This metric is an "attractiveness" measure and can provide economic justification that a project is a financially sound venture. The ROI is calculated by dividing the (discounted) net benefits by the total costs of the investment. The interest rate that equalizes the costs and the benefits is the internal rate of return. Related to ROI is a benefit-cost analysis (BCA), which may expand on the ROI. An ROI usually includes only tangible (e.g., financial) benefits and costs, whereas a BCA and the related social ROI often include tangible and intangible benefits and costs, such as societal benefits (Applied Geographics, 2009).

ROI and the closely related BCA have been utilized in countless applications, mostly involving public-sector projects but also private-sector projects as well. This chapter provides a literature review of various programs that have been subjected to ROI and the types of analyses that have been conducted. As the focus is ultimately on ROI studies of vocational rehabilitation (VR), the review of programs goes from the most general applications to specific VR evaluations. That is, after first examining the distinction between private- and public-sector ROI, we discuss the common elements of public-sector ROI and then investigate ROI issues in governmental "human capital" development programs such as education and training, finally looking at the variety of ROI/BCA analyses conducted in the VR arena.

ROI in the Private Sector

Evaluations of investments and business strategies often utilize an ROI strategy (e.g., Brealey, Myers, & Allen, 2006) and can be useful for applications such as developing market orientation (Narver & Slater, 1990; Kumar, Jones, Venkatesan, & Leone, 2011), investigating how training sales personnel benefits customer relations (Saxe & Barton, 1982; Homburg, Müller, & Klarmann, 2011), developing information technology to gather information on consumer behavior (Tambe, Hitt, & Brynjolfsson, 2012), and developing tobacco control programs (Dilley, Harris, Boysun, & Reid, 2012).

Although ROI calculations were initially based on financial information, such as short-term costs and benefits, intangible information is increasingly included in the ROI discussion. Customer satisfaction and brand loyalty serve as more traditional intangible corporate examples of ROI (Smith, 1956; Webster, 1988; Rust, Lemon, & Zeithaml, 2004). In addition, performance measures related to environmental, social, and governmental variables are also accounted for in ROI estimates (Amaeshi & Grayson, 2008; Sikken, 2011). Some studies have included evaluations of corporate social performance (Crittenden, Crittenden, Ferrell, Ferrell, & Pinney, 2011), customer equity (Blattberg & Deighton, 1996), and country business start-ups in the face of cultural differences (Calantone, Di Benedetto, & Song, 2011). Conservation strategies have also been explored within the context of ROI, evaluating the benefits yielded by increasing biodiversity and conserving land areas (Balmford, Gaston, Rodrigues, & James, 2000; Boyd, Epanchin-Niell, & Siikamäki, 2012; Moore, Balmford, Allnutt, & Burgess, 2004).

Several variations of ROI exist. To highlight a few, there is the "energy return on investment," which is a ratio of energy returned to energy used when evaluating the cost-effectiveness of energy technologies (e.g., Mulder & Hagens, 2008; Guilford, Hall, O'Connor, & Cleveland, 2011; Murphy, Hall, & Powers, 2011). Likewise, return on training investment evaluates how many dollars an investor gets back for each dollar of training provided. This form of ROI compares typical training costs, such as course development, facilities, and salary to typical benefits including time savings and better quality (Baker, 2001).

Development of ROI in the Public Sector

As illustrated above, the private sector has traditionally utilized ROI valuations to assess the effectiveness of various aspects of business operations. However, ROI is now increasingly used to evaluate public entities as a form of accountability to promote the efficient use of resources with government funds. Such program assessments were initiated in 1949 when the Hoover Commission proposed performance budgeting. Since then, various policies have governed the practice of measuring results. President Johnson implemented a program planning budgeting system, and President Carter advocated a zero-based budgeting system. In 1993, the Results Act required strategic plans to serve as the starting point for each federal agency when establishing goals, defining how to meet the goals, and measuring achievement (Dean, 2005).

Under the George H.W. Bush Administration, the U.S. Office of Management and Budget (OMB) was charged with investigating measures of program effectiveness for federal agencies. The OMB provides a set of guidelines to be followed when using cost-benefit or cost-effectiveness analysis to assess a publicly funded program or purchase (OMB, 1992). The elements that must be included in the analysis include policy rationale, explanation of explicit assumptions, evaluation of alternatives, and identification and measurement of benefits and costs. The OMB clarified that the social net benefit should be evaluated, which is the benefit to society as a whole and not just the government. Benefits and costs should include both tangible and intangible benefits and interactive effects and should exclude transfer payments such as Temporary Assistance to Needy Families (TANF), Social Security Disability Insurance (SSDI), and Supplemental Security Income (SSI). In addition, a discount rate should be used to discount the time value of money; discount rates can be real or nominal depending on how the costs and benefits are measured. The OMB provided a discount rate for base-case analyses, although other discount rates can be used under other

circumstances. To account for uncertainty in estimations, sensitivity analyses should be conducted to provide varied analysis conditions for major assumptions, such as the discount rate, future wage growth, and inflation. The OMB provides an updated discount rate each year for agencies to use; the 2014 memorandum provided a 1.9% discount rate.

Using this BCA framework, economists have conducted evaluations of all types of government projects beyond vocational training programs, including--

> public pensions, market extension (globalization), targeting Alzheimer's disease, drug abuse treatment, transport networks, project financing, alternative ways of building schools, adopting a pro-growth policy package, reducing the amount of bribes, supporting domestic TV, preventing financial crises, deciding to wait before one invests, reducing malnutrition, reducing inflation and poverty, reducing climate warming, and providing information about smoking. (Brent, 2009, p. 10)

ROI in Education

An ROI for higher education is one area of study that is becoming increasingly estimated. The Center for Law and Social Policy (CLASP) and the National Center for Higher Education Management Systems developed an online "dashboard" tool (http://www.clasp.org/issues/

postsecondary/pages/the-credential-differential) that evaluates the potential long-term effects of investment in postsecondary education. Users can see how the country or a specific state fares when calculating net benefits of staying the same (maintaining the status quo) or pursuing higher (postsecondary) education. The ROI dashboard was created to assess the global competiveness of the United States (compared with other Organization for Economic Co-operation and Development member countries) in terms of postsecondary education and indicates that the United States is falling far behind the necessary level of degree attainment (CLASP, 2010).

Although the United States may require a higher percentage of the adult population to attain postsecondary credentials to

remain competitive, many people are now evaluating personal returns to higher education. CLASP (2010) stated that the net return for credential attainment is positive. However, the benefits may not always be positive. To explore the ROI for education, PayScale, a Seattle-based data firm, is using a data set compiled from self-reporting individuals who use some form of online payment tool (Hough, 2012). Data collected include base salary, bonuses, and other cash earnings. PayScale examined the link between pay, colleges, and other variables. This information was used to find an earnings differential between those who went to college and those who did not (Lavelle, 2012). Across all degrees and schools, PayScale found a 4.4% average yearly return, although the variation of returns between schools could be substantial. Alumni from schools with a strong "brand" did better; certain majors, like engineering, also had higher returns (Hough, 2012). Therefore, the investment risk to one individual may not be as great as for another, depending on a variety of variables at hand.

ROI in Workforce Development

Workforce development programs are another area of study where ROI has been utilized. Workforce development programs are generally publicly funded programs that provide training and assistance to qualifying participants with an ultimate goal of raising economic productivity and securing employment. (It is important to note that not all workforce development programs provide training.) Examples of workforce development programs include apprenticeships, dislocated worker training programs, VR, vocational training in high schools, and adult education. Such workforce development programs "typically involve a variety of costs: including personnel associated with providing the intervention such as counseling or training; capital cost for such factors as buildings and equipment; wastage of materials used in training (less the value of output produced); an imputed value of the time of any volunteers since such time involves a use of resources with an opportunity cost; and the opportunity cost of the time of participants while receiving this intervention" (Brent, 2009, p. 171).

To date, program administrators have held local and state programs accountable through performance standards. The use of performance standards in federally funded employment and training programs began in 1982 with the Job Training Partnership Act (JTPA), which was replaced by the Workforce Investment Act (WIA) in 1998. The goal of JTPA was to provide job assistance and training for the economically disadvantaged. Highly decentralized, the JTPA had 600 service areas nationwide with considerable state and local autonomy. Once the program was in place, performance standards began being measured, starting with placement rates, wages at placement, earnings at termination from the program, and reductions in welfare payments. These four standards served as the benchmarks for evaluating program achievement. In 1989, four additional standards were added that relied on data gathered after termination from the program, providing a longer-term assessment period. With the implementation of the WIA in 2000, the performance standards evolved to using state-level unemployment insurance program data and incorporating attainment of educational and workforce credentials. In addition, states may now negotiate their own performance levels, which provides greater flexibility for states that have difficulty meeting certain standards due to differences in economic conditions, characteristics of participants, and other factors (Dean, 2005; Heckman, Heinrich, & Smith, 2011). The JTPA and WIA performance standards do not include ROI measures, although such measures have been proposed for a broad range of workforce development programs (Wilson, 2005).

Chapter 2 included a discussion of having benefit-cost ratios, and hence ROIs, calculated for multiple perspectives. The framework presented there is based on Long, Mallar, and Thornton (1981), who provided the framework for how an ROI calculation would operate within workforce development program evaluation. Several studies have used this framework (e.g., Hollenbeck, 2009). When using an ROI to evaluate workforce development programs, three investment "perspectives" may be considered: those of participants, taxpayers, and society (Long et al., 1981; referred to as corpsmembers, the rest of society, and society, respectively).⁵ Participants include individuals who make an investment into a program by enrolling. The costs to an individual are dominated by a time cost—the opportunity cost of forgone wages. Time cost can vary largely across participants when considering the age and lifetime earnings profile for youth versus older dislocated workers. In addition to time cost, individuals may be charged tuition and fees (such as with postsecondary education); however, many programs charge no cost to the participant. The benefits received by participants are estimated by an individual's earnings profile, generally averaged across participants, and fringe benefits (such as health care, paid leave, and retirement plans) (Long et al., 1981).

The public sector consists of the taxpayers, who are responsible for fronting the cost of program services. The investment cost to the taxpayers comprises total program costs; the benefits received by taxpayers are the increased tax revenues received from employed participants and the decreased welfare payments paid to those individuals. Reductions in welfare payments can come from programs such as Medicaid, the Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), and unemployment insurance (Hollenbeck, 2009).

Finally, the societal perspective combines participants with taxpayers, with transfers netted out. When considering these three perspectives, the ROI can vary across perspectives given the different costs and benefits received by each group.

When assessing the ROI of a workforce development program, the computation should only serve as a metric or judgment of the effectiveness of the program. Several assumptions must be made to calculate an ROI, including the discount rate, extrapolating future earnings and fringe benefits, and determining the proper income differential between participants and nonparticipants. However, the evaluation does provide insight into whether a specific program is effective, can hold program administrators accountable to taxpayers for using funds effectively, and provides a metric policymakers can use to improve and expand

⁵ Chapter 2 included employers in addition to participants, the rest of society, and society.

upon existing programs (Long et al., 1981; Hollenbeck, 2008, 2009).

Examples of Workforce Development ROI

ROI has been used numerous times to evaluate workforce development programs. States considering or having ROI assessments include Minnesota, Texas, Virginia, Washington, and Indiana, among others. Brief summaries of the Texas and Minnesota evaluation approaches follow.

The Ray Marshall Center is evaluating ROI for workforce development programs in Texas (King, Tang, Smith, & Schroeder, 2008; Smith, Christensen, & Schroeder, 2013). The initial statewide analysis estimated ROI for selected programs that are directly operated or strongly influenced by local workforce boards in Texas (e.g., WIA Title I adult programs, TANF, Trade Adjustment Assistance programs, Wagner-Peyser Employment Service), but did not include VR. Their approach made use of data on participant characteristics and service costs from each of the programs, as well as UI wage, UI claims, TANF benefit, and SNAP benefit data to estimate program impacts. It also distinguished between "low-intensity" workforce services such as job referrals and job search assistance (which labor economists typically refer to as "labor force attachment" strategies) and "highintensity" services such as vocational and on-the job training, education, internships, and other work experiences (which labor economists often categorize as "human capital development" services). As King et al. (2008) pointed out, human capital development services "tend to raise participants' skill levels, while [labor force attachment services] mainly reduce participants' time between jobs" (p. 4).

For the low-intensity services, the Marshall Center researchers estimated participant impacts based on deviations from their prior employment and earnings trajectories and assumed that any impacts would "decay to zero" by the end of the second quarter following service. For the high-intensity services, the researchers constructed a comparison group matched along 18 characteristics from the pool of individuals who had only received low-intensity services during the same period. Returns for both groups were estimated for participants, taxpayers (also referred to as "the rest of society"), and society (both participants and taxpayers) at 5- and 10-year periods, taking into account costs such as forgone earnings and fees and benefits including wages, fringe benefits, employer productivity, increased taxes, and reduced welfare payments. The study found net returns to be positive and substantial, with the greatest annualized returns going to participants (38%), society (35%), and taxpayers (25%) at the 10-year intervals.

The Minnesota Governor's Workforce Development Council (2013) is undertaking an initiative that began in 2009 to develop a standardized ROI framework for workforce programs across the state. The evaluation will measure net impacts over the short term (2 to 3 quarters after program exit), medium term (5 to 6 quarters after exit), and long term (9 to 12 quarters after exit) for participants in the WIA adult and youth programs and Trade Adjustment Assistance, TANF, SNAP, and VR programs, among others. Minnesota's framework makes use of a matched comparison group drawn from Wagner-Peyser participant records and unemployment insurance applicant data. Following Long et al.'s (1981) methodology, the council will determine an ROI for participants, taxpayers, and society. Pilot testing was initiated in 2012 for a limited number of Minnesota training and education programs to help refine the parameters and process of the ROI methodology (Minnesota Governor's Workforce Development Council, 2013).

ROI for VR of Veterans with Disabilities

The Vocational Rehabilitation and Employment Program (VR&E) is authorized by Congress under Code of Federal Regulations Title 38, Chapter 31 and is administered by the VR&E Service within the Veterans Benefit Administration of the Department of Veterans Affairs. VR&E provides comprehensive vocational and educational counseling and employment-related services to veterans with service-connected disabilities. In May 1991, the consulting firm SRA submitted the "Final Report on Return on Investment Analysis" to the VR&E Service. In this report, SRA provided an ROI framework that estimated benefits accruing to participants in the VR&E program and compared them

to programmatic costs of the Veterans Benefit Administration and other costs incurred by the veteran. They identified these benefits as increased future earnings, reduced living expenses, in-program subsistence allowance, federal income tax recovery, public assistance and other cost avoidance, and intangible benefits such as spillover effects to family members and society at large. Examples of the latter intangible benefits are particularly important for valuing the returns to an independent living outcome. The costs that SRA identified included (1) earnings and leisure time the veteran may give up in order to participate in the program; (2) readjustment benefits, including subsistence allowance payments, tuition, and other VR services; and (3) the VR&E general operating expenses for the salaries of staff administering the program. They also noted that a circumspect calculation of the ROI should include non-VR&E costs such as Veterans Health Administration medical payments.

SRA then used this general framework, which is based on a model initially formulated by Thornton, Agodini, and Jethwani (2000), for estimating the benefits of supported employment, to calculate the present value of the future stream of these benefits and costs that they could measure. SRA did not have data on many of the items that they identified as costs or benefits. Consequently, they made estimates of the benefits for only the components of increased future earnings, the subsistence allowance payments received by veterans, and any federal income tax recovery. For costs, SRA made crude estimates of the "opportunity costs" of forgone earnings (i.e., veterans' reduced earnings while participating in the program) and combined this item with the aggregated readjustment benefits and general operating expenses. The sample frame they used consisted of veterans served from fiscal year 1994 through 1999.

Even implementing this streamlined model required a host of assumptions due to the lack of availability of the requisite data. For instance, SRA's benefit estimates relied primarily on the data available from the VR&E master record. Thus, SRA was forced to use preprogram earnings, which are only available for a limited time for a small portion of all VR&E applicants when they are likely to be temporarily unemployed. This *1 month of preapplication earnings* served as the basis for (1) forgone earnings during program participation and (2) measurement of increased earnings for program participation. They then assumed that these earning gains continued until retirement age, which was adjusted for the severity of the veteran's service-connected disability. The present value of these earning gains, along with the estimated value of increased federal income taxes, represented the benefits of VR&E participation.

The cost analysis framework was based only on aggregate data available from VR&E reports. The cost estimates consisted of (1) prorating the overall VR&E expenditures for readjustment benefits and general operating expenses to those veterans receiving services in 1994 through 1999; and (2) forgone earnings for a veteran during the VR&E training time interval, defined as the period from rehabilitation plan development until completing this plan.

The present value of the measured benefits, calculated as \$9.157 billion, was then compared with the cost components, \$3.736 billion in 1999 dollars, to develop an ROI of 145% for those rehabilitated veterans who successfully completed the program between the 6-year period from fiscal year 1994 to 1999.

An evaluation by Dean (2005) provided a framework for determining an ROI using individual-level data provided by the VR&E and Defense Manpower Data Center and aggregate-level earnings from the Social Security Administration. This framework compares earnings impacts to the costs of participating in the VR&E program for applicants in 1992. A comparison group of VR&E program dropouts was constructed as a benchmark for estimating the earning impacts for a "treatment group" drawn from those applicants who received subsistence allowance awards.

Treatment impacts were obtained using individual-specific longitudinal earning records obtained from the Social Security Administration for the 18-year period from 1985 to 2002. The results from the selection bias–corrected earnings equations found the earnings impacts to be highly negative and statistically significant in the first 5 years. This is not surprising, given that VR&E participants are likely to be enrolled in training during this period while the program dropouts have secured employment through other means. These treatment impacts became progressively less negative during this 5-year interval, as more veterans completed their training. Indeed, treatment impacts steadily increased over the entire 10-year period following application for VR&E benefits.

These benefits from the treatment impacts were then compared to the costs of the VR&E program. The VR&E master record was used to create a longitudinal tracking of subsistence allowance payments and hours of academic and nonacademic training for the 11-year period from 1992 to 2002 following application for VR&E benefits. A benefit-cost framework was developed, where the benefits of the increased earnings were compared to the direct costs of VR&E service provision and the implicit or "opportunity costs" of the veteran's forgone earnings while enrolled in the VR&E program. Using a 4% discount rate and three different earnings estimation techniques, each \$100 invested (in paying for services and in forgone earnings) resulted in \$19, \$45, or \$51 in increased annual earnings for the average VR&E applicant during the 10-year period following their application in 1992.

ROI and the Public-Sector VR Program

The public-sector VR program is one of the oldest workforce development programs, having been established following World War I to serve persons with primarily physical disabilities. The Rehabilitation Services Administration (RSA) was one of the first agencies to develop a management information system for reporting caseload activity for persons terminated from the VR program. This reporting system—called the RSA-300 (now 911) Case Service Report—serves as the basis for almost every evaluation of the VR program. This data set allowed for implementing rather simplistic benefit-cost calculations of VR program efficacy, with studies reporting benefit-cost ratios as high as 10 to 1 (Berkowitz, 1988). These analyses were followed by a series of more rigorous evaluations published in economics journals (e.g., Conley, 1969; Bellante, 1972; Worrall, 1978; Dean & Dolan, 1991; Dean, Dolan, & Schmidt, 1999), with the latter studies more or less following advances in the more general field of workforce development program evaluation at the time (see Ashenfelter, 1978; Bassi, 1984; Heckman & Hotz, 1989). These

analyses controlled for a rich set of demographic and disabilityrelated variables in developing cost-benefit ratios for specific impairment groupings. However, as Loprest (2007) noted, with the exception of the last study, these analyses suffered a lack of data on longitudinal (post-VR) earnings. Moreover, all studies were hampered by insufficient data on the costs of specific types of services, since the RSA 300/911 data only provide the cost of agency-purchased services (see the discussion of data considerations in chapter 5).

The past decade or so has seen a series of state-level evaluations of VR produced by economic consulting firms, university research bureaus, and state VR program evaluation units (Hemenway & Rohani, 1999; Uvin, Karaaslani, & White, 2004; Hollenbeck & Huang, 2006; Kisker, Strech, Vetter, & Foote, 2008; Wilhelm & Robinson, 2010; Bua-Iam & Bias, 2011). These studies, some of which are reviewed in more detail in chapter 4, use "internal" comparison groups (Bell, Orr, Blomquist, & Cain, 1995) drawn from program participants that require strong assumptions to resolve the inherent problem of selection bias resulting from nonrandom participation in VR. Hollenbeck and Huang's (2006) study of VR impacts for the state of Washington mitigated the impact of this selection bias problem of nonrandom program participation by incorporating statistical matching estimators based on the likelihood of program participation; these estimators were initially developed by Rosenbaum and Rubin (1983) and have been incorporated in other workforce development programs (Heckman, Ichimura, & Todd, 1997; Dehejia & Wahba, 1999).

A different application of BCA of the VR program is concerned with looking at the effect of VR on disability insurance beneficiaries in Canada (Campolieti, Gunderson, & Smith, 2007). Since the researchers could not make use of a comparison group using a natural experiment, they used propensity score matching techniques with a group drawn from administrative records. The analysis examined the net benefits of VR by examining the savings that accrued to the disability insurance program when the individuals left the program.

Conclusion

ROI, and the closely related BCA, are widely used metrics for evaluating the attractiveness of a specific investment. ROI and BCA are used in various disciplines, from financial analysis and energy investment in the private sector to education and federally funded programs in the public sector. For public-sector investments, a social discount rate is utilized, which will reflect the future weight society will place on costs and benefits. Workforce development programs, VR programs, and VR for veterans are all examples of public-sector programs that utilize and benefit from ROI in program evaluation. Several ROI studies already exist for the analysis of these programs, and results help provide guidance for program growth and fund allocation. However, although ROI is widely used in program evaluation, challenges exist in methodology development, with one major challenge surrounding the availability, accessibility, and consistency of data sources.

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Chapter 4: Methodology

The purpose of this chapter is to identify the principal components of a return on investment (ROI) study. In a sense, the chapter enumerates the necessary ingredients for an ROI recipe, indicating the importance of each and describing how different choices that analysts make regarding the component affect the final estimate.

The five key ingredients comprising ROI studies are as follows:

- Identification of the treatment and treated population
- Identification of the time period of analysis
- Estimation of the outcomes of treatment, i.e., benefits
- Estimation of investment costs
- Treatment of statistical uncertainty

These ingredients are discussed below, followed by a discussion of adjustments for inflation/discounting and multiplier/displacement effects. The chapter then identifies how these components have been addressed in several ROI studies conducted in the vocational rehabilitation (VR) context, i.e., what recipes were followed in these extant studies.

Treatment and Analysis Population

When medical interventions are being tested and developed, the treatment that is given to patients is often a

precisely determined chemical compound or specified procedure. VR programs, on the other hand, typically tailor services to each individual being served. Thus, each participant may receive different services. Furthermore, VR professionals who are providing the services may vary in how they deliver the services, and participants vary in their adaptability, effort, and motivation. So, even if participants were given the same "treatment," they may exert more or less effort in learning or applying the skills or knowledge being delivered to them. Furthermore, some individuals may not complete the treatment at all.

The typical practice in the evaluation of workforce development programs such as VR, and in the estimation of ROI, is to identify a cohort of participants who received some set of services at a particular time period. The cohort may be limited in a number of different ways. The cohort may be identified by having a particular disability. The cohort may be identified by particular demographic characteristics (e.g., age, sex, location, etc.). The cohort may be limited by the services received, or the cohort may be limited by the time period in which the services were received.

In selecting the cohort for analysis, there is a tradeoff between homogeneity of the cohort and sample size. The more homogeneous the treated population is, the more precise will be the estimated impact of the treatment. However, the more homogeneity that one attempts to use in defining the treated population, the smaller the size of that population, and therefore the more difficult it will be to achieve statistical confidence. In practical terms, consider a study that focuses on one county in a state that is served by one VR office vis-à-vis another study that focuses on the entire state with multiple VR offices. The former study will have a population of participants that are all in the same labor market, have access to the same education or training institutions, and are being served by the same VR professionals. With this homogeneity in the participants, it will be easier to identify the effect of the services received on outcomes. However, estimates of variance, which are used to gauge statistical uncertainty, are inversely related to the number of observations in a study. Other things equal, a larger number of observations means less variance and less statistical uncertainty. So the county study will likely have much more statistical uncertainty about the

relationship between program services and outcomes than the state study, even though the latter may involve multiple labor markets, service regimens, and institutional context. In short, achieving an adequate sample size for the treated population may come at the cost of increasing the heterogeneity of the population. Sampling error is being traded off for estimation error.

An issue that must be addressed in selecting the cohort for analysis is whether to include individuals who do not complete their participation in program services. And in fact, there may be individuals who apply for services and then do not participate at all. Common sense would suggest that program completers would have better outcomes than noncompleters, and so there might be an incentive to examine outcomes for only those individuals who complete. On the other hand, individuals who do not complete may have "dropped out" because they were offered an employment opportunity or may have achieved some other successful outcome. Furthermore, arguably part of the impact of the treatment might have been to provide enough services to engender success even prior to completion. Or it might have been the case that the impact of the treatment was negative and caused individuals to leave. A compromise that is sometimes done in practice is to include all members of the cohort-completers and noncompleters-and to calculate outcomes both for the entire cohort and separately for each subgroup.

If one excludes individuals who did not receive the full treatment, then it is said that the program effect is the average treatment effect on the treated. If one includes all individuals whether or not they completed, then it is said the program effect is on the intention-to-treat population.

Another issue to consider in defining the cohort is whether one uses an entrance cohort or an exit cohort. Because services are individualized and because they are voluntary, the length of time that an individual is "treated" may vary considerably. That means that the time periods when outcomes are observed for the treated population may vary considerably. An entrance cohort defines the treatment group as the individuals who initiate their program participation in the same period of time. An alternative approach is an exit cohort that defines the treatment group as the individuals who end their program participation in the same period of time. An example may indicate the difference between an entrance and exit cohort approach. Suppose that we start with an entrance cohort. We'll define the treated population as everyone who started program services in a particular time period (say a quarter or a year). But suppose that one individual receives services for 6 months and another individual receives services for 30 months. If employment and earnings after receiving the treatment are benefits to be measured and included in the ROI calculation, there will be a 24-month lag between the two individuals' outcomes. In those 24 months, many events may occur, such as macroeconomic changes, that may differentially affect the outcomes. If one redefines the outcomes to be employment and earnings at some point in time after program entrance, then the first individual will have an extra 24 months in which to gain labor market experience.

On the other hand, if we use an exit cohort and define the treated population as everyone who received services and exited in a particular time period, then individuals who only received 6 months of services will have initiated their participation 24 months after individuals who received 30 months of services. The way services were delivered or the types of customers may change considerably in those 24 months, so again it may not be reasonable to compare the two individuals.

The question of whether to use an entrance or exit cohort depends on the definition of the "treatment" and on the data available. In most instances, the analytical question being addressed is the ROI of services provided by VR professionals at a particular point in time or to a particular group of customers. The preferred approach for this study would be an entrance cohort so that the effect of the services can be identified by comparing customers who received the services at that time to a counterfactual group of customers who did not receive the services. However, some data management information systems that are used for tracking outcomes may use program exit date as a baseline, and then the "second best," but only practical, approach is an exit cohort approach.

Another issue that confounds the definition of the treatment is recidivism. From an individual client's point of view, the services provided by VR may span several years, and in the case of recidivism, several spells. To the client, estimating the impact of the VR system, and by extension its ROI, should take a multiple year or lifetime approach. However, from the organizational point of view, the cohort approach is more practical and meaningful. The treatment is defined as services provided to participants in the cohort in their current spell, even if the participant had received services at an earlier time or will receive services in another spell in the future.

Time Period of Analysis

An ROI compares the outcomes of an investment to the investment itself. As the name suggests, outcomes occur after the investment is made. So time—between investment and outcomes—is an important component of an ROI analysis. Just as the definition of the treated population requires a specific time period, so does the definition of outcomes. Outcomes may be an economic flow variable such as earnings per time period, or they may be particular statuses as of a point in time, such as attaining an educational credential after treatment.

A practical method for selecting the time period of analysis is to limit it by data availability. If an analyst has, for example, 3 years of postprogram earnings, then he or she may limit the outcome period to 3 years. However, several factors may influence the definition of the outcome period. First of all, administrators usually want an evaluation or ROI calculation to be done on as recent data as possible. After all, if the purpose of the ROI is for program improvement, what good is evidence from the program as it operated several years ago? So an analyst may be requested to calculate an ROI with a very short outcome period, such as a year. For many outcomes, however, especially labor market outcomes, a short outcome period such as a year may not be sufficient for the program to show an effect.

On the other hand, it may be desirable to have a very long outcome period.⁶ In general, as long as benefits are likely to exist into the future, a longer outcome time period will increase an ROI,

⁶ Some argue that in the VR context, it may take 6 to 10 years for the rehabilitation services for some disabilities to affect outcomes. See Dean, Ashley, Rowe, and Schmidt (2006).

other things equal. This may mean that the ROI study has to be undertaken several years after the program services/investment were provided to participants, or that the analyst will have to extrapolate benefits.

Benefit Extrapolation

An analyst conducting an ROI study may be asked to extrapolate benefits in order to estimate a long-run payoff. For example, Hollenbeck and Huang (2003, 2006) estimated the ROIs of workforce development programs for a working lifetime. If one takes the outcomes from a treatment that involves receiving services from a workforce development program including VR and compares them to a baseline, meaning the outcomes that would result if the services were not provided, it is likely to be the case that the treatment outcomes exceed the baseline, i.e., benefits will be positive. The issue with which to grapple in an extrapolation is the time trend of outcomes. Will a short-term positive impact accelerate? Will it stay constant? Will it depreciate? Suppose, for example, that after receiving services, a cohort of VR customers averages \$500 more per quarter in earnings 3 years after participating in a program compared to a baseline forecast for these individuals at that time if they had not gotten VR services. Will the earnings advantage to participants grow over time to be bigger than \$500 per quarter? Will it stay right around \$500 per quarter? Or will it decrease over time to be significantly less than \$500 per quarter? Any one of these paths is possible.

The average earnings advantage of \$500 per quarter may arise because of a greater employment rate, because the VR customers work more hours per week, or because they are more productive on the job and earn a higher wage rate than the baseline forecast. These advantages may further improve the skills and productivity of the VR customers, who will stand to gain an even bigger earnings advantage over time, i.e., the earnings advantage will grow bigger than \$500 per quarter. That is, in this scenario, a short-term advantage accelerates.

On the other hand, a short-term advantage may dissipate if skill advantages or learning depreciates. Then a short-term advantage depreciates. For example, suppose that the earnings advantage of \$500 per quarter emanates from being trained to use a particular type of equipment or software. However, after 3 years, the customers' employers may begin to phase in other equipment or software and train other employees on the new technology. We would expect the earnings advantage to shrink and perhaps disappear altogether.

Finally, program services may provide customers with an advantage that results in a short-term gain, but no further gain or loss occurs. That is, the short-term advantage stays constant over time. In the example, the \$500 per quarter advantage stays about the same over time.

Perhaps the safest way to extrapolate benefits is to use program data to estimate a relationship with time, and then use that trend to extrapolate into the future. In any case, extrapolation is more of an art than a science and opens the ROI estimate to considerable statistical uncertainty.

Estimating Observed Outcomes

Probably the most important component of an ROI study is the counterfactual that is used to estimate the impact of the treatment. The benefits, or outcomes, in all ROI studies are *net impacts*. That is, they are outcomes that occur after the intervention of the treatment relative to what might have happened in the absence of the treatment. The hypothetical context of what would have happened in the absence of the treatment is referred to as the counterfactual.

Statement of the Problem

Appendix C presents the net impact problem in mathematical terms, but basically the desired information (which cannot be observed) is the difference between the outcome that occurs to a VR program participant once he or she receives rehabilitation services minus the outcome that would have occurred if the individual had not received such services. Obviously, individuals cannot simultaneously be in two states both receiving services and *not* receiving services—so we must *estimate* the net impacts.

That estimation is accomplished by having outcome data on the individuals who are treated and on other individuals who are not in the treatment group. Then statistical procedures can be used to analyze the differences, if any, in the outcomes of the two groups and to attribute those differences to receipt of the treatment. If it is possible to have the individuals in the two groups similar to each other, then we can have some confidence that any differences in outcomes are likely to be caused by the treatment.

Two important constraints on the data sets must hold in order for the statistical identification of a treatment effect. The first is called the support condition, which basically says that there are no observable characteristics that are unique to the treatment group or the nontreatment group. For example, the support condition would be violated if the treatment group consisted of VR customers who resided in one state and the group to which those customers were to be compared resided in a different state. If differences in outcomes were found, it would be impossible to identify whether those differences were caused by the VR services or by the economic conditions or other contextual variables that may differ between the two states of residence.

The second constraint is called conditional independence. It is similar to the support condition. Essentially, this condition holds if there is no set of observed characteristics that is perfectly correlated with receiving or not receiving the treatment. This condition would be violated in an ROI study of VR services if it just so happened that persons with a certain condition, particular gender, age group, or educational level happened to receive services, but no one with those same characteristics was in the comparison group. Then we would not be able to identify whether the outcomes were the result of the VR services or the unique characteristics. In many instances, conditional independence is simply an empirical question.

Methods of Estimation

Randomized controlled trials. Randomized controlled trials (RCTs), also referred to as random assignment experiments, are usually thought to be the most rigorous way to determine net impacts since participants are selected randomly and there is no way that systematic selection bias can occur. Any differences in the outcomes of individuals who receive the treatment from those who are randomly screened out of the program must be due to the

program itself since all other potential causal factors are randomly distributed. Because receiving the treatment is randomly determined, individuals' characteristics and whether or not they receive the treatment are uncorrelated by design, so the conditional independence assumption must hold.

In the VR context, it is unlikely an RCT could be implemented for an evaluation of program services in their entirety since that would require denial of services to the control group. If it were allowed to happen, the point of randomization would be after individuals were determined to be eligible. Then a fraction of the individuals (usually, but not necessarily, 50%) would be allowed to receive services, and the remaining cases would not. The randomization could be presented to potential participants as a "lottery" that has been necessitated by budgetary limitations. In some instances, an RCT is implemented by "wait listing" the control group. Then outcomes are observed during the waiting period before the control group is provided services.

A more likely and more feasible alternative would be an RCT to evaluate various types of services. For example, if there were interest in estimating the return to a particular type of assistive technology, an experiment could be run to provide the technology to a randomly assigned treatment group and to serve control cases in the status quo manner. There are, of course, many other variants for which an RCT could be used to evaluate the net impact.

On certain rare occasions, natural experiments may occur, and if they do, then analysts can exploit these situations to identify analytically the impacts of a treatment. A natural experiment would be defined as a situation in which randomization was used for programmatic or operational reasons, not just for evaluation reasons. The classic example of a natural experiment is the Vietnam-era selective service draft lottery. In the VR context, a local office or state may use a lottery system if it has too many applicants for a particular type of service.

Quasi-experiments. Another approach to attributing outcomes to an intervention when random assignment is not feasible or desirable may be referred to as a quasi-experimental
methodology.⁷ Just like in an experiment, the individuals receiving the treatment are referred to as the treatment group. However, instead of randomly screening out potential participants to form a control group, quasi-experiments use an alternative source of data to form the control group. For example, Hollenbeck and Huang (2006) used individuals who applied and were eligible for VR services but were never served under a plan for employment (Status = 30) as a source of comparison observations for a net impact evaluation of VR services on participants in Washington State. In quasi-experiments, the observations that are used to compare outcomes to the treatment group are called members of a comparison group, instead of a control group, which is the terminology used in RCTs. The methodology is referred to as quasi-experimental because it is intended to emulate an experiment, with the only difference being the source of the comparison/control groups.

There are many variants to how the comparison group in a quasi-experimental evaluation is developed. For expositional purposes, let T represent a data set with treatment observations, and U represent a data set from which the comparison set of observations may be chosen. Note that T and U may come from the same source of data or may be entirely different data sets. In the former situation, U has been purged of all observations that are also in T.

Various techniques have been suggested in the literature for defining the comparison group, but they may be boiled down to two possibilities: (1) use all of the U set or (2) try to find observations in U that closely match observations in T. Note that identification of the treatment effect requires that none of the covariates X in the data sets are perfectly correlated with being in T or U. That is, given any observation X_i , the probability of being in T or in U is between 0 and 1. The techniques that use all of U are referred to as full sample techniques.⁸ Techniques that attempt to find matching observations are called matching techniques. Appendix D describes these techniques.

⁷ Some evaluators prefer not to use the term *quasi-experimental* and simply refer to any approach that is not an RCT as *nonexperimental*.

⁸ Some of these techniques trim or delete observations from U, but we still refer to them as full sample techniques.

Regression techniques. RCTs and quasi-experimental techniques are intended to identify a treatment effect. That is, we want to have some statistical certainty that participation in the treatment, and not the characteristics of the participants, is what caused particular outcomes (which might be positive, essentially zero, or negative). Another method of identification, if one has the appropriate data, is to estimate a regression model that includes a dummy variable for being in the treatment. A linear regression *controls* for all of the observable characteristics of the program participants.

One regression approach that we might refer to as direct estimation has the following functional form:

(1)	$Y_i = a + BX_i + cT_i + e_i$		
	where	Y_i = outcome for individual <i>i</i>	
		X_i = vector of sociodemographic	

characteristics of individual *i*

 $T_i = 1$ if individual *i* participates in

the treatment; 0 otherwise

 e_i = error term a, B, c = estimated parameters

The estimated coefficient, c, would be the net impact estimate for this particular outcome variable.

Other regression techniques that may be used to identify treatment effects are instrumental variables and regression discontinuity. Equation 1 requires certain assumptions to hold in order to provide unbiased estimates of the treatment effect. In particular, it is assumed that the treatment variable, T_i , is uncorrelated with the error term. However, for various reasons, that assumption may not be true, in which case it is said that the T_i is endogenous. In this situation, it may be possible to identify instrumental variables, which are variables that are correlated with the treatment variable, but uncorrelated with the outcome variable. In the VR context, an instrumental variable (if it were available) might be distance between an individual's home and closest VR office. That variable might be correlated with whether an individual receives VR services, but should be totally uncorrelated with labor market outcomes. A regression discontinuity approach might be appropriate if there were a programmatic rule or regulation that sharply divided a population between those who receive a service and those who don't. An example might be if a particular test result (such as an IQ test) were used to screen clients, such that individuals with a test score below a certain level were eligible for a service, whereas individuals above that level were not. Then a regression could be run using observations for which that test score is very close to the criterion (over and under) to see whether the eligibility and service make a difference in terms of impacts.

The data required to estimate Equation 1 or the instrumental variables or regression discontinuity alternatives would be administrative data that contain information on individuals who received the treatment and individuals who did not receive it or, lacking that, a survey of individuals who did, or did not, receive the treatment. For example, in the VR context, if a state had follow-up information on all individuals who applied for services and could identify those customers who actually received services, then a regression model like Equation 1 could be estimated by using these data. Alternatively, the state could commission a sample survey of individuals who applied for services and estimate Equation 1 from these primary data.

Post – **pre.** The fourth type of estimation methodology is similar to the quasi-experimental estimation technique, except that instead of finding a comparison group, the participants who receive the services themselves provide the counterfactual situation. This is done by comparing the outcome variables prior to receiving the treatment to those same variables after receiving the treatment. This is called a post minus pre approach and is generally considered to be a weak methodology because of its reliance on two very strong assumptions. The first underlying assumption is that in the absence of the treatment, the participants would have continued in their pretreatment circumstances (or their exact equivalent). Secondly, it assumes that receiving the treatment is the causal factor for any change in or improvement over the individual's prior position. The former assumption is problematic because the individuals receiving the treatment were likely to have had something occur that caused them to seek help. In essence they are in the treatment group because their preprogram circumstances

were unlikely to continue. The second assumption—that the treatment is the causal factor—is problematic because many factors change over time in addition to receiving the treatment. Individuals' ages, skills, and sociodemographic characteristics may change as well as the local economy and, thus, the demand side of the labor market.

Exhibit 4.1 continues the case history from chapter 2 to show an example of how a treatment effect might be identified.

Exhibit 4.1. Case History (Continued)

A detail that was glossed over in the case history presented in chapter 2 is how it was estimated that, in the absence of receiving services, Steve would have worked intermittently at jobs that he could handle and would have earned about \$12,000 per year. This is precisely the issue that is being discussed in this section of the chapter.

To derive that estimate, the evaluator used a quasiexperimental approach. Steve's case occurs in Maine. The evaluator was able to access the Maine administrative data on all individuals who applied for unemployment insurance at about the same time that Steve applied for VR services. The unemployment insurance application denotes a self-reported disability status as well as other educational, family, and labor market background information. The evaluator extracted the observations that had a reported disability and deleted observations in the remaining group that were served by VR. The remaining observations comprised the comparison group pool.

A statistical match was conducted, and for Steve, observations were chosen that matched well on having been in the paper industry, having an educational attainment at the high school diploma level, being married, and having children. After matching all of the members of Steve's cohort in VR to the observations in the comparison group pool, a comparison group was formed. By statistically analyzing the subsequent quarterly wage record data for the individuals in the comparison group, it was determined that an individual with Steve's characteristics would earn \$12,000 per year.

Simulating/Imputing Unobserved Outcomes

In some circumstances, it may be possible to include in a benefit-cost or ROI calculation outcomes that are not directly observed in the data. For example, if observed net outcomes include reliable labor market information such as employment, hours of work, or wages, then it might be possible to impute payroll and income taxes at the state and federal level. These imputed taxes would be costs (or negative benefits) to participants and benefits to the public sector/society. Furthermore, if the analyst conducting the ROI study has enough data, then it might be possible to simulate net changes in means-tested transfer payments that might occur if the treatment at issue alters the participants' income. Decreases (increases) in the participants' transfer payments would be considered a cost (benefit) with an equal benefit (cost) to the public sector.

Imputations of unobserved outcomes increase the statistical uncertainty of the results. Thus, simple rules of thumb about whether to undertake them can be articulated. First, these outcomes should be quantitatively important to the overall results in order to justify the increased uncertainty. Second, the statistical precision of the imputation should be considered. For example, the mechanical rules of the payroll tax (Federal Insurance Contributions Act [FICA]) are quite precise and should not introduce additional statistical error. On the other hand, results found from a statistically estimated model of a behavioral response to a policy or practice may introduce considerable statistical error and thus should probably be avoided.

Estimating Costs

In general, estimates of costs of VR programs will be of two types based on who is bearing the costs. The first, and predominant, type is the cost of services provided. These costs include direct financial payments in the form of reimbursements or purchased services made in a case, salary costs of VR professionals who spend time on the case, and administrative costs that can get allocated to the case. The second type is costs that are (or may be) borne by participants. Such costs include the value of the time that is spent receiving program services and any costs associated with participation. The time cost for participants is typically estimated as forgone earnings, i.e., reduced earnings while the participants were actually engaged in the programs. These topics are addressed in the following sections.

Direct Costs of VR Service Provision

Once an applicant is accepted for VR services, the counselor and customer develop an individualized plan for employment, which specifies a wide assortment of services that may be provided. In addition to counseling and guidance, these services can include, for example, diagnostic and evaluation services, restorative medical care and assistive technology, training, education, and job search and placement services. These services can be provided to an individual through three separate channels: (a) as a purchased service through an outside vendor paid for using VR funds; (b) internally by VR agency personnel; and (c) as a "comparable benefit" purchased or provided by another governmental agency or not-for-profit organization with some cost-sharing or no charge to the VR agency.

Purchased services are the most readily measured direct cost, as the VR agency records the cost of such service provision through its financial accounting system. Such services are usually classified along the lines of medical procedure codes that are then aggregated into procedure or service categories and recorded on an individual basis at the time of the case closure. Services provided "in house" by VR personnel typically include counseling, guidance, and placement services by the individual counselor, his or her aides, or supervisors who carry a caseload. Moreover, other specialized services directly provided in house by VR professionals include vocational evaluation and training, orientation and mobility, and rehabilitation teaching. Such inhouse services may be provided by a state-operated rehabilitation facility (there are eight nationwide) or in a field office. Procedures to account for the cost of the provision of such services vary across states; such services may or may not be recorded on an individual customer basis. For sure the salaries and fringe benefits of VR personnel are not available on an individual customer basis. While also a direct service, the extent of the provision of comparable benefits is difficult to determine, as the procedures for recording

these vary from state to state. As with in-house services, there is no reporting of the cost of such services provided to the individual consumer.

Administrative Costs

A variety of administrative costs are incurred in the purchasing, provision, or procurement of services by VR professional staff. Beyond the direct costs of the VR counselors are those agency costs supporting counselor activities directly or indirectly, including

> clerical personnel, . . . medical consultants, interviewers, placement officers, and specialists, district and local supervisors (except that portion of their time assigned to a caseload), non–caseload carrying rehabilitation teachers, psychologists, social workers, and other professional personnel who do not have a caseload carrying responsibility. (p. 13)

Other governance and administration costs are incurred for program planners, budgeting and fiscal personnel, and staff development and clerical personnel who support the administrative staff functions. Additional administrative staff includes "staff providing management and supervision services under the Business Enterprise Program (e.g., Randolph-Sheppard Program) [and] State Coordinators for the Deaf and the Deaf/Blind" (RSA, 2009, p. 13).

Finally, a public VR agency may also incur costs for services for construction of facilities for community rehabilitation programs, for innovation and expansion projects, and for other special services for specific populations of consumers with disabilities (e.g., provision of nonvisual access to information for individuals who are blind and of captioned television, films, or videocassettes for individuals who are deaf or hard of hearing). It is the usual practice to determine the annual costs of these administrative items and allocate them to consumers on a per capita basis.

Time Costs for Participants

For consumers with disabilities participating in a public VR program, the time costs to consider in the benefit-cost analysis involve the potential loss of opportunity to be working and generating income or conducting other activities rather than receiving VR and related services. An estimate for these costs is the earnings of comparison or control group members during the length of training. If an analyst is using an entrance cohort approach, and the average duration of services for the treatment group is *d* quarters, then an estimate of forgone earnings would be the average quarterly earnings⁹ of the VR customers while they are receiving services times *d* minus the average quarterly earnings of the comparison or control group for the first *d* quarters after they would have entered the program. Note that these "costs" may be negative if customers work and receive earnings while they are receiving services.

Statistical Uncertainty

As with any analysis of data, ROI estimates are subject to statistical uncertainty. Sources of this uncertainty include sampling error if data used to generate the estimates are compiled through sample surveys, and nonsampling error such as misreported data, estimation biases, or analytical mistakes. Analysts conducting ROI studies should attempt to minimize such error, as feasible, and consumers of ROI studies need to recognize the existence of such error whenever they use the results.

Most ROI studies are based on administrative data. Whereas administrative data sources are thought to be highly accurate, an early step to take in any ROI study is to thoroughly edit these data. Care should be taken to make sure that key variables, such as those related to labor market outcomes, do not take on infeasible values. It is good practice to examine the minima and maxima of the distributions of these variables to identify cases in which these data were entered incorrectly.

The construction of a comparison group in order to estimate net impacts is prone to selection bias. For example, using

⁹ These are unconditional averages of earnings, i.e., they include zeros.

VR clients who are coded as status 30 may be problematic in estimating the net impact of VR services for clients. Individuals who apply for services, but do not receive the services, may have disabilities that do not meet order of selection criteria or may find employment and therefore are likely to have more positive labor market outcomes than customers who receive services. On the other hand, the individuals who are not served may not have the motivation or may have other barriers that prevent them from benefiting from services, and so they are therefore more likely to have less positive outcomes. In any case, use of this comparison group may introduce bias into the net impact estimation. (Of course, it should be recognized that this comparison group may introduce less bias than not using any comparison group, which is effectively assuming that the counterfactual is no earnings or employment.)

One way to address statistical uncertainty is to conduct robustness testing. This involves, for example, making slightly different assumptions about parameters and recalculating ROIs. If relatively minor changes in parameters result in relatively large changes in estimated ROIs, then there is relatively high statistical uncertainty in the estimates. If they result in only minor changes to the estimated ROIs, then there is less statistical uncertainty. Technical documentation of the ROI estimates should include a discussion of the robustness testing that has been undertaken and its results.

Inflation Adjustments/Discounting

As noted above, time is an important consideration in estimating ROIs because it is usually the case that the benefits of service delivery occur in the future, whereas the investment costs generally occur in the present. The ROI calculation involves comparing net benefits to costs, but if inflation has occurred between their incidence, then the numerator and denominator have different units and are not comparable. Thus, it is always necessary to measure these constructs in real terms, i.e., adjusted for inflation. Typically, the consumer price index for urban residents (CPI-U) is used to make these adjustments. The U.S. Bureau of Labor Statistics publishes these data on a monthly and annual basis, and if projections are needed, virtually any macroeconometric model will forecast this price index.

The CPI-U is an index number that has a value relative to a baseline time period. The baseline period is assumed to have an index of 100. If an analyst has an outcome measured in year t_1 and a cost measured in year t_0 , then to adjust the outcome to be in the same year's dollars as the cost, the analyst would divide the outcome by the ratio of the CPI-U in t_1 to the CPI-U in t_0 .

As described in chapter 2, an analyst may also wish to discount future benefits over and above the inflation adjustment. The reason for this is that the returns to an investment that occur in the future may have some risk or uncertainty. So a prudent, risk-averse individual would prefer to have a dollar now rather than a promise of getting an inflation-adjusted dollar in the future. Consequently, benefits are discounted. The usual practice is to use a discount rate that is on the order of 3% to 5%. The higher the discount rate, the lower the ROI of an investment will be.

Multiplier/Displacement Effects

If VR increases the employment or earnings of a participant, then that individual may spend the additional earnings and generate second and further rounds of economic activity. In some circumstances, when there is a large change in earnings or income, a national or regional economic model can be used to estimate second and higher-order effects as those earnings or income changes affect the economy. The ratio of the total change in economic activity to the initial change in earnings is called the multiplier. This is often done in economic development analyses. So, for example, if the multiplier in a given state is 2.0, then a federal investment (say a new highway) of \$100 million will generate \$200 million of economic activity in the state. The analog in the VR context is that if the average VR customer increases his or her earnings by \$10,000 a year in this state after receiving services, then we might assume that the benefit to state residents was \$20,000 per VR participant if we were to apply the multiplier.

However, in general, multipliers are not used in ROI studies. A reason for this is because of displacement effects. If the labor market in which the VR customers work is tight (fairly low levels of unemployment), then the increase in employment or hours is coming at the expense of somebody else who would have gained the employment or hours instead. This is referred to as displacement—the VR customer has displaced another worker. The displaced worker now has less earnings to spend, and so that individual will generate negative second and higher-round effects on the economy. In fact, the Office of Management and Budget (1992) released Circular A-94 revised, which indicates that federal projects should assume that labor markets are in equilibrium and that multipliers should not be employed.

Review of Extant ROI Studies

This section briefly reviews selected ROI studies from a few states whose study information was readily available and sufficient in order to provide a thorough critique. Each review presents the overall findings and then notes how the "key ingredients" of ROI studies, as described in this chapter, were treated. The reviews are in no way intended to be evaluative. Rather, the intent is to be instructive about assumptions and methodologies used in the studies. Furthermore, the studies that were selected were those familiar to the authors. They do not exhaust the set of available state-level studies, and whether a study is included or excluded is not intended to be an endorsement or lack of endorsement of its quality or usefulness. Because the studies have not been prioritized in any way, they are presented in alphabetical order by state.

Massachusetts

The Massachusetts Rehabilitation Commission retained Commonwealth Corporation to conduct an ROI analysis of its public VR program in 2004 (Uvin, Karaaslanli, & White, 2004). The researchers examined the cost and benefit to participants, taxpayers, the government, and society from the provision of VR services. The study found the following:

• \$5 was returned to the government in increased taxes and reduced public assistance over the clients' lifetime for

every state dollar spent, with \$1.70 returned in the 10-year period after services ended.

- Participants, i.e., individuals who had received VR services, whether or not they were successfully closed, had, on average, an increase of about \$60,000 in lifetime earnings after exiting from the rolls.
- The increase in average annual earnings associated with the receipt of services rose from \$495 in the first year to \$1,503 in the third year after case closure.
- Clients receiving services had a 12.3% higher average annual employment rate than a comparison group of individuals who did not receive services.

The study also examined how gender, race/ethnicity, disabling condition, and employment at the time of application affected net earnings and the employment impact of services.

Treatment and treated population. Two models were used in the study. The post–pre model analysis (based on Hemenway & Rohani, 1999) included an exit cohort of all 19,355 participants whose cases closed in 1999 or 2000. The quasiexperimental study (based on Hollenbeck & Huang, 2003) included an exit cohort of 11,435 clients between the ages of 19 and 50 (at the time that eligibility was determined) who applied for services in or after January 1995, who received substantial VR services (Status 26 or 28), and whose cases were closed in 1999 or 2000. Data availability dictated the use of exit cohorts for the treated population, which as noted earlier is less preferred than using entrant cohorts. It is recognized that at this time, the data used in this study and thus the VR services received by the treatment group come from an environment that is over a decade old.

Time period of analysis. The post – pre study used data from the Rehabilitation Services Administration (RSA)-911 and RSA-2 reports for 1999 and 2000 (which do not include longitudinal data) and extrapolated net benefits over a 30-year work-life period. The quasi-experimental study merged data from the RSA-911 report for cases closed during fiscal years (FY) 1999 and 2000 with quarterly earnings from January 1995 to September 2003 reported by unemployment insurance (UI) wage record matching for the clients. Outcomes were examined 1, 2, and 3 years after services, and earnings were extrapolated to estimate lifetime benefits over a 30-year work-life period. Analysts are often asked to extrapolate benefits far into the future because in the out years, it is generally the case that net benefits will accrue (costs, for the most part, were borne much earlier). This means that the ROI will be much larger than if the analysis period were shorter. In general, readers and users of a study that uses lengthy extrapolations need to remember that they are not based on data and introduce considerable statistical uncertainty.

Estimation of treatment outcomes. The study estimated outcomes using several methods. Using a post – pre model with the closure cohort for the years 1999 and 2000, the average earnings increase based on the RSA-911 report was \$3,580. The study imputed reduced public assistance and increased tax payments (assuming a marginal tax rate of 23%) and extrapolated the net benefits to taxpayers over a 30-year work-life period using a discount rate of 5%. The resulting ROI estimation was \$7 for every state dollar invested. Again, the post – pre approach relies on very strong assumptions that the pre-encounter experiences of clients make a reasonable counterfactual.

The second model used a quasi-experimental approach in which the comparison group consisted of 5,164 clients between the ages of 19 and 50 who were deemed eligible for services, but who chose not to participate before individualized plans were initiated (Status 30). Benefits included increased discounted lifetime earnings, fringe benefits, and tax contributions and reduced public assistance. Lifetime earnings were estimated by extrapolating the net earnings impact estimated in quarters 3 and 10 following case closure over a 30-year work-life period. Fringe benefits were estimated as 25% of earnings based on the 2002 and 2004 Bureau of Labor Statistics reports. Tax payments were estimated using the current tax rates for Social Security, Medicare, and state income tax (6.2%, 1.45%, and 5.3%, respectively), a marginal federal tax rate of 10%, and a sales and excise tax rate of 2.3%.

Earnings were adjusted to 2000 dollars using the CPI-U. Participants were assumed to be employed in a quarter if they earned at least \$50. If earnings were less than \$50, earnings were set to zero. If no wage record data were available, it was assumed that participants had no earnings. The authors noted that at the time of closure, the UI data covered only 67% of the participants who were reported to be employed on the RSA-911 report, possibly because participants were self-employed or employed in positions not covered by UI (such as religious organizations or some agricultural industries). In a state like Massachusetts that has employment opportunities in adjacent states (New Hampshire, New York, Connecticut, Rhode Island) for its residents, the employment and earnings coverage of state wage record data may be low. Of course, the net impact estimates will not be biased unless the out-of-state employment rates differ for the treatment and comparison groups.

The authors used three methodologies to estimate net earnings and employment rates in the quasi-experimental model: (i) a simple comparison for clients who did and did not receive services; (ii) a regression-adjusted comparison accounting for the preservice earnings trajectory, type of disability (using nine classes), number of quarters between eligibility and closure, and local labor market and economic conditions; and (iii) a regressionadjusted comparison in which net impact was defined as the difference in employment and earnings of the program group and comparison group in certain quarters and years after closure (i.e., exit from program) minus that in various base periods such as the third, second, and first years before program entrance (i.e., before eligibility determination).

Reporting net impacts using three different estimation methodologies may be problematic. If the results are in accord with each other, then the reader/user of the results has buttressed confidence in them. However, if the results are discordant (one or two differ from the others), then the reader/user cannot be sure which results are most reliable. Our general recommendation is that results should always be regression-adjusted to overcome any selection bias that may occur in observable variables. Furthermore, difference-in-difference models are generally thought to be somewhat stronger than levels models because they net out timeinvariant portions of the error term. Our suggestion would be to report the regression-adjusted difference-in-difference estimates (or other favored specification), and use appendices to report other specifications.

Investment costs. Direct and administrative costs of program services were obtained from the RSA-2 report, and public assistance expenses were obtained from the RSA-911 report. The average expenditure of state funds was estimated by dividing the total program expenditures by the number of individuals in the study and by the length of time for which services were provided. In the quasi-experimental model, costs also included out-of-pocket expenses of participants and predicted forgone earnings. To calculate the present value of future revenues, the authors used 5% (following Hemenway & Rohani, 1999) and 3% (following Hollenbeck & Huang, 2003) discount rates in the post - pre and quasi-experimental models, respectively. The approaches used in this study calculate net impacts and ROI on an (average) individual basis. VR investments vary widely across individuals-variation that would only be picked up in this kind of study by examining subgroups of the treated population that are classified by services, duration, or expenditure level.

Statistical uncertainty. The net impacts used in this study to calculate ROI were estimated using both a post – pre model and a quasi-experimental model in which net impacts were estimated using three different techniques. Although the ROI estimate and employment rate change were sensitive to the model assumptions, the conclusions that the ROI was positive and that employment rates increased were robust. In addition, the study included sensitivity analyses to evaluate the effects of estimation methods, treatment and comparison group definitions, and choices of comparison periods in the difference-in-differences method. The authors also examined the effects of selection bias using propensity score matching. The sensitivity analyses are to be applauded. All ROI studies should conduct similar analyses in order to inform the reader/user of how sensitive the results are to the various assumptions used in the calculation of ROI.

Utah

The Utah State Office of Rehabilitation (USOR) conducted an ROI analysis for VR services in 2010 (Wilhelm & Robinson, 2010). The study compared the benefits to the state in the form of increased state tax revenue, decreased public assistance, and decreased Medicaid payments with the annual state expenditures on the VR program. In addition, the authors estimated the benefit to Utah of the increased taxes collected from employees and service providers whose jobs were funded by the federal VR funds allocated to the state. The study indicated that \$5.64 was returned for every state dollar spent, on average clients receiving services were 9.1% more likely to be employed and earned \$1,500 more per quarter, and VR services resulted in reduced public assistance expenses of \$32 million over the lifetime of the FY 2005 program participants.

Treatment and treated population. The study included clients who submitted applications for services after December 1, 2001, and whose cases were closed between October 1, 2004, and September 30, 2005. This "treatment" group consisted of 3,972 clients who received VR services during this period (Status 26 or 28). The extent and intensity of the services rendered was not considered, and participants were not separated by type of disability. Selection of participants was not random, but rather was dependent on individual choices to pursue or drop out of the VR program. Note that the cohort being analyzed was exiters, or more precisely case closures. We recommend the use of entrant cohorts, but data availability often dictates the use of exiters. Interestingly, the analysts did truncate the treatment population to individuals who had applied for services on or after a particular date, which ameliorates somewhat the criticism of not using an entrant cohort because the constraint deletes from consideration "outliers" who may have been on the rolls for several years. The "cost" of this deletion was approximately 15% of the sample.

Time period of analysis. The study used data collected by USOR for reporting to the RSA and quarterly data collected by the Utah Department of Workforce Services on employment covered by UI spanning the 3 years prior to application for services and the 3 years following case closure for each participant. Using the average age of the participants (41 years), the authors applied the calculated increase in earnings and resulting tax revenues over 24 future years of employment (until age 65) to estimate lifetime benefits. Thus the study extrapolated benefits to the VR services for the "average" participant.

Estimation of treatment outcomes. A quasi-experimental approach was used in which the comparison group consisted of

2,058 clients who were deemed eligible but who chose not to participate (Status 30). The program and comparison groups had similar gender, race, ethnicity, education, and disabilities (evaluated as not significant, significant, or most significant).

Earnings outcomes were estimated as the difference in earnings for the 3 years after closure compared with the 3 years prior to application. The comparison of earnings was limited to participants who were employed following case closure, whereas analysis on employment outcomes included participants who were not employed continuously. Earnings were adjusted to 2008 dollars using the CPI-U. A multivariate regression was used to account for individual characteristics (e.g., severity of disability) and labor market differences (using the regional unemployment rate). Individuals were considered employed if they had at least \$50 per quarter in earnings. Otherwise they were considered unemployed. If no data were available from the Utah Department of Workforce Services, it was assumed that participants were unemployed and had no earnings. Tax revenues were estimated from the earnings data using a rate of 11.4%, which was based on the current (2009) taxes for Utahns with similar total earnings. The ROI calculation used the average decrease in public benefits for all successful VR closures. The Medicaid savings included only the reduction in the amount paid by the state (25% of annual benefit payments).

Due to sample size limitations, the study's quasiexperimental approach used all of the comparison group pool and did not do any statistical matching to the treatment population. This requires an assumption that there are no unusual outliers in the treatment or comparison group population that might skew the results. The regression-adjustment of outcomes is to be commended since it controlled for differences in observable characteristics between the treatment and comparison populations. Presumably key variables used to adjust the outcomes were the severity of the disability and the regional unemployment rate.

The purpose of this study was to examine the return to the state of Utah, and so the study did not provide information o the net impact of the VR services to individuals. The increased taxes were state and local taxes only and did not include federal income or payroll taxes. The reductions to public benefits did not include federally funded benefits.

Investment costs. Costs included the annual state contribution to operating and administering the USOR. Forgone earnings of the participants while receiving services were not considered. Federal funds spent on USOR were considered separately, as a benefit to the state resulting in additional jobs and additional tax revenue. The authors calculated the present value of tax revenues estimated over the participants' lifetimes using a 3% discount rate.

It is likely that the analyses of additional benefits to the state of federal funds spent on VR overestimate the benefit since these analyses do not seem to net out the payment of federal income or payroll taxes by workers and firms. Furthermore, some of the federal funding may have been used to purchase services from out of state vendors.

Statistical uncertainty. The study acknowledged that employment and earnings may have been underestimated owing to the reliance on UI data, which do not include self-employment or employment in certain positions (such as religious organizations or some agricultural industries). Appendices to the report show the statistical error associated with the regression adjustment of earnings and employment.

Virginia

There have been three separate evaluations of the Virginia Department of Rehabilitative Services over the past two decades conducted by Dean et al. This section presents a thumbnail summary of the second of these.¹⁰ Dean and Schmidt (2005) examined the impacts of the Virginia Department of Rehabilitative Services using a comprehensive ROI framework based on the

¹⁰ The initial evaluation (Dean & Dolan, 1991a, 1991b) used a sample frame drawn from closed cases from the Department of Rehabilitative Services in 1982, stratified by gender and three impairment groupings—cognitive, physical, or mental. Administrative data were used to obtain 4 years of preprogram and up to 3 years of post-VR closure earnings. Earnings gains were more pronounced for women than men, on the order of about \$1,000, and exceeded 100% of preprogram earnings for females with cognitive impairments. Dean, Dolan, and Schmidt (1999) subsequently conducted a nationwide analysis of VR using a similar framework for all VR closures in 1980 using the RSA-300 closure records merged with annual earnings from 1972 to 1988 obtained from Social Security Administration records.

seminal work of Long, Mallar, and Thornton (1981), which identified the costs and benefits according to three distinct perspectives: those of an individual VR participant, the VR agency, and society. The results, calculated for men with a musculoskeletal impairment who applied for services in FY 1988, showed that from the agency's perspective, the ROI to the government over a 10-year period, comparing increased tax payments to the costs of VR purchased services, resulted in a benefit-cost ratio of 1.78, meaning that \$1.78 was returned for every \$1 invested. Similarly, the return to the individual from the agency's perspective, i.e., comparing increased after-tax earnings to the cost of purchased VR services, was a much higher 4.65. On the other hand, the return from the individual's perspective was much lower, at 0.97, since the opportunity costs of the participant's time was greater than the cost of VR services. The return to society as a whole was 1.11.

Treatment and treated population. This framework was implemented using a narrowly drawn cohort of men with a musculoskeletal impairment who *applied* for VR services in 1988. Thus, the strategy of this study was to attempt to identify a program impact (and ROI) on a relatively homogeneous population, i.e., individuals of the same gender and impairment. The study indicated that the number of individuals who received services over the timeframe was 1,469. The homogeneity of the study's population has an advantage, but also a disadvantage. The advantage is that it more narrowly and accurately estimates the effect of VR services for this population since the effect cannot be attributed to sex or impairment. The disadvantage is that it is of limited usefulness to the agency if the purpose of the ROI calculation was to evaluate or assess the agency's overall effectiveness.

The study used an entrance cohort as opposed to an exit cohort, which as described above is the preferred methodology for an ROI analysis; although it results in estimates that apply to service provision that took place a number of years ago.

Time period of analysis. Quarterly wage record data from the Virginia Employment Commission were used to measure employment and earnings for a period of 3 years prior to VR application and up to 10 years after application. The study did not

rely on extrapolation of benefits. Presumably the earnings and employment advantage for the treatment population would persist beyond the 10-year timeframe of the study, and so the reported ROIs are conservative.

Estimation of treatment outcomes. Benefits included treatment effects separated into the present value of increased posttax earnings as well as increased governmental tax revenue, using a 4% discount rate for both a 5- and 10-year post-VR application period and quarterly employment data from the Virginia Employment Commission. Both a quasi-experimental approach and a regression approach were used to estimate net impacts on earnings. The regression estimates used the Heckman two-stage selection bias correction method (an estimation method also referred to as Heckit). The first-stage regression estimates the probability of being in the treatment group, and the second stage uses the estimated inverse Mills ratio for each observation as a regressor in the earnings equation. The quasi-experimental approach used a bin-stratified matching technique. The authors noted that the Heckit technique provided greater treatment impacts than the stratified bin-matching technique.

Taxes were estimated by applying a constant marginal tax rate of 27.65% (equal to 15% for federal income tax, 5% for Virginia state income tax, and 7.65% for payroll/FICA taxes). No attempt to estimate changes in public assistance benefits was made in this study.

Investment costs. The estimated benefits were compared to the total costs of purchased VR services and the opportunity cost of the participant's time in VR. Note that neither direct nor indirect in-house or administrative costs were allocated. This implies that the ROIs are overstated since the full agency costs are not included in the denominator. The time costs for participants were estimated using the weighted average of earnings for the treatment group for the 3-year period prior to VR application. The study indicated that this weighted average¹¹ was an arbitrary ad hoc estimate and made the rather strong assumption that customers had no earnings while receiving services.

¹¹ The weights that were employed were 10% on earnings from 3 years prior to application; 30% on earnings from 2 years prior; and 60% from the prior year's earnings.

Statistical uncertainty. The regression analyses yielded estimated standard errors that yielded direct measures of statistical uncertainty of the estimated impacts. Furthermore, having 5- and 10-year estimates provided some sense of the stability of the results.

Postscript. Dean, Pepper, Schmidt, and Stern (2011) updated the existing evaluations of VR services in Virginia by conducting an evaluation of all persons with mental illness who applied for VR services in state FY 2000. Tracking an applicant cohort forward avoids the problem of comparing outcomes for VR participants with wide variations in program duration who applied for services over different time periods. Longitudinal employment data from the Virginia Employment Commission provided quarterly earnings from the period 3 years prior to VR application through 10 years postapplication, which allowed for an examination of any long-term employment outcomes. The "selection problem" that arises when unobserved factors associated with VR service receipt are correlated with VR program outcomes was addressed by (1) using a structural model of the VR selection process into any of six distinct service types (i.e., diagnostic, training, education, restorative, maintenance, and other) that (2) incorporates "instrumental variables" (i.e., factors that are assumed to impact the service receipt but not the subsequent employment outcomes) and that (3) incorporates preprogram labor market outcomes that control for differences between those who will and will not receive these VR services.

The results suggested a complex interaction of the impact of VR services on both employment probability and subsequent earnings. Preprogram labor market experiences varied among those receiving the six service types; estimated employment effects were positive for some services and negative for others, while earnings effects were consistently positive. Combining these outcomes resulted in positive long-term earnings gains for almost all service types, averaging on the order of \$2,000 to \$8,000 for persons with mental illness. Overall, VR services had a positive average ROI, with average long-term benefits of \$5,700 to \$14,000, depending on how one interprets the results of diagnosis and evaluative service receipt, and average service costs of \$3,200 to \$5,000. There was, however, wide variation in this return across VR participants. Depending on the estimates of fixed costs in VR, some one-sixth of VR participants with mental illness had service costs that exceeded long-run earnings gains, and half had long-run rates of return on the order of 18% and 30%.

Washington

Using administrative data, Hollenbeck and Huang (2006) estimated the ROI for individuals served by the Washington Division of Vocational Rehabilitation, taxpayers, and society over two time periods: the first 2.5 years after exit and over an average working lifetime. Table 4.1 provides the estimated benefits and costs from that study. For society as a whole, the taxes and transfers netted out to zero, so the benefits (discounted at 3%) and costs per customer in the first 2.5 years after exit were \$10,840 and \$8,640, respectively. This worked out to an annual ROI of 9.50%. For the average participant's working lifetime, the total benefits were \$63,374 (discounted at 3%) and the costs did not change. Using these figures, the annual ROI was 8.09%.¹²

	First 2.5 years		Lifetime (until 65)	
Benefit/cost	Participant	Public	Participant	Public
Benefit				
Earnings	9,034	0	52,812	0
Fringe benefits	1,806	0	10,562	0
Taxes	-1,559	1,559	-9,110	9,110
Transfers				
UI	410	-410	1,072	-1,072
TANF	-449	449	-675	675
FS	-282	282	-660	660

Participant and Public Benefits and Costs per Participant in Washington Division of Vocational Rehabilitation Program

Table 4.1

¹² In general, the formula for the annual ROI when a benefit-cost ratio has been calculated for a period of *t* years is the *t*-th root of the benefit-cost ratio minus one. Thus, the annual ROI for the data from Table 4.1 for the first two columns is the ratio of benefits to costs (10,840/8,640 = 1.2546) raised to the 1/2.5 power minus 1, which equals .0950 (9.5%). The annual ROI for the last two columns is the ratio of benefits to costs (63,374/8,640 = 7.335) raised to the 1/25.6 power minus 1 = .0809 (8.09%).

Medicaid	-398	398	-1,431	1,431
Costs				
Forgone earnings	-707	0	-707	0
Program costs	0	9,347	0	9,347

Note: Entries in 2010 dollars; discount rate is 0.03; average age at program exit = 39.4.

UI indicates unemployment insurance benefits; TANF, Temporary Assistance to Needy Families; FS, food stamps.

Treatment and treated population. The treated population in this analysis was any individual with a status code of 26 or 28 who was coded as a case closure in state FY 2001 (July 2001 to June 2002). The extent and intensity of the services rendered were not considered, and participants were not separated by type of disability. As with several of the other state studies, this one used an exit cohort for its definition of the treatment group. Besides that limitation, the presenting data are now over a decade old.

Time period of analysis. The study estimated short-term outcomes (3 quarters after exit) and longer-term outcomes (9–12 quarters after exit). Wage record data on earnings prior to program entry were also used in the analyses. These data went back a variable number of years depending on the individual's work history in the state, but in no case did they go back further than 1994. As noted in the table, benefits were extrapolated to the end of the typical customer's work life, which was assumed to be age 65. The columns of the table labeled "First 2.5 years" are based on actual data; the columns labeled "Lifetime (until age 65)" are extrapolations and, as such, are much more uncertain.

Estimation of treatment outcomes. A quasi-experimental methodology was used to estimate the net impacts on employment and earnings of participation in the Washington Division of Vocational Rehabilitation programs. Using an exit cohort, individuals who received services were matched to those who applied but did not receive services (Status = 30).¹³ Propensity

¹³ The study also matched the participants who had been served to individuals who had applied to the Job Service who were 16 to 60 years old. However, the

score matching was done. This procedure was accomplished in two steps. First, a participation model was estimated using logit, and then matching was done using the estimated propensity score from the logit estimation. The match was accomplished by finding, for each observation in the treatment group, the observation in the comparison group that had a propensity score that was closest in value to the propensity score of the treatment observation. The statistical match was done with replacement, so some observations in the comparison group pool were the "matches" for more than one observation in the treatment group. Absent the possibility of conducting a random assignment experiment, the quasiexperimental methodology is probably the most rigorous approach to identifying the causal impact of VR services. However, it does require the assumption that all of the selection into the program is based on observable characteristics.

The study also estimated net impacts for two subgroups of customer participants—those who completed their activities and noncompleters. The results for the program completers "swamped" the noncompleters' net impact estimates. The longer-term employment and earnings impacts for the completers were all positive and sizeable. These same outcomes were negative for noncompleters. Both the short-term and longer-term net impacts for earnings for program completers were on the order of 30% to 35%. In both the longer-term and short-term net impact estimates, there were sizeable reductions in public assistance for the completers. That is, the completers were likely to go off the welfare rolls and noncompleters actually increased their likelihood of being on the rolls.

This study looked at two subgroups of the treatment population. Whereas the results for clients who complete their activities versus those who don't are quite predictable, calculating ROIs for other subgroups of the population may uncover inequities that should be investigated. A state might look at results for different levels of severity, different regions of the state, different demographic characteristics, and so forth. When analyzing

participation model and the quality of the matches were not as believable or as statistically robust as the models using the nonserved clients.

subgroups, however, it is crucial to ensure that there is an adequate sample size for each group that is examined.

Investment costs. The Washington Division of Vocational Rehabilitation provided the cost data. These data included a fixed cost per participant for administration and other supports (\$2,487 in 2002 dollars) and a monthly average cost of services of \$183. The average case duration of 26.45 months yielded an average cost of \$7,327 (in 2002 dollars) that included the fixed costs. These costs (inflated to 2010 dollars) were the public costs displayed in the table. In addition, this study estimated the forgone opportunity costs for clients by comparing the earnings received while receiving services to the earnings of the comparison group over the same time period. In this case, the clients in VR were actually, on average, earning more than the comparison group members, so the opportunity cost was negative.

Statistical uncertainty. The net impacts used in this study to calculate ROI were estimated with a regression-adjustment model. The study reported statistical significance of the net impact estimates based on a *t* test of significance, but no robustness tests were documented in the study.

West Virginia

The discussion of the West Virginia (WV) ROI model is primarily based on the recent ROI study by Bua-Iam and Bias (2011). The authors used data from the West Virginia Division of Rehabilitation Services (WVDRS) to demonstrate a substantial ROI for a public VR program that provides VR and related services to individuals with significant disabilities. The WV ROI model had two critical components: (1) the streamlined ROI component that used actual administrative and service costs versus gross wages from UI data and (2) the inclusive ROI component that also incorporated estimates of state and federal taxes paid, as well as reduced public Social Security payments.

The study used a very nonstandard method of reporting ROIs. It essentially used the ratio of gross earnings in a year to the cost of serving the clients and called that the ROI. For a random sample of customers, in the first year, the costs of \$1,954,899 and the cumulative gross wages of \$3,802,982 (average of about \$10,300) produced a \$1:\$1.95 ROI. In the second year, the costs of

\$1,954,899 and the cumulative gross wages over 2 years of \$7,664,388 produced a \$1:\$3.92 ROI. In the third year, the costs of \$1,954,899 and the cumulative gross wages over the 3-year period of \$11,245,900 produced a \$1:\$5.75 ROI. Using the inverse of the sampling ratio used to draw the random sample of clients to weight up the third-year results yielded an estimated \$13,312,865 investment in FY 2007 WVDRS for the full set of case closures and an estimated return of \$76,584,581 in the short-term period of 3 years. Computationally, this results in having an estimated ROI of \$1:\$5.75.

Treatment and treated population. The WV ROI model used a random sample from the population of 2,521 cases closed after services in WVDRS in FY 2007. A total of 370 cases were selected for a margin of error of $\pm 4.71\%$ at a 95% confidence interval. The extent and intensity of the services rendered was not considered, and participants were not separated by type of disability. As with other state studies profiled here, this project used a random sample from an exit cohort. The choice of using an exit cohort was presumably based on data availability for the outcome variable of interest—earnings. The authors indicated that the random sampling was done for computational ease. As long as administrative records in a state are retained electronically, we would not recommend this step because it adds sampling error to the calculation of an ROI.

Time period of analysis. The study used gross earnings per quarter for 3 years (12 quarters), including the quarter in which the case was closed as reported in the UI wage record data. When UI data were unavailable, this was supplemented by reported wages at closure data in RSA-911 to determine the wages received in the closure quarter (but not in any subsequent quarters). Note that the study relied on observed outcome data and did not conduct any extrapolation beyond the time period of analysis.

Estimation of treatment outcomes. Bua-Iam and Bias (2011) argued that it is not realistic to use individuals who did not receive services as a control group. Eligible VR consumers have disability-related barriers to employment and *require* VR services to remove these barriers in order to gain or maintain employment. Thus, the WV ROI methodology excluded a control group as part of the research design. The U.S. Government Accountability

Office (2007) study on earnings increases for Social Security beneficiaries after completing VR services also concluded that it was infeasible to find a control group as noted in the following quotation:

> We were not able to compare the earnings of beneficiaries who completed VR with a control group that had not completed VR because we could not identify a group that was sufficiently similar to those who completed VR to feel confident that any differences in outcomes that we found would be attributable to the VR program and not to the differences in individual characteristics. (p. 43)

It should be noted that without a comparison group, the counterfactual used in this study was the null counterfactual, or in other words, the assumption that customers would have zero earnings if they had not received services. It should be recognized that this is an extraordinarily strong assumption that is nonstandard in ROI analyses and may cause a large bias and overestimation of the ROI.

On the benefits side, the study included wages, Social Security savings and taxes, Medicare taxes, and federal and state taxes. For Social Security savings, the study utilized Supplemental Security Income (SSI) or Social Security Disability Insurance (SSDI) benefit payments received by consumers at closure or application (as reported in RSA-911) if the consumer stopped receiving Social Security benefits during services by achieving the substantial gainful activity (SGA) level. For Social Security taxes, the study utilized 6.2% of gross wages up to \$106,800 annually. For Medicare taxes, the study utilized 1.45% of gross wages annually. The study calculated federal taxes using reported earnings and the 2009 federal employer withholding tables. For state taxes, the study used reported earnings and the 2009 WV state employer withholding tables.

For the inclusive component of the WV ROI model, the authors also estimated the amount of savings in discontinued Social Security payments (SSI and SSDI). Each case was broken down into either a blind or nonblind group, since there are different SGA limits for each. Using the UI wage data, each consumer who received SSI or SSDI at closure was examined to see how many quarters he or she exceeded SGA. In those quarters, it was assumed that the consumer no longer received SSI or SSDI benefits. In some cases, consumers received SSI or SSDI at application, but had already stopped receiving the payments by closure. In these cases the SSI/SSDI amount at application was used to determine Social Security savings each quarter after closure that SGA was achieved. Partial decreases in benefits were not included, making this a conservative estimate of savings. Summing all these quarterly savings in SSI/SSDI payments resulted in the estimate for the sample and extrapolated to the entire FY 2007 closure year.

Investment costs. Costs included administrative and actual costs of services for each WVDRS consumer in the sample. The study used quarterly cost per consumer based on the administrative costs from RSA-2. The value for each consumer was found by taking the average cost for all consumers served in a given year and summing them for each year the consumer was in the WVDRS Internet-based electronic case management system. This included all preceding and subsequent cases the consumer had on record. The study used costs for total services in each case (including preceding and subsequent) the consumer had with WVDRS. Based on costs of services from RSA-911, the actual amount for each individual consumer was reported.

Administration costs for WVDRS were taken directly from the RSA-2 "administration costs" and "total number of individuals." Costs for years prior to 2001 were estimated at 2001 values (\$333.10 per consumer served). This was thought to be a conservative method, as WVDRS fiscal data indicated that administration costs, in general, rise slightly over time for the program. The model included all prior and subsequent cases on record at WVDRS as well as the costs for the cases closed in FY 2007. This study seemed to be very thorough and accurate with respect to the agency's costs. It did, however, assume zero forgone earnings costs.

Statistical uncertainty. The study noted sampling error associated with drawing a random sample of treatment cases. However, it did not use that error in any tests of robustness.

Conclusion

This chapter has presented a listing and discussion of the key ingredients in an ROI study. These included definition of the treatment and treated population, time period of the analysis, estimation of the observed outcomes, estimation of costs, and treatment of statistical uncertainty. The chapter argues that all ROI studies either explicitly or implicitly include these ingredients. For expository purposes, ROI studies from six states were reviewed to identify how they addressed the key ingredients. Aside from methodology, the usefulness and accuracy of an ROI study hinge greatly on the data sources used. The next chapter discusses data.

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Chapter 5: Data Considerations in Estimating ROI

This chapter examines data considerations in developing a circumspect return on investment (ROI) estimate for a state vocational rehabilitation (VR) program. An initial section reviews the primary data source that was used most frequently in developing earlier ROI estimates, and the limitations of this data source for estimating ROI. Fortunately, many of these problems can be overcome by using state-level data from administrative records, which are discussed in the second section. A third section examines the pros and cons of using these various sources of employment data to conduct an ROI. The fourth section then examines the availability of administrative data for examining the "investment" of VR service dollars, and the last section identifies the availability of other state-level data sources for examining other external factors that might affect VR outcomes and subsequent returns to the VR investment.

Overview of VR Data Available from the Rehabilitation Services Administration

As described in chapter 1, the Rehabilitation Services Administration (RSA) oversees the states' and territories' provision of VR services to eligible persons with disabilities. RSA maintains individual-level data for cases closed by all 80 VR agencies in a given federal fiscal year (FFY) through the RSA-911 Case Service Report. Currently, over 200 data elements pertaining to each closed case are reported on the RSA-911¹⁴ (see selected list

¹⁴ The full list of data elements for the RSA is provided in the Reporting Manual for the Case Service Record Report (RSA-911), State-Federal Program for

of data elements in Table 5.1). A state agency code designates from which state or territorial agency the case was closed (RSA, 2014).

The data elements collected on the RSA-911 have evolved over time. For example, prior to 2001 a three-digit condition code classification was recorded for a person's primary or secondary disability. Subsequently, a four-digit RSA disability classification schema was incorporated to combine information on the nature of each individual's disabling conditions and their cause or source. Further changes to the coding of disability information are anticipated in the future, with the existing disability coding system likely to be replaced by the International Statistical Classification of Diseases and Related Health Problems, a medical classification list established by the World Health Organization.

There are numerous variables pertaining to the characteristics of each individual participant whose case has been closed. In addition to demographic and socioeconomic variables (e.g., gender, age, race, education level, number of dependents), information is also collected about the type and amount of disability benefit payments received by the participant. Several variables detail the nature and severity of the participant's disabling condition. Both an individual's primary and secondary disability are designated by a four-digit code that is a combination of 19 impairment codes (e.g., sensory, physical, mental) and 37 codes for the causes and sources of the impairment (e.g., amputations, traumatic brain injury, spinal cord injury). A binary designation indicates whether the person is classified as severely disabled or not. Data are collected about the individual's VR case, including the VR employment plan, the types of VR services provided, and the total dollar value of purchased VR services.

Vocational Rehabilitation, OMB Control Number 1820-0508, available at https://www2.ed.gov/policy/speced/guid/rsa/pd/2014/pd-14-01.pdf

Table 5.1Selected Data Elements Included in the RSA-911 Case Service Report

1	A consultando	19 Significance of disability
1.	Agency code	20. Semineance of disability
2.	Social Security number	20. Services provided (includes 28
3.	Closure order	service categories)
4.	Previous closure	21. Total cost of services by
5.	Date of application	category
6.	Date of birth	22. Comparable services and
7.	Gender	benefits providers
8.	Race	23. Employment status at
9.	Ethnicity	application and at closure
10.	Veteran status	24. Weekly earnings at application
11.	Zip code at application	and at closure
12.	County name at application	25. Hours worked in a week at
13.	Source of referral	application and at closure
14.	Involvement with other	26. Types and monthly amounts of
	services at application	public benefits at application
15.	Education level at application	and at closure
	and at closure	27. Medical insurance coverage at
16.	Living arrangement at	application and at closure
	application	28. Type of case closure
17.	Primary disability	29. Reason for case closure
18.	Secondary disability	30. Date of case closure

Information is also collected about the individual's (1) employment status, (2) weekly earnings, (3) hours worked, and (4) whether this employment provided health insurance, all in the week prior to application for VR services. The same information is obtained for the week of case closure, although it is reliably reported only for participants who achieve successful employment outcomes after being employed for at least 90 days prior to case closure. Additionally, a six-digit Standard Occupation Classification code is recorded for the type of employment at the time of successful completion of VR.

An earlier critique of the uses of RSA data for program evaluation purposes (Pelavin & Associates, 1989), as well as more recent studies of the VR program (Government Accountability Office [GAO], 2005, 2007), pointed out four major limitations in the national RSA-911 data used to evaluate the impact of VR on participants' employment outcomes. These shortcomings consist of (1) focusing on VR case closures in a given fiscal year rather than on applicants at the time of application for the program; (2) a lack of longitudinal employment data on these applicants for both the pre- and post-VR application period; (3) a lack of longitudinal data on the costs and specific types of VR services provided; and (4) a lack of information on the local labor market and the nature of the job training situation in which the person is attempting to secure employment. Each of these shortcomings is discussed in turn.

Focusing on VR Case Closures in a Given Year

An individual applying for VR services is assigned a case number. A VR "case" can have one of numerous administrative closure outcomes that, in turn, affect the amount of time a person spends in the VR program. Many VR cases close quickly when a person (1) is declared ineligible for services; (2) leaves after a short while upon making the determination that VR services are not appropriate for his or her circumstances; or (3) is "placed" in a job after a brief VR intervention. Such cases are often closed from the VR rolls in the same year the person applies for services. At the other end of the spectrum are cases lasting several years. In such instances an individual may have embarked on a job training or education regimen. Alternatively, a participant may be unable to secure employment even after completing the planned VR services. The latter type of case may languish until the VR agency closes it as "not successfully rehabilitated."

The upshot is that a cohort of closed cases in a given fiscal year includes people who apply for VR over a span of several different years. This introduces a host of factors about which reliable data are usually unavailable that potentially impact vocational outcomes and cause problems when interpreting the results of any subsequent evaluation. An early analysis by Berkeley Planning Associates (1988) of approaches to evaluate the federal-state VR program noted: "In order to control for external events that take place during the treatment it is important that the treatment and control groups experience the same history" (p. C-12). It is critical that there be a "comparison over the same calendar time period (thus keeping constant the local economic conditions, community service environments, and federal policy

conditions) of employment and nonemployment situations between matched clients served and not served by VR" (p. 52).

In a specific VR agency there may be changes in the eligibility requirements (e.g., establishing an order of selection that mandates which priority categories are to receive scarce VR services) from year to year, which may result in closure cohorts made up of people who entered the VR program under very different circumstances. For example, individuals who enter VR following lengthy periods on a waiting list due to a VR agency's order of selection may have different levels of motivation and needs for VR than those who enter within the typical 60-day application period. There may be other state/federal budgetary considerations affecting the VR services provided to applicants in one fiscal year versus another, and information on these historical variations is not always available to the researcher.

Finally, people may be enrolling in the program in widely divergent economic conditions. For instance, participants achieving successful employment outcomes who apply and whose cases are subsequently closed in the same year may be benefiting more from a robust economy than from the VR services they received. The motivation of such persons may differ dramatically from those persons who applied for VR several years prior, perhaps during a downturn in the economy, to improve their skills through a longer-term job training program—and there are no data in the RSA-911 reporting system that measure VR participants' motivations.

Lack of Longitudinal Employment Data

Under current RSA-911 data collection guidelines, a participant's earnings profile contains a maximum of two earnings points—at acceptance and closure from the program. Moreover, earnings at closure are only reliable for the fraction of persons completing VR after retaining employment for a period of at least 90 days. Adopting simplistic assumptions, the net impact of VR services may be calculated as the difference between earnings at acceptance and closure. However, this earnings profile is grossly deficient for evaluation in several respects.

First, the earnings reported at acceptance are unlikely to reflect the true preprogram earnings path of a participant due to
Ashenfelter's (1978) "pre-program dip." This phenomenon is evidenced by a decline in participant earnings immediately prior to seeking assistance. Although this decline is understandable given that people are more apt to turn to training programs when faced with employment difficulties, it is unlikely that earnings reported at this time capture a trainee's true preprogram earnings potential. The true long-run earnings path may be understated. If so, these earnings do not represent how the participant would fare in the absence of treatment and therefore are a poor baseline for assessing net training effects. Furthermore, VR may be an extreme case of preprogram dip. It is common for participants to report zero earnings in the week prior to application to the program.

A second problem exists with the earnings record at closure for participants who achieve successful employment outcomes. Although this earnings figure is accurate for the participant's first 90 days of employment, it is tenuous to assume that post-VR earnings will continue indefinitely at the same levels. Indeed, given the rather high numbers of individuals with multiple VR cases (e.g., see Pepper & Stern, 2009), it would be more appropriate to assume that postprogram earnings will decline over time following any given case closure.

A third data problem follows from the fact that a significant fraction of participants receiving VR services are not successfully employed by the time their VR cases are closed. However, there is evidence that many of these participants do ultimately get jobs (e.g., see Dean & Dolan, 1991). They typically receive substantial services and may derive significant benefits from their VR experience, but these benefits will not be captured if employment is not forthcoming while the VR case is still open.

Lack of Longitudinal Data on Specific VR Service Provision

There are two problems with the way the RSA-911 collects data on VR service provision. While ostensibly a "time-limited" service regimen, many VR plans may be several years in duration. Moreover, many VR participants choose to discontinue services before obtaining a job, and some are subsequently served again during a later VR case. The RSA-911 does not link these separate cases across an individual. Consequently, it is not possible to account for the overall cost of VR service provision from the RSA-911 for each VR participant who has multiple VR stints.

A related problem is that the current RSA-911 reports only the *total* value of services purchased for each case, along with designations as to which of 22 types of services is being provided (e.g., counseling and guidance, medical treatment, job training, rehabilitation technology). This specification does not provide a meaningful measure of the intensity of the specific service regimen. It is simply not possible to ascertain the dollar value of a particular type of service provided while an individual's case is active, let alone the value across multiple cases for the same individual.

Lack of Information on the "Economic Environment"

A final issue with using the RSA-911 to estimate the earnings impacts of VR service provision is that there is no information available on any external factors beyond the VR service provision that may influence a person's employment. Such considerations include the condition of the economy at the time the person applies for and subsequently leaves the VR program. Clearly, the business conditions in the area in which a person resides will have some influence on the individual's employment prospects and subsequent level of earnings. Fortunately, various state/regional identifiers available on the RSA-911 allow for matching with other data files to obtain this information on the "economic environment" in which a person is seeking employment.

Availability of Existing Longitudinal Employment Data to Estimate "Returns" on Investment

Each of the data limitations of the RSA-911 reporting system for estimating VR ROI can be ameliorated by incorporating available state-level administrative data. These enhancements either allow for (1) a better specification of the variables used in ROI estimation or (2) the incorporation of better estimation techniques to determine this ROI. This section examines the various types of employment data that are available to better assess the ROI of VR services. As discussed earlier, the "point in time" measures of employment in the RSA-911 are not sufficient for conducting a circumspect ROI analysis. As Kornfeld and Bloom (1999) noted, "Because the costs of employment programs are incurred up front, whereas their benefits (in terms of increased earnings and employment, or reduced welfare and UI receipt, etc.) can accrue over long periods of time, extensive follow-up is often required for a proper benefit-cost analysis" (p. 194).

Moving beyond these two earnings points used for RSA administrative performance standards requires the use of longitudinal data sets. The two primary sources of such data for measuring employment come from either surveys or administrative sources. Since the early days of manpower training initiatives of the 1960s, economists have been using national surveys, such as the Current Population Survey, to examine changes in employment. Customized surveys, such as the one incorporated in the Longitudinal Study of the Vocational Rehabilitation Services Program initiated in 1992 (Hayward & Schmidt-Davis, 2003), have also been used for analysis of earnings impacts for targeted groups. Administrative files, such as state unemployment insurance (UI) wage records, Social Security Administration (SSA) earnings records, and tax records, have been increasingly incorporated in evaluations in the past three decades.

Usage of such data sets has led to concern about the mismeasurement of earnings and the potential for obscuring the true economic impact of a given training regimen. Moreover, as Bound and Krueger (1991) pointed out, "If measurement errors are uncorrelated over time then statistical problems caused by the mismeasurement of economic data may be greatly exacerbated when longitudinal data are used to estimate fixed effects or firstdifferenced regressions [models used to determine earnings impacts]" (p. 2). The choice of the source of earnings data for a VR ROI estimate has numerous implications. It affects the costs of the evaluation, the types of outcome measures that can be analyzed, the time period over which these earnings impacts can be estimated, and the types of measurement error in the employment indicator. It is of paramount importance, then, to determine the merits and drawbacks of the various approaches to gathering employment-related data for persons with disabilities. The

overarching criterion is to obtain accurate data. However, the "true" values of an employment-related outcome measure are not usually available.

Accordingly, it is imperative to examine the difference between the various employment-related outcome measures that can be used in net impact and ROI analyses of job training programs, including VR. Several sources of employment data are available from state/federal administrative records maintained for payment of taxes, income transfers such as Supplemental Security Income (SSI) and Social Security Disability Income (SSDI), and other purposes. Three of these sources have been used to provide data for evaluations of job training programs: (1) UI wage records, which are collected to determine eligibility for and the amount of UI benefits; (2) SSA records, which are maintained to make old age, survivor, disability, and health care payments to eligible beneficiaries as well as recipients of SSI or Medicaid; and (3) state or federal tax returns, which are used for tax payment and auditing purposes. A brief discussion of each administrative source is presented in turn.

Unemployment Insurance Wage Records

The federal government requires each state to maintain a standardized reporting format from all employers covered under that state's regulations. UI wage records consist of total quarterly earnings reported by employers to state UI agencies for each "covered" employee. By law, any employer paying wages above a certain earnings threshold— currently \$1,500—during a calendar quarter to a state-decreed minimum number of employees is subject to the state UI tax. The employer must report on a quarterly basis all monetary compensation paid to each employee, including regular earnings, overtime, and tips and bonuses. States must maintain the most recent five quarters of earnings, allowing for lags in reporting by employers. States may maintain up to 20 quarters (5 years) or more of earnings in archive files.

UI wage records have been used in numerous evaluations of job training programs, including the supported work demonstration, the Job Training Partnership Act experiment, and most Workforce Investment Act–authorized programs.

Social Security Data

Administrative data from SSA master files are available on a special request basis from SSA's Office of Research, Evaluation, and Statistics. These files contain data on individuals' demographics, earnings, benefits, industry of employment, and health and disability status. The master earnings file contains records for some 400 million persons with Social Security numbers, with annual earnings available since 1951. These Social Security earnings records are taken directly from employerreported Form 941 quarterly payroll tax records, which are used by the SSA to calculate Social Security benefits and determine insured status. Other files contain data pertaining to some 160 million beneficiaries of the old age, survivor, disability, and health care program and 65 million SSI recipients. Finally, the "numerical identification" file contains more than 600 million records of original applications for Social Security cards. This file contains name, Social Security number, date of birth, and selected other personal information.

SSA data have been used in several workforce development program evaluations in the last two decades. For instance, SSA data were used in the RSA-SSA State Partnership Initiative project, which examined the efficacy of return-to-work strategies for recipients of SSA disability benefit payments (Kregel, 2006).

A memorandum of agreement between SSA and RSA was signed in 2008 allowing for the merging of the RSA-911 Case Service Report file with various files from the SSA, including the earnings file and information on monthly benefit payments for SSI and SSDI since 1998; these files are linked to the RSA-911 files on VR program closures. These restricted data have been made available to U.S. Department of Education and SSA researchers for a variety of purposes (for example, see Berry & Caplan, 2010, 2012), although they have not been used for VR ROI estimation.

Tax Data

Another possible source of earnings data comes from federal and/or state tax returns. The reporting format of tax data is similar to that of SSA earnings records. Specifically, Internal Revenue Service (IRS) earnings are available by calendar year and are only made available as aggregate data for groups of 10 to 19 persons to preserve the confidentiality of the respondents. Tax reports are more encompassing than SSA earnings in that they include all sources of income, including self-employment and spousal sources. They also have much broader coverage of earnings than UI wage records. Finally, whereas employers may have an incentive to underreport earnings to avoid the UI tax, they have no such incentive for IRS reporting, since wages are a business expense item and thus lower the employer's tax burden.

The Pros and Cons of Using Various Sources of Earnings Data to Estimate ROI

This section examines the merits and drawbacks of using various sources of earnings data from state/federal agency management information systems-based performance reports and administrative files for conducting net impact analyses used in conducting an ROI analysis. The pros and cons of each of the three administrative sources of earnings data—UI records, SSA earnings, and tax records—are each discussed in turn.

Strengths of UI Wage Record Data in Measuring Employment-Related Outcomes

There are several advantages to using UI earnings data for gauging the performance of workforce development programs, including employment outcomes from VR services.

- UI records consist of almost all wage earnings, including overtime, tips, and bonuses.
- Coverage of employment is very high.
- There is a lack of measurement error attributable to low nonresponse bias which, presumably, leads to the accurate reporting of UI wages.
- UI records are readily available, have a low cost of acquisition, and are available in a relatively timely fashion, particularly for state-level analysis.

A particular advantage of UI-reported earnings compared with earnings available from SSA is that UI data are available on a quarterly versus annual basis and are reported for all employers in that quarter. Having separate wage records from each employer on a quarterly basis allows analysts to examine a multitude of employment-related outcomes not available from SSA data.

Weaknesses of UI Wage Record Data in Measuring Employment-Related Outcomes

Disadvantages and limitations to using UI wage record data are provided below. They are listed from the general to the specific.

- A perceived weakness cited by Hotz and Scholz (2000) is the inability to capture family income through UI wage records. This may be the more appropriate unit of analysis for examining labor force participation decisions. There is also virtually no information on demographic characteristics.
- UI wage records only collect aggregate earnings per employer, and most states do not record information on either wage rates or hours worked. This limits the choice of outcome variable to one of level of earnings in a period or employment status (e.g., percent of quarters worked over some time period). In a related vein, UI wage records cannot be used as a gauge for determining full-time or parttime employment status. Nor can they be used for distinguishing the type of employment (e.g., according to Dictionary of Occupational Titles classification).
- There are reporting lags in the collection and recording of UI wage records. UI wages are reported for the quarter the earnings are actually paid, which may not correspond to when they are earned. Thus, a potential mismatch can occur when a job training participant obtains employment in one quarter but is not paid until the next. Also, the reporting lag limits the use of UI records for agency performance measures, which are based on timely data. A GAO study in 2002 found that in 60% of the states, there was a 6-month

reporting lag; for another 30% of the states, the delay was 9 months or longer.

- UI wage records report "covered" employment; earnings in uncovered jobs are not reported to the UI system. The evidence on the overall coverage rate of UI records is conflicting. GAO (2002) reported that UI wage records cover about 94% of wage and salary workers. Kornfeld and Bloom (1999) reported that the coverage rate is generally thought to be in the 90% range. However, Hotz and Scholz (2000) cited some recent studies that have challenged this rate as being too high. Using detailed audits of a sample of UI wage records in Illinois, they found only an 86% coverage rate. Unfortunately, coverage problems occur in certain types of employment that are particularly prevalent for persons with low income who are likely job training candidates.
- Coverage regulations vary across states. In general, • employment categories not covered include self-employed workers, most independent contractors, military personnel, federal government workers, railroad employees, some part-time employees of nonprofit institutions, employees of religious orders, and individuals who work as domestics, on farms, for commission, or in casual and irregular employment. For the latter group of workers, employers are not required to withhold taxes, Social Security, or UI for these workers. The problems with measuring employment with direct short-term hires (e.g., "flexible staffing," "contingent labor force," day laborers, temporary agency work) are significant since they are estimated to comprise one-eighth of the workforce (Houseman & Polivka, 1999). The GAO survey (2002) of agency performance standards found that two-thirds of the states used supplemental data to compensate for these uncovered occupations.
- Some recipients of a job training program may ultimately secure employment out of state, and then earnings will be reported in the state in which they are employed. Such cross-state employment is particularly prevalent in border counties. How big is the problem? The GAO (2002) study found that more than one-third of the surveyed states

reported that an estimated 16% to 30% of cases were not being picked up by their state's UI wage record system. In response, states have developed an interstate information sharing system, known as the Wage Record Interchange System, which makes UI wage records available to states seeking employment and wage information on their job training participants.

- There may be unreported UI earnings by the employer. This may be unintentional due to simple oversight or perhaps difficulty in understanding complex UI-reporting regulations. However, it may also be due to deliberate noncompliance on the part of the employer. Kornfeld and Bloom (1999) provided three rationales for why an employer would willfully not report earnings to UI: (1) to avoid paying UI taxes; (2) to escape responsibility for subsequent UI benefit claims; or (3) to acquiesce with an employee's wishes to conceal earnings. Blakemore, Burgess, Low, and St. Louis (1996) reported extensive *employer* noncompliance with the provisions of the payroll tax-reporting regulations of the UI system. Through extensive audits of UI tax records, they had three major findings: (1) firms fail to report almost one out of every seven of their workers to the UI system; (2) almost half of all employers made some underreporting error of workers or wages; and (3) this underreporting was a more serious problem for smaller firms.
- Finally, there may be simple reporting errors from persons with incorrectly recorded Social Security numbers.

Strengths and Weaknesses of SSA Earnings Data in Measuring Employment-Related Outcomes

SSA earnings data are generally considered to be the most complete source of data for conducting workforce development program evaluations, in that roughly 99% of the labor force has their earnings reported by employers. Indeed, many studies use SSA-reported earnings as their measure of "true earnings." The SSA master earnings file contains earnings all the way back to the 1950s. However, there are a few notable drawbacks to using this data source:

- SSA earnings are available only on an annual basis.
- SSA program data on earnings are available only after the data requestor undertakes an extensive application and approval process. Individual earnings records are rarely released in order to meet confidentiality restrictions. Rather, all earnings must be aggregated to the five-person level in order to ensure anonymity of respondents.
- There is a significant reporting lag. Earnings for the previous calendar year are available only after a 15-month delay.
- While the overall coverage rate is very high, there are some gaps. Workers in some occupations are not covered by the Social Security Act; workers in other occupations receive significant income from tips that is likely unreported (e.g., wait staff, baggage porters, maids, taxicab drivers).

Strengths and Weaknesses of Tax Report Earnings Data in Measuring Employment-Related Outcomes

Hotz and Scholz (2000) noted that the primary advantage of tax data, like SSA earnings, is their accuracy in reporting due to strict auditing and employer sanctions. Hotz and Scholz (2000) reported the findings from a 1999 study of California Aid to Families with Dependent Children recipients that recorded significantly lower earnings in UI wage records than in tax returns. Their main finding was that IRS earnings ranged from 14% higher for adult women to 25% higher for male youth.

Hotz and Scholz (2000) also noted several disadvantages to using earnings from tax reports, the most significant of which is extremely limited access for research and evaluation purposes. Also, tax data provide very little, if any, information on the demographic characteristics of the individuals who are filing tax returns. Particularly for low-income taxpayers, there is some question of whether all sources of income are being reported, especially for individuals who work as independent contractors.

Availability of Cost Information in Conducting VR ROI Analyses

The primary costs in determining the "investment" portion of an ROI estimate include the full costs of VR service provision for persons with disabilities. These services come from three different channels, all of which should be accounted for in the analysis.

The first channel includes the direct, indirect, and administrative cost of services provided "in house" by the VR agency. The first of these categories comprises VR services provided directly by VR professionals (counselors, counselor aides, supervisors, and rehabilitation teachers who carry a caseload) in the form of counseling, guidance, and placement. Costs are also incurred indirectly by in-house staff who support counselor activities, such as

> clerical personnel, . . . medical consultants, interviewers, placement officers, and specialists, district and local supervisors (except that portion of their time assigned to a caseload), non–caseload-carrying rehabilitation teachers, psychologists, social workers, and other professional personnel who do not have a caseload carrying responsibility, . . . [as well as] staff providing management and supervision services under the Business Enterprise Program (e.g., Randolph-Sheppard Program), [and] State Coordinators for the Deaf and the Deaf/Blind. (RSA, 2009, p. 13)

These costs should also include those incurred by a state-operated rehabilitation facility, of which there are eight nationwide, such as Virginia's Woodrow Wilson Rehabilitation Center and Maryland's Workforce Technology Center. Also to be added are the VR program's administrative costs, including "salaries and fringe benefits of all [administrative] staff . . . as well as all other State VR agency expenses incident to carrying out its administrative functions. These other expenses would include staff travel, rent, utilities, supplies, etc." (RSA, 2009, p. 3).

The second cost channel is for VR services purchased for the participant by the VR agency. These purchased services, which are arranged for by VR counselors prior to and while developing and implementing the participant's individual plan for employment (IPE), may consist of diagnosis and treatment of impairments, training in postsecondary institutions of higher education, job readiness and augmentative skills training, vocational and occupational skills training, maintenance, transportation, personal assistance services, interpreter services, transition services for students with disabilities, services to the family of an individual with a disability, occupational licenses, tools, equipment and initial stocks and supplies, postemployment services, rehabilitation technology services (including rehabilitation engineering, assistive technology devices, and assistive technology services), job placement, and other job-related services (e.g., job search, job retention services, follow-up services, follow-along services, etc.).

The third channel of VR service provision is the procurement of services arranged for by the VR counselor that are provided by a third party at no cost (or only partial cost) to the VR agency. VR counselors are directed to find such "comparable benefits" (e.g., Pell grants, Medicaid-funded medical procedures, services provided through the Department of Veterans Affairs) before committing VR funds. While not involving a direct cost to the VR agency, these additional resources are considered by many VR agencies to be an important source of alternate funding and service provision contributing to successful VR outcomes.

A significant portion of the costs of these three VR serviceprovision channels can be determined using data provided by the state VR agencies to RSA. A state VR agency must periodically submit three different reports to RSA about its VR activities, programmatic expenditures, and individuals with disabilities being served. These reports are the Annual VR Program/Cost Report (RSA-2), the RSA-113 Quarterly Cumulative Caseload Report, and the RSA-911 Case Service Report on all cases closed in a given FFY. Although some state VR agencies maintain information systems that include substantial additional cost data beyond that required for federal reporting, other agencies do not. As a result, states will vary considerably in their ability to provide more specific and detailed cost and service provision information for developing ROI estimates. The RSA-2 includes expenditures for administration as well as for individuals with disabilities, both provided by the state VR agency and purchased outside the agency (e.g., public and private community rehabilitation programs and other public and private vendors). This report also includes expenditures for groups of individuals with disabilities (e.g., establishment and/or construction of community rehabilitation programs, business enterprise program). Additionally, the report provides data on expenditures broken down by service category and individuals served, VR staff composition reported by person-years, and an analysis of carryover funds.

The second form, the RSA-113 Quarterly Cumulative Caseload Report, collects information on VR participants as they progress through the rehabilitation process. This form reports cumulative data for VR participants in each of four separate stages: (1) application and eligibility determination; (2) development of the IPE; (3) implementation of the prescribed VR service regimen from the IPE; and (4) outcomes for those who leave the program (RSA, 2012).

The third source of data provided to the RSA by the individual state VR agencies is the RSA-911 Case Service Report provided for all cases closed in a given FFY. As discussed earlier, all VR agencies must report to the RSA the total cost of purchased services at the individual participant level for all closed cases in a given FFY. These purchased service costs involve those provided by various public and private vendors, categorized into 22 potential service types for each individual, with a categorical designation for the source of the funds (i.e., VR, non-VR, or combination of both) along with the type of provider (i.e., VR agency, public or private community rehabilitation program, one-stop center, other public or private providers).

Because the RSA-911 includes no details on the dollar value of the specific types of service provided, one cannot determine the intensity of a particular mix of services. Another problem that arises is that it is not possible to distinguish whether there are multiple providers of a given service designation. That is, since only one response is allowed for each type of service, the form can record only a single provider for any of the 22 service categories. A potential way to circumvent this problem is to use additional data from the state agency's own case management and/or fiscal data systems, which often include more detailed and case-specific information on the costs of purchased services across various categories for a given individual.

Data from the RSA-113, in conjunction with information from the RSA-2, is used by state VR agencies when determining the amount of reimbursement due them from SSA for services provided to recipients of SSDI or SSI disability payments. The state VR agency is entitled to reimbursement for all the costs of VR service provision to those SSDI beneficiaries and SSI recipients who achieve earnings exceeding substantial gainful activity for a 6-month period. SSA reimbursements include the cost of purchased services as well as administrative costs and the cost of agency-provided counseling, guidance, and placement. These costs are estimated for each state VR agency in a four-step process described briefly below. SSA's standardized approach to estimating the reimbursement of costs for VR participants who receive SSI/SSDI can be useful to state VR agencies in estimating the in-house and administrative costs for all participants for ROI purposes.

The first step in the SSA cost reimbursement formula involves using data from the RSA-2 to estimate administrative costs and services provided in house by the state VR agency to determine what SSA calls "Administrative, Counseling and Placement" costs (SSA, 2012, p. 45). The second step in the SSA cost reimbursement formula involves calculating the "total service months of clients open" (SSA, 2012, p. 116), obtained from the RSA-113 from the previous year. In the third step, the number of VR participants' cases that are open at the end of each quarterly period is annualized and then combined with one-half of the new participants accepted for services during the year. The administrative, counseling, and placement costs are then divided by this total number of "adjusted" months of service in the fourth step to obtain the total cost per month of service, which is the rate charged by the VR agency for eligible SSDI and SSI claimants closed in a given fiscal year.

Depending on the state agency, the VR case management system may include data on the extent of comparable benefits provision when there are multiple service providers (in-house staff, purchased service vendors, other service providers/funding sources) within the same specific service category. Of course, the provision of a comparable benefit does not involve a dollar cost to the VR agency, and most state agency data systems do not include reliable data on the costs of these services. As a result, such service costs will need to be imputed when included in the ROI calculation.

Enhancement for Measures of the External Factors Influencing Vocational Outcomes

Individual characteristics are only one factor affecting vocational outcomes. A region's current "business climate" may be particularly influential on a person's earnings, especially given the historically tenuous employment prospects for persons with disabilities. Moreover, it is well understood that business fluctuations can also have an impact on job prospects. Accordingly, both the level as well as any changes in the local economic environment (e.g., unemployment rate, per capita income) should be tracked to account for their influence on any earnings-related outcomes.

Most analyses that incorporate such regional economic variables rely on countywide or Core Based Statistical Area aggregations of such information. There can be a great deal of heterogeneity in unemployment rates and per capita income within such broadly drawn areas. For instance, a county can include rural and urban areas within its boundaries. As such, countywide data combine such disparate information into a single measure that does not capture the true impact of this factor. The influence of such factors will be negated through the "flabby" construction of the variable.

In some states, city- and county-level economic data are aggregated to the "planning district" level. Such districts have been formed across regions with similar economic characteristics to solve mutual problems (e.g., transportation, water resources, solid waste planning) that cross political boundary lines. For example, the planning districts in Virginia reflect the aggregation of 41 city and 54 county regions into 21 districts. There is tremendous heterogeneity among these planning districts, which include the poorer coal-mining localities in southwestern Virginia as well as the affluent suburbs of Washington, D.C., in the northeastern part of the state.

Fortunately, local, regional, and state-level data on economic conditions are readily available from several key sources, including the Census Bureau and the Bureau of Economic Analysis in the U.S. Department of Commerce, as well as the Bureau of Labor Statistics in the U.S. Department of Labor. Regardless of the specific data sources used to measure the influence of the economic environment on VR outcomes, it is important to include such indicators in estimating ROI.

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Chapter 6: Building VR Agency Capacity and Resource Allocation

This chapter begins with a discussion of the need to enhance the credibility of return on investment (ROI) estimation for the vocational rehabilitation (VR) program and the relative merits of internally versus externally developed ROIs. The remainder of the chapter focuses on considerations for VR agencies interested in building their capacity and effectively allocating the necessary resources to develop robust ROI estimates.

Enhancing the Credibility of VR ROI Estimates

The survey of state VR agencies conducted by the 10 Technical Assistance and Continuing Education Centers in 2010 (Appendix B) found that over half (58%) of the 67 responding agencies conducted some type of ROI assessment. The majority (59%) of respondents indicated that they had developed their ROI analysis methodology in house. Many also reported using readily available data to calculate the agency's ROI, most commonly the data they are required to report to the Rehabilitation Services Administration (RSA) (e.g., for the RSA-911 Case Service Report and the RSA-2 Program Cost Report), and comparing VR program participants' earnings at the time of case closure to their earnings at the time of application to VR. As discussed in chapter 4, this type of "post – pre" approach to estimating the employment impact of VR program participation is generally considered to be methodologically weak. This approach also requires extrapolating post-VR employment rates and earnings from a single point in time-the week of case closure-which substantially increases the uncertainty of the ROI estimates, as discussed in chapter 5.

A review of publicly available reports on the ROI, costbenefit, and economic impact of VR was conducted by staff of the West Virginia Division of Rehabilitation Services in conjunction with the 38th IRI. This review, included as Appendix E, examined reports from 15 states and the Council of State Administrators of Vocational Rehabilitation that were produced between 1998 and 2009. The reported ROI estimates ranged widely (from \$1.86 to \$21.95 for every \$1.00 spent by VR), due in large part to the substantial differences among the reports in the time periods covered, the use of comparison groups, the discount rates used, and the specific measures of costs and benefits. Seven agencies utilized external entities to develop their ROI estimates, one agency used in-house resources, and the origin or authorship of the remaining seven is unknown.

The information provided in Appendix E suggests varying capabilities among public VR agencies to develop methodologically sound ROI estimates. While a few states have used fairly rigorous methods to estimate the economic impact of VR, most utilized fairly simplistic "post – pre" approaches to estimating ROI. Ultimately, the capacity of a VR agency to conduct an ROI and economic impact study depends on a number of factors, including its internal resources and capacity and its access to external expertise. With the increasing demand for all public programs to demonstrate their value (see May 2012 memorandum to federal agencies in Appendix F) and the substantial interest in using ROI results to demonstrate the value of the public VR program, there is a need to build the capacity of VR agencies to develop ROI estimates that are reliable and valid.

Internal vs. External ROI Estimation

While most existing cost-benefit and ROI estimates of state VR programs have been carried out by VR agencies themselves, a number of VR ROI studies have been conducted by external organizations in collaboration with VR agencies (Grassberger, 2006; Hemenway & Rohani, 1999; Hollenbeck & Huang, 2006; Kisker, Strech, Vetter, & Foote, 2008; Uvin, Karaaslanli, & White, 2005; Wilhelm & Robinson, 2010). A number of potential costs and benefits may arise from either approach to ROI estimation. The potential advantages of an "in-house" analysis include:

• *Perceived low cost:* Agencies that carry out their own analyses use their existing staff to do the work and can often gain access to the employment data they need from other state agencies at minimal or no cost. While the cost of supporting existing staff to carry out the work is usually an

integral part of a VR agency's budget rather than an "extra" expense, substantial staff time is typically required to acquire, compile, and analyze the necessary data to develop the ROI estimate and produce a report describing the results.

- *Good understanding of VR services and cost data:* The staff who carry out internal ROI analyses is usually well versed in the strengths and limitations of the VR services and cost data that are integral to estimating ROI, and they may already be familiar with the employment data that are available from state unemployment insurance (UI) programs.
- *Ease of data access:* The data for the investment side of the ROI equation should be readily available to internal analysts, and much of the data that may be used to account for variations in local or regional economic conditions are publicly available from state or federal sources. While some state VR agencies may face significant challenges in obtaining UI data on VR program participants, most state UI programs are more willing to share such data with other state agencies than with external consultants or contractors.

An in-house analysis faces potential disadvantages as well:

- *Limited in-house expertise in ROI analysis:* Few VR agencies have staff with the training in economics and statistical analysis that is required for a methodologically robust ROI estimate.
- *Perception of bias in design or results:* Whether justified or not, there is often a concern that program evaluations conducted by employees of the organization that runs the program may not produce objective results, especially when the results show the program in a favorable light.

These potential disadvantages can often be addressed by working with an external expert to develop an agency's ROI. The possible advantages to this approach include:

• *Extensive expertise in ROI analysis:* State VR agencies can choose to engage the services of regionally or nationally recognized ROI experts to ensure that the analyses of their

programs are methodologically sound and the results are interpreted accurately. Some states may also have in-state ROI expertise in their state governments (e.g., in the offices of state inspectors general or state legislative research bureaus) that can provide needed expertise. Several state VR agencies that have developed ROI estimates (e.g., Florida, Massachusetts, Oklahoma, Utah, Virginia and West Virginia) have used in-state resources from public or private academic institutions and research organizations.

• Appearance of impartiality: An important aspect of involving an external evaluator in any program evaluation is the perception—and at times, the reality—that someone external to the organization being scrutinized is able to view the program, and the results of any analysis of the program's effectiveness, more objectively than an "insider." (Of course, it is also possible that the opposite may occur, and a paid external consultant may be viewed as a "hired gun" who will produce dubious results.)

However, there may also be some disadvantages of working with an external evaluator, including:

- *Perceived higher cost:* Particularly when state VR agencies engage the services of an external expert in a paid contractual role, the cost is usually not part of an agency's routine operating budget. A number of factors influence the cost of working with an external contractor or consultant to carry out an ROI analysis (e.g., the scope and design of the ROI analysis, the level of expertise of the contractor, the nature of the reports needed by the VR agency), and no information is readily available on the range of costs incurred by VR agencies that have used external contractors. Nonetheless, it is often perceived to be more expensive to use the services of an external contractor than to conduct an in-house study.
- Lack of familiarity with the VR program and its data: While outside consultants may be experts in ROI estimation, they may not be familiar with basic features of the VR program that should be considered in designing the

analysis and are likely to be unaware of limitations in the available agency- or state-level data.

• *Limitations on data access and security:* Depending on the ability of the VR agency to compile and de-identify all the data that may be needed for an ROI, external evaluators may need access to personally identifiable information to carry out the analyses; as a result, highly secure data transfer and storage mechanisms may be required to protect the confidentiality of sensitive information on VR program participants.

It is important to note that, even when an external expert is developing the agency's ROI estimate, substantial VR agency staff time may also be required to carry out the work. VR agency staff must typically compile the data to be used by the consultant and provide detailed explanations of the meaning and utility of various data elements. Also, VR agency staff is often called upon by external consultants to provide guidance regarding the various choices that must be made in developing the methodology, as discussed in chapter 4, such as the time period for analysis, the services to be included in estimating "treatment" costs, and the participants to be included in the "treated" population. VR agencies must also provide external consultants with important contextual information regarding the VR program's current and historical policies and procedures, scope of services provided, VR staff roles and responsibilities, or other information that is critical to interpreting the results of the ROI estimation procedure.

Rather than thinking of an ROI estimation that uses an external contractor as exclusively external to the VR agency, it is probably more appropriate to consider it to be a collaborative endeavor that engages both external and internal resources. Each VR agency that is interested in developing an ROI estimate must weigh the potential costs and benefits to determine whether it is preferable to conduct the analysis totally in house or with the assistance of external consultants or contractors.

Building Capacity

Given the substantial interest among state VR agencies and other stakeholders in using ROI results to demonstrate the value of VR, there is a need to build the capacity of VR agencies to develop ROI estimates that are reliable, valid, and meaningful to stakeholders, as well as their capacity to use ROI results effectively. For an individual VR agency, ROI capacity-building may involve developing internal knowledge and skills, gaining access to data, developing internal analytic systems, and working effectively with external partners—or activities in all areas. The following sections discuss possible considerations for VR agencies interested in building their capacity in each of these areas.

Developing Staff Knowledge and Skills

A critical ingredient for VR agencies considering in-house ROI estimation is having the requisite knowledge and experience in using the ROI methods and processes laid out in chapter 4. However, as the 36th IRI's report on program evaluation and quality assurance in VR acknowledged (Uchida, 2011), "There is currently little standardization or consistency" (p. 85) in the roles and responsibilities assigned to program evaluation specialists working in state VR agencies, although these are the staff who will most frequently be charged with developing ROI estimates or working with external experts who develop the estimates. Given that the relatively new profession of VR program evaluation "has relied on . . . education, health care, program evaluation (other than VR), psychology and industrial manufacturing" (Uchida, 2011, pp. 88-89) to inform its practices, it is unlikely that many state VR agencies currently have the necessary expertise in economics and statistical analysis to conduct reliable and valid ROI analyses.

Some of the strategies discussed by the 36th IRI for enhancing general program evaluation capacity in VR agencies may also be applied to the specific need for enhancing staff knowledge and skills to develop ROI estimates and use ROI results appropriately. These strategies include consultation with external experts in ROI analysis, independent learning through academic coursework or targeted workshops, working with existing rehabilitation training programs to include ROI assessment in graduate-level curricula for current and future VR staff, and developing customized training to address specific VR agencies' needs. There may also be opportunities for professional development of existing VR staff through targeted coursework in economics and statistics offered by in-state colleges and universities.

Developing Access to Needed Information

A different aspect of knowledge development involves gathering the necessary information to conduct an ROI analysis. This includes, at a minimum, information on the cost of the VR investment—primarily the costs of providing VR services—and information on the return—primarily the value of the employment outcomes for those who receive VR services. As discussed in chapter 5, some VR agencies collect extensive data on the cost of services beyond what is necessary to produce required federal reports. However, depending on the desired focus or rigor of the ROI analysis to be conducted, some VR agencies may need to explore ways to obtain additional data on the costs of services (e.g., the estimated costs of specific types of VR services provided in house by agency staff, or the costs of services provided to VR participants by partner agencies).

Another consideration for some VR agencies is the length of time that the services and cost data are maintained. Given the longitudinal nature of rigorous ROI analyses, the recognition that maximum returns on VR's investment may come several years following case closure, and the knowledge that some participants return for subsequent VR services, agencies interested in assessing the ROI of their VR programs may need to preserve their services data for much longer periods than they currently do.

The time period for ROI analysis is also relevant to the acquisition of information on VR participants' employment outcomes. Employment data for ROI formulas are most commonly obtained from state UI wage records (see chapter 5). Many state VR agencies already have access to these data for their Social Security cost reimbursement programs. These agencies may need to focus on expanding their UI wage record data access to include all VR participants they serve, and on revising their agreements with the state agencies overseeing the UI programs to allow for expanded access. Depending on the length of time the state UI program maintains its employment records, and the desired length of time covered by a given VR program's ROI estimate, some VR agencies may need to consider establishing their own longitudinal

repositories of employment data, in addition to VR services and cost data. Alternatively, VR agencies in some states may be able to access individual-level education and workforce data such as the UI program wage records from state-level longitudinal data systems that have been developed or expanded as a result of the U.S. Department of Education's Statewide Longitudinal Data Systems Grant Program

(https://nces.ed.gov/programs/slds/stateinfo.asp) and the U.S. Department of Labor's Workforce Data Quality Initiative grant program

(http://www.doleta.gov/performance/workforcedatagrant09.cfm).

Also, because an individual state's UI wage records do not usually include all individuals served by VR (see chapter 5), VR agencies may need to consider seeking additional sources of employment information. For example, UI data from multiple states can be obtained under certain conditions through the U.S. Department of Labor's Wage Record Interchange System. Additionally, data on some federal employees who are not included in the UI system may be available through the Federal Employment Data Exchange System operated by the Jacob France Institute at the University of Baltimore.

Developing Internal Analytic Systems

The need for long-term services and outcomes data may require some VR agencies to enhance the knowledge and skills of their information technology staff in creating and managing large data repositories. Also, especially for agencies that need to acquire data from external sources (e.g., on employment outcomes or the costs of services provided by partner agencies), information technology staff may need training in appropriate procedures for secure data acquisition (to protect the confidentiality of personally identifiable information) and reliable matching of individual-level data from multiple sources.

Along with the need to acquire, store, and manage the data that are essential for ROI analysis, VR agencies wanting to conduct their own ROIs must also determine whether their existing data analysis capabilities are sufficient to conduct the types of statistical analyses that are necessary for valid and reliable ROI results. While newer versions of computer spreadsheet programs such as Microsoft Excel and Lotus 1-2-3 have enhanced statistical analysis capabilities, these may not be sufficient for the types of complex analytic procedures and the large volumes of data that may be included in developing rigorous ROI estimates. Some VR agencies may consider acquiring high-level statistical analysis software, either as an added feature for existing spreadsheet software (e.g., Analyse-it, XLSTAT) or as a stand-alone statistical package (e.g., SAS, SPSS, STATA). In either case, staff training in the use of these powerful analytic tools will be important to maximize their effective use. Another alternative is to engage the services of an external data analysis vendor with the necessary software and analytic expertise; both private research firms and research entities associated with public and private academic institutions may offer such services.

Working with External Partners

As discussed earlier, VR agencies may choose to enlist the services of external consultants or vendors to carry out an ROI analysis. While some agencies may have concerns about the cost of such an arrangement, other factors should be considered in determining whether to do an externally or internally guided ROI analysis, including:

- The consultants' familiarity with the state VR program and the people it serves—and, if necessary, their willingness to learn about the VR program before beginning their analysis
- The consultants' level of analytic and report-writing skills
- The consultants' prior experience with ROI analyses, especially for human service or workforce programs
- The consultants' capacity to complete the work and produce meaningful results in a timeframe that meets agency needs
- The likelihood that the consultants would be available in the future to develop updated ROI estimates, if desired

Individual state VR agencies interested in working with external experts may also consider partnering with VR agencies in other states, or with other human service or workforce agencies within their own state, to share the cost of a consultant's time and expertise. Intrastate partnerships may increase VR agencies' access to services and cost data from partner agencies. Similarly, interstate partnerships may provide opportunities to enhance the completeness of employment data from multistate UI records, especially for states that are geographically adjacent to one another.

Regardless of whether the ROI analysis is to be conducted in house or by an external party, VR agencies may also need to think about developing or expanding partnerships with other organizations that can provide data on services to VR participants or information on their employment and earnings. In particular, data on pre- and post-VR employment and earnings from state UI program records are a critical element of most methodologically rigorous ROI analyses. Many state VR agencies already have access to these records for the purpose of confirming individual VR participants' employment status and earnings. However, depending on the nature and scope of the VR agencies' access, new data-sharing agreements with the state agencies that operate the UI program may need to be developed, and existing agreements may need to be modified or expanded.

Allocating Resources for ROI Estimation

As mentioned earlier, the levels of in-house ROI expertise vary substantially among state VR agencies, and agencies also vary in the type and intensity of ROI analysis they want or need to conduct. As a result, the resources that each agency will need to allocate for ROI estimation will vary significantly as well. It is important to keep in mind that substantial resources must be allocated in order to achieve meaningful ROI results, whether the analysis is carried out by the VR agency itself or in collaboration with external partners.

Another factor to consider in determining ROI resource allocation is the desired frequency of updated ROI results. Some agencies will find a single ROI estimate to be sufficient for their purposes, while others may wish to establish an ROI estimation cycle that complements their federally mandated triennial needs assessment or consumer satisfaction survey activities. State-level performance measurement systems may also dictate the frequency of new VR ROI estimates, and the availability or cost of acquiring the necessary data may also play a part in determining how often an ROI is updated.

Finally, while this chapter has focused on resource and capacity-building considerations for state-level ROI estimation, resources may also need to be allocated to develop ROI estimates at the national level. The 2012 Office of Management and Budget memorandum on using evidence-based budgetary and policy decisions (see Appendix F) states that the office "is more likely to support an existing resource allocation or a request for new resources" that is supported by comparative cost-effectiveness data demonstrating higher returns on the federal government's investments in programs and services. While the merged nationallevel RSA and Social Security data described in chapter 5 provides one option for developing national ROI estimates for the VR program, another possibility would be to support a meta-analysis of existing state ROI studies. Either approach would provide useful information to VR administrators, policymakers, advocates, and legislators at both the state and national levels.

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Chapter 7: The Use and Communication of ROI Research

This chapter provides guidance for state agencies and others on the use and communication of results once a return on investment (ROI) study is complete and the potential for influence begins. Making the ROI case for vocational rehabilitation (VR) requires that researchers and stakeholders communicate with each other effectively. As the sender of the message, VR program administrators should tailor communications to suit different audiences so the information is available, accessible, relevant, and useful for all. To inspire confidence in the ROI research generated, VR programs must also communicate that studies have been conducted with honesty and integrity, using only accepted research principles and methods, and communicated responsibly-without bias or misrepresentation. Accordingly, VR programs must be prepared for the possibility that a negative ROI result may occur. In such an instance, the opportunity should not be lost to examine why, to learn from the study, and to incorporate lessons learned into strategic initiatives.

The Needs of Various Stakeholders

Information targeted to a particular audience is only accessible and potentially useful for decision making when it is presented using a method and format that is appropriate for that audience. Few stakeholders have a background in statistics or research methods; therefore, research findings and other data presented using technical jargon can be too scientific and difficult to understand. Different stakeholders have different information needs because they make different types of decisions. The information communicated to stakeholders must address their needs and concerns. Information disseminated to stakeholders should emphasize key findings for action and include recommendations that are useful.

Legislators use research findings to make decisions regarding policies, resource allocation, and strategic planning. Government-sector officials have limited time and expertise to read detailed research reports; therefore, researchers often disseminate information to them in the form of policy briefs, brochures, and executive summaries that highlight actionable recommendations for decision making. Policymakers sometimes seek information from government agencies and research organizations, suggesting that making research available on public websites will increase its uptake.

The State Rehabilitation Council works in partnership with a state's division of VR. Members of the council are appointed by a state's governor after recommendations are solicited from the citizens of the state or representatives of organizations representing individuals with disabilities. State Rehabilitation Council members use program research to review, analyze, and advise the agency regarding its performance in providing VR services to individuals with disabilities. Communications needs of council members vary considerably, so reports should be developed in multiple formats.

Constituent groups tend to be interested in action-oriented research, yet they do not commonly use research terminology. Brochures and other handouts are frequently used to communicate research to community-based and professional groups. Such groups represent the interests of a particular segment of the VR customer base, for example, customers who are deaf. Consulting with constituent group leaders prior to developing materials is an effective means of ensuring appropriate communication.

VR program administrators frequently use research information for decisions, including program design, planning, improvement, management, and operations. A program administrator's role within the system drives his or her preference for the presentation of the information. Those at the district level or below are likely to find a detailed report with site-specific information more useful than an executive summary. A report that highlights the major findings within research results is also of interest to this group of stakeholders. Audiovisual presentations with charts and graphs are very effective methods of disseminating information when it is needed in a succinct form.

Community rehabilitation partners may be particularly interested in ROI results as they relate to the services they provide. These partners will likely benefit from elements of the ROI that are pertinent to their operation. Like VR administrators, they may wish to use the information for decisions, program design, planning, and continuous improvement. Individualized discussions or presentations by VR program staff may be helpful and effective.

Executives within the business community are widely seen as preferring results-based, bottom-line communications. It is likely, then, that an examination of the VR program's ROI would be well received. In general, the communication of ROI results pertinent to the business community should be presented succinctly—perhaps summarized in bullet form. The Utah Department of Rehabilitation Services, for example, disseminates ROI information through a flyer given to employers. Such communications can serve to strengthen relationships with potential employers. Businesses certainly understand and relate to the demonstration of quality within services and outcomes that maximize the efficient use of resources.

Report Types Shape the Message

The results of an ROI study may be communicated in many ways, within a format and style suitable to the purpose of the message. Members of the IRI Prime Study Group conducted a review of publicly available reports and other documents that communicate the results of ROI studies. The group focused on public-sector communications that appeared after a study was completed. We sought to observe how the information was used and the various formats and channels selected to deliver them. From these observations, we relay below several standards and conventions that, if incorporated into communications, will help to ensure that the consumer of the information has sufficient context to understand the data and the means that were employed to acquire it.

Prime Study Group members found and reviewed a number of ROI-related press releases, web pages, and departmental brochures. Only public-sector ROI communications were selected. These items were accessed through Internet searches. In our review, we consistently observed that these forms of communication were selected when the need for supporting technical information was low. Importantly, all of the higherquality communications we reviewed took care to orient the reader to very basic information such as the date of the study, the organization that performed it, and a contact whereby an individual could seek additional information.

The group also reviewed a number of policy briefs with various aims and intents. A policy brief is a short document that presents the findings and recommendations of a research project to those outside of a profession. It is usually used to present evidence in support of a particular course of action to legislators or their aides. These documents are designed to accommodate the reader's limited time and knowledge of the subject matter. As with the forms of communication cited earlier, a policy brief should orient the reader to the same basic information mentioned above, yet should further describe efforts made to ensure the objectivity of the study's findings. Evidence of neutrality can be supported by statements, where appropriate, that the study was conducted by a credible third party or, for example, that the funding for research originated from a neutral source. Credibility of the evidence can be supported by demonstrating that appropriate methodological decisions were made.

Agency budget proposals have increasingly been singled out for their lack of corresponding evidence to support budget requests. The full text of a "Memorandum to the Heads of Executive Departments and Agencies" dated May 12, 2012, has been included in Appendix F (Zients, 2012). This document details the Obama Administration's emphasis on "the need to use evidence and rigorous evaluation in budget, management, and policy decisions." Further, the document states that the "budget is more likely to fund requests that demonstrate a commitment to developing and using evidence." The IRI Prime Study Group was unable to locate for review any formal federal or state budget proposals utilizing ROI research. It seems logical that budget proposals citing any sort of evidence should be supported by references to the details of any studies named in support of budget requests.

Participants in the IRI Forum noted that ROI results can and often should be released alongside consumer satisfaction surveys and within annual reports. States such as Utah, Virginia, West Virginia, and Florida have undertaken these efforts and are continually refining their methods. Annual reports and consumer satisfaction surveys present an excellent opportunity to place ROI results in the context of other program metrics and case studies, giving multiple perspectives on the agencies' creation of value.

Internal communications among VR program administrators may take on an entirely different form. Contrary to viewing the ROI study as the final outcome of a summative assessment, managers and administrators should attempt to learn from and use the study in a formative sense. Recall that a formative evaluation is a method of judging the worth of a program while the program's activities are forming or happening. Formative evaluation focuses on the process (Bhola, 1990).

Where summative studies produce an answer for external, program justification purposes, formative studies seek answers to multiple questions aimed at process improvement. These questions might include efforts to uncover both problem areas and bright spots for further investigation. For example: "Which are our most efficient and effective initiatives?" "Does reduced funding lead to diminished returns?" "What other factors complicate or limit the program's ROI?" "What are the common characteristics of persons in our customer base that we are least successful with?" The answers to these questions and others can provide a set of actionable items that could be implemented in many ways across the organization.

Examples and Resources

For recent examples of VR communications concerning ROI research, readers may contact Prime Study Group members Michael Shoemaker of Utah, Steve Collins of Florida, Kirsten Rowe of Virginia, or Pisnu Bua-Iam of West Virginia. Many other states may have recent examples to share. The reason for this suggestion is that the communication of ROI results, an emerging practice within VR, is itself evolving and improving. Several participants in the IRI (both Prime Study Group and Forum members) expressed some concerns over various historical communications in which VR programs have used the term "return on investment" without the kind of rigor or attention to detail advocated in this document. Table 7.1 lists websites providing other examples of communications in public-sector contexts.

Table 7.1Examples of Different Formats for Communicating ROI Results

Organization	Format	Website
National	Various	http://www.nrccte.org/publications-
Research Center for Career and Technical Education	documents for different stakeholders	resources
	Press release for an ROI study	http://eon.businesswire.com/news/ eon/20110321005174/en
Florida Division of Library and Information Services	Brochure	http://info.florida.gov/bld/roi/pdfs/ 2010-ROI-Brochure.pdf
	Full report, with hyperlinks	http://dlis.dos.state.fl.us/bld/roi/pdfs/ ROIsummaryreport.pdf
Institute for the Study of Societal Issues, University of California,	Visually appealing ROI executive summary	https://alumni.berkeley.edu/sites/ default/files/Californias_Economic_ Payoff_Executive_Summary.pdf
Information Services Institute for the Study of Societal Issues, University of California, Berkeley	Full report, with hyperlinks Visually appealing ROI executive summary	nttp://dlis.dos.state.fl.us/bld/rol ROIsummaryreport.pdf https://alumni.berkeley.edu/site default/files/Californias_Econo Payoff_Executive_Summary.pd

Conclusion

Within external communications that use the findings of ROI research, it is generally important to anticipate and address a "healthy skepticism" on the part of the information's consumer. The groundwork laid in the study's design and implementation will provide support and structure to the claims that are communicated. If a commitment was made to the achievement of credible, robust economic research, the ROI study's findings will be based on solid evidence and can be confidently communicated.

Within internal communications that use the findings of ROI research, it is important to dissect the study results in the light
of the VR program's mission. Administrators and managers can use the study as an examination of VR's process, furthering their understanding of the long-term impact of services. The perspective gained should be put into action by communicating business tactics that increase the program's ROI while serving each customer at his or her individual level of need.

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Chapter 8: Recommendations

This chapter provides recommendations based on the research and activities of the Prime Study Group (PSG). One key recommendation is to refrain from reviewing only this chapter in an attempt to design and conduct a return on investment (ROI) study. The information in this publication should be read and considered in its entirety to ensure the execution of an appropriate and robust study.

The second key recommendation is that all vocational rehabilitation (VR) agencies should conduct *credible* ROI studies to use as a tool for measuring performance. The credibility of the study is critical to build trust and support from key stakeholders such as federal agency partners, members of Congress, and state legislatures. However, it should be noted that ROI studies in VR organizations are still evolving. Different VR organizations are at different points in their ROI "journey." As such, the remaining recommendations should be considered as an attempt to assist in the evolution of ROI estimates for VR organizations. These recommendations are grouped into three general areas: recommendations for designing and conducting an ROI study, recommendations for using and communicating ROI results, and recommendations for expanding the capacity of VR agencies to develop credible ROI estimates.

Designing and Conducting ROI Studies

- 1. Prior to conducting ROI studies, state VR agencies should assess the advantages and disadvantages of conducting an inhouse study versus one with an external organization.
- 2. VR agencies should develop realistic expectations in regard to the time and resources it takes to design and conduct an ROI study. Most VR agencies should not be expected to produce rigorous ROI studies in the near term, as this approach is considered an emerging discipline in VR, as well as the public sector in general. Realistic time and resource expectations should also be considered in regard to implementing changes to the system as a result of the findings and recommendations.
- 3. Because VR agencies are heterogeneous in terms of number of people served, specific state economic factors and statutes, available resources, access to various datasets, and other issues, a "cookbook" approach to conducting an ROI study is *not* recommended. Given these differences, the PSG also strongly recommends against comparing one VR agency's ROI estimates to those of other agencies.
- 4. The preferred approach for selection of cases for ROI studies is an entrance cohort. That is, the data to be included in the analysis should be based on when participants came into the VR system, as opposed to when they exited the system. It is recognized that this is not always possible, depending on the structure and content of each agency's data systems.

- 5. VR agencies should make an effort to ensure the accuracy of internal datasets. This helps managers and other key stakeholders (e.g., legislators) to be confident in drawing conclusions and making recommendations based on ROI studies (as well as other performance-based studies).
- 6. ROI studies should include and clearly document the source(s) of all costs of service provision including direct costs, administrative costs, opportunity costs involved in receiving services, and any other costs. In addition, statistical uncertainty should be considered due to potential sampling errors and/or data errors. This can be addressed through robustness testing (see chapter 4 for additional discussion).
- 7. Determining the time period covered by the ROI study is an important consideration, and no specific number of years can be recommended. However, results should always be converted to an annual rate of return so that there is a common framework for interpreting ROI results from different studies. Of course, other means of communicating results may be included in communications as well.
- 8. Explicit acknowledgment of the counterfactual used in estimating ROI is recommended for all ROI studies. This is probably the *most important* component of an ROI study because it is used to estimate the impact of VR services. The counterfactual is a hypothetical estimation of the outcomes that would have occurred if VR services had not been provided. Appropriate designs are recommended (e.g., randomized controlled trials, quasi-experiments, regression techniques, and post pre) depending on the scope of the ROI study, as well as the availability of appropriate data (see chapter 4 for additional discussion).

Using and Communicating ROI Results

9. ROI studies should be used as a tool to improve VR performance, as opposed to being used *only* as a tool for demonstrating accountability. The PSG recommends the use of additional tools, such as consumer surveys and testimonials, Rehabilitation Services Administration (RSA) 911 data, performance dashboards, global informational systems, and

documented results of targeted performance improvement activities, in order to get a fuller picture of VR organizational and programmatic performance.

- 10. Each ROI study must make use of various data sources to produce credible ROI estimates. Therefore, it is critical to clearly document in technical communications the method utilized, sources of the data, the reliability of the data, how the data were used, and what assumptions were made. It is also essential to acknowledge all potential methodological gaps. These elements should also be included in less technical communications, as appropriate. In all cases, communications should refer interested readers to documents that contain technical details.
- 11. Consulting with stakeholder group leaders prior to developing materials to report ROI results is an effective means of ensuring appropriate communication. Information should emphasize key findings for action and include recommendations that are useful. Annual reports and consumer satisfaction surveys present opportunities to place ROI results in the context of other program metrics and case studies, giving multiple perspectives on the agency's creation of value.

Expanding VR ROI Capacity

- 12. RSA should take the lead in developing mechanisms to provide technical assistance to state VR agencies interested in expanding their capacity to develop robust ROI estimates. Possible approaches may include providing access to national ROI expert consultants and/or supporting the development of specialized training for VR staff within existing rehabilitation counseling programs.
- 13. A VR ROI community of practice should be developed. This group could conduct the following activities: (a) define and communicate best practices; (b) identify commonalities among various VR agencies for comparison and collaboration purposes; (c) help agencies embark on simultaneous ROI studies in order to facilitate learning and share project resources; and (d) assist in comparisons and benchmarking across similar agencies.

- 14. RSA should consider making small grants to states to enable them to (a) develop partnerships with ROI experts in their own states or regions; (b) develop multistate partnerships among several VR agencies interested in combined ROI studies; or (c) gain access to necessary information from other state- or national-level data systems (such as the state unemployment insurance systems and federal wage databases).
- 15. State VR agencies should have the same access to employment-related data as other workforce development programs authorized under the Workforce Innovation and Opportunity Act. These data sources include state unemployment insurance wage records, employment records of federal employees, and the Wage Record Interchange System. Access should be assisted and promoted by the RSA.
- 16. Agreements should be facilitated that allow state VR agencies to have access to relevant data from the Social Security Administration's Ticket Research File matched with RSA 911 data. This "cross-match" file not only contains more complete information on employment and earnings, albeit on an annual rather than a quarterly basis, but also tracks VR participants' receipt of disability insurance and supplemental security income.
- 17. As states consider changes to their data collection systems, they should consider changes mandated by the Workforce Innovation and Opportunity Act.
- 18. States should collect data in addition to federal requirements to assist them in determining ROI.

The PSG believes that these recommendations, if followed, will greatly enhance the credibility of and support for state VR agencies. However, the PSG understands well that the mission of VR is to provide assistance to individuals and help them to overcome barriers as they traverse the pathway to independence. Furthermore, we understand that VR professionals are dedicated and caring individuals who will put forth 110% effort whether their agency's ROI is 2.3% per year or 7.6% per year. Our belief and hope is that rigorous, high-quality ROI studies can and should be used to support and promote the work of these professionals, of whom we are proud to be colleagues.

Appendix A: Definitions of Terms

- Average treatment effect on the treated: A measure of the impact of a treatment on the population that received the treatment. It excludes members of the treatment population that did not receive the treatment (e.g., those who chose not to participate).
- **Benefit-cost analysis:** A tool for measuring the benefits and costs of an action, placing a value on each and arriving at a conclusion as to the net benefits of the action. To conduct a benefit-cost analysis, it is necessary to measure the benefits and costs in a common unit, usually dollars.
- **Cost components:** Items that require resources (time or money) that comprise an investment. In vocational rehabilitation return on investment studies, these components usually include direct costs and indirect costs of providing services and may include forgone income incurred by clients.
- **Direct costs:** Costs of activities provided to or purchased for clients for the purpose of enhancing their employability.
- **Discount rate:** An interest rate factor used in a present value formula to reflect the time preference of money for an individual.
- **Displacement effects:** Economic changes that occur because of a treatment that otherwise would not have happened in the absence of the treatment. For example, a person who received services may become employed, whereas a different person may have become employed if the services had not been provided.
- **Entrance cohort:** A group of participants who initiate their program participation in the same period of time.
- **Exit cohort:** A group of participants who end their program participation in the same period of time.
- **Indirect costs:** Costs that may be borne by an agency or entity that are necessary to operate the agency, but are not directly expended on clients, e.g., administrative costs.

- **Intention-to-treat population:** All individuals in the treatment population, regardless of whether or not they received the treatment.
- **Internal rate of return:** The rate of interest that equilibrates net present value to zero. It is considered to be the highest interest rate that an investor would pay to undertake an investment.
- **Multiplier effects:** An increase or decrease in economic activity resulting from the second- and higher-round expenditure responses to an increase or decrease in income.
- **Net present value (net present worth):** Present value minus investment cost. Investments are usually considered prudent if and only if net present value is at least 0.
- **Present value (present discounted value):** The current value of a flow of benefits or costs to be received or borne in the future. Present value formulas adjust for the fact that inflation causes future dollars to be worth less than current dollars. Discounting adjusts for the fact that future flows of benefits or costs may be uncertain or may be differentially valued by different individuals.
- **Quasi-experimental methodology:** Methods for examining the impact of a treatment that approximate a true randomized experiment, but lack the key feature of random assignment to treatment and control groups. In quasi-experiments, the individuals whose outcomes are compared to those of the treatment group are called a comparison group, instead of a control group. Various techniques are used to identify comparison groups that are as similar as possible to the treatment group.
- **Randomized controlled trial:** An experiment where potential participants are randomly assigned to either a treatment group, in which they receive the treatment being studied, or a control group that does not receive the treatment (or, in some cases, receives "treatment as usual" rather than the alternative treatment being studied). These trials are usually considered the most rigorous way to determine treatment impacts, since any differences in treatment outcomes can be assumed to be due to the treatment because all other potential causal factors are randomly distributed.

- **Regression analysis:** A statistical technique used to estimate the relationship between one or more independent variables and one or more dependent variables. A commonly used method of estimation is ordinary least squares, which minimizes the distance between observed values of the independent and dependent variables and a line.
- **Return on investment:** A measure of the profitability or lack of profitability of an investment. It is generally defined as the net benefits of an investment (benefits minus costs) divided by cost, and it is sensitive to how benefits and costs are defined and measured.
- **Robustness testing:** Verification of the accuracy (reliability) of the test measure.
- **Social return on investment:** A method for estimating the nonfinancial benefits and costs that are not included in a typical economic return on investment. It is a specialized type of cost-benefit analysis that attempts to place monetary value on the activities and outcomes of importance to a program's stakeholders.
- **Statistical uncertainty:** Errors affecting a measurement that are caused by chance, by errors in measurement, by misspecification, or for other reasons.
- **Time cost for participants:** Value of time spent by participants in receiving treatment; often measured by forgone labor market earnings.
- **Treatment:** An intervention, process, or "remedy" to a problem. A treatment group consists of the participants who receive the intervention.
- **Unemployment insurance program:** A partnership program of the U.S. Department of Labor and the states that provides time-limited cash benefits to eligible workers who become unemployed through no fault of their own and meet other eligibility requirements of state law.
- **Wage record data on earnings:** Administrative data maintained by state unemployment insurance agencies that record quarterly earnings of employees as filed by employers. These data are a method of determining unemployment insurance.

Appendix B: ROI Survey of State VR Agencies Conducted by 10 TACE Centers (2010)

Region 1	Yes D (federa consur after e	CT-B Program	Yes Du for cor VR, pr Reven
tes your agency measure on Investment (ROI). If yes, provide her definition of ROI	einflörr total tax revenues as state) generated by mers in 1st year of employment xitting VR.	efention: No formal definition. ggregate eanings to Ilustrate mimportance. No Change	efinition: Total annual earnings nsumer placed in competitive yiment in 1st year after exting ojected State & federal Tax ues generated by Status 26
(2) How does your agency meesu fearing, the measure ROIP Phenesu fearing, the measure ROIP Phenesu fearing, the measure ROIP Phene (ROIP as not a sortial agency costs, costs, costs of some constaliation of specific services, cost, the items of phenesure of the services of the servic	Employment data from competitively employment data from competitively employed consumers for each FFY accordigure an estimated satisty. We multiply projected asainy frimes 19% for an estimated tax flability for the person (19% during from CT Department of Reveiue) 18, year of employment, after exching 18, year of employment, after exching	Calculate annualized earnings for status 20 using annual review report (an FSA web site). Looking at avg. costs per closure (Tabe 1), avg. costs per closure (Tabe 1), avg. stanualized earnings were s2, 24,5366 in FT-7500. (multiply were annualized earnings for competitive closures by ang. numbers of fins. exp. bourty earnings for competitive closures by ang. numbers of fins. 22,353/16/int. Compare this to case S533/15/int. Compare this to case S533/15/int. Compare this to case (RCI that shows for every 51 spent, VR clients earn S500 (S27/631 forked by 58,356) for there is state income to & fielder from the x & and sales taxes. It is likely that a client pays rearly samch yearly in taxes as the fold sport on a case.	 Average Hours worked per week and average hourly wages for empkyed consumer, current lederal and MA state income tax rates, Commonwealth Corporation ROI
(3) Who developed your methodoloy7		Brian Sigman	MRC and Commonwealth Corporation
(4) What data sources are used to conduct the analysis? For each source, include where this is agency or non-agency data, and how easily) you colled #.		Annual Report data	Using data from the MRCIS Case Management & Data System & State & Federal Tax Data
(5) What does your agency do with its ROI used? How is it used?	Info is used on "Fact Sheets" or other descriptive occurrents when ligh-level program overview is needed for Bojalators' other stakeholders.		MRC analyzes data & develops fact sheets on an annual basis. This information is distributed to stakeholders.
(6) Does your agency have any information (methodogical manuals, reports of results, reports of villing to share?	Yes		Yes
 Who should be contacted for more information about ROI measurement at your agencr? 	david doukes20ct.acv	Brian Sigmen@ct.gov	Joan Phillips@state ma.us

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consumers, increase in lifetime earnings for consumer placed into employment, & returns to government in the form of reduced public assistance payments & tax revenues	No	No Changes	Yes Def:	Yes Def.	Definition: Definition: No change But now have the details
study formulas. 3. Status 26 consumers placed in competitive employment, 1st year of employment after exiting VR.			Cost of competitive closures, IL closures & total cost of programs. Also #s served in a year, etc.	calculates ROI from info in A-2 & 91 against current picture of our state's economy (Sluggish, Medium, Boorning) Calculate it 1 time per year.	Rhode Island has used several methods & acloulations for return on investment (& where we get the best barg for our buck). It history serves mere in 1892. Congress commissioned Research Triangle Institute (RTI) to messioned Research Triangle Institute advice agencies. The numbers were seen for yourself from Reg I advice agencies. The numbers were seen for yourself for the analysis considerations are recallations are not optime of the relation of cost survings on the federal eligibilityfentifierent programs SSISSISSI, TANF era and cost surving on Action Bartis Commonwealth Corporation & Johan Bartiels commissioned Commonwealth Corporation & Johan Inn (now with U.S. Our numbers were merclewecutive_surmany_Lois doc: Our numbers were to distore surving on to dissimilar to MCCs. Vio house used & memories
				1993 W. Virginia RRTC MS DOS Exe Program Benefit:Cost Analysis: A Decision Support Tool for VR	Corporation Corporation
				A-2 & 911 Data	Common-wealth Corporation's formula & RSA 911
				fact sheets and reports to our State SRC.	
					htp://www.mass.gov/Eeo hhs2/docs/mc/executive_ summary_05.doc.
	Patricia. Hart@state.ma.us		Brenda G Drummond@Maine	SRoma@ed.state.nh.us	L Pada@ors ri cov

	T	VT-B	Region ک	ΝΥ	NY-B
	Yes Definition: No formal definition. The program collegation earnings data based on 911 reporting & Unemployment Insurance wage data to ilustrate program impact. We also track earnings 3 years post closure	Yes Definition. No formal definition. The program collects aggregate aearings data based on 911 reporting & Unemployment Insurance wage data to llustrate program impact We as brack earnings 3 years post cosure	 Dees your agency measure return on investment (ROI). If yes, please provide the definition of ROI that your agency uses. 	No Yes	4
the \$14-18 OD lifetime figure in the past. 2. Uhlization of data from RSA 911 (simple caculation) annualized earnings for any given FFY years. (typical cost of servicing those clients (typical) runs around 250% to 350% to 350 SS 00 saving the 260% and 725 GD. 53 00 saving the reactors in other feedingstate program savings.	We track earnings, hours worked and a range of other variables for 28 closures. We compare this data to closures. We also track earnings three impact. We also track earnings three years post closure using Sate Unemployment. Insurance wage data to demonstrate job telerition and impact over time	We track earnings, hours worked and a targe of other variables for 26 closures. We compare this data to earnings at intake to illustrate impact. We also track earnings three years post closure using Sate Unemployment: Insurance wage data to demonstrate job reterriton and impact over time	(2) How does your agency measure ROI? Phese identify, the immeasure ROI? Phese identify, the immeasure ROI? Phese identify, the investment (such as obtal agency oscist, costs of some constallation of specific services, etc.), the iterrs included in the formula for return socied per week, small of the worked per week, small of the included in your sample (such as a richate of exit of them sample (such as a richate of exit of some of the point).	We calculate ROI through consumers' annualized earnings and savings in public benefits for successful closures.	
	Alice Porter		(3) Who developed your methodology?	Developed in- house data unit	
	911 Data State UI Data		(4) What data sources are used to conduct the used to conduct the used source, indicate whether this is agency or non-agency data, agency or non-agency data, collect if.	Information is collected through a review of consumer data collected at application and again at closure.	
	VR has a short and highly target at the general public and legislators		(5) What does your agency do with its ROI do with its ROI used? How is it used?	Information is used reports to State legislature, SRC, Stakeholders and VR annual report.	
	≺es		(6) Does your agency have any information (methodological manuals, reports of results, other deal that you are willing to share?	We can share information on method and data used to calculate ROI. We do not have a manual.	
	Alke Porter@ahs state vrt.us	Alke Porter@ahs state vit us	(7) Who should be contacted for more information about ROI messurent at your agencr?	Debora Brown-Johnson	
	1				_

	R	NJ-B	РЯ	SN	5	Region 3	DE	DE-B	В	QW
	No	No	No		No	 Does your agency measure return on investment (ROI). If yes, please provide the definition of ROI that your agency uses. 	No. We did it once several years ago in response to national call to VR agencies from CSAVT to identify ROI.	No	No	Each year, Maryland Division of Rehabilitation Services (DOR3) calculates the estimated tax (wenue that will be generated by consumers rehabilitated within the first year of employment.
						(2) How does your agency measure ROI? Prese dentry: the measure ROI? Prese dentry: the measure ROI? Prese dentry furthers investment (such as total agency costs, costs of some constellation of society as measured and the formula for return (such as weges earned. #hts such as weges earned. #hts (such as all elemest, and earned are somethy, etc.), who is included in your sample (such as all elemest, cleints admitted for services, cleints actually served, etc.) at what point in thre (such as intake or exit or some other point).	Investment: cost or purciased services, ang \$4,000 in Delaware Return on investment = a. Clients earnings, or b. Clients payment of b. Clients payment of consumption of benefits (as measured)			To calculate return, DORS looks at the average wages armed and average hours worked per week to determine the estimated taxes paid back within the first year. DORS also calculates the average costs presron surveys rehabilitated, and surveys rehabilitated consumers to determine how many are still working within a wanr of are still
						(3) Who developed your agency?	LOS Jackson, retired			The previous, Mirrector of DGRS, Mirrector and Burns, developed the agency's methodology.
						(4) What data sources are used to conduct the analysis? For each source, indicate where this is agency of non-agency data, and how (and how easily) you collect it.	LEIKS, gelorp' case management system RSAMIS, RSA data system			Agency data is used to could be the estimated taxes generated within the first year, and average cost per year, and average cost per average hourly wages is derived using the Standards derived using the Standards and the average hours worked per week are worked per week are strictured Ad-Hor work and Strictured Ad-Hor work and
						 (5) What does your agency do with its Roll information? How is it used? 	we calculated and shared it with CSAVR			This information is published field manual State Rehabilitation Council Anrual Report.
						(6) Does your agency have any information (methodological manuals, reports of results, other data) that you are willing to share?	92			MD DORS does not have additional data, manuals, or reports
						(7) Who should be contacted to more information about RO messurement at your agency?	Ed los, Jepuy Director			Sue Page. Director Maryland Onlision of Rehabilitation Services spage@dors.state.md.us 410.554.9385 Ron Vinter Ron Vinter Service Of Field MD DORS MD DORS MD DORS
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		Dr. Joe Ashley, DRS Dr. Joe Ashley, DRS Grants and Special Joe Ashley/Colts wighina gov, B04.662.7624 Dr. Kristen Rowe, DRS Grants & Systems Development Specialist Kristen Rowe@drs.virginia.go
		We have some limited reports on entier cost- benefit studies available. However, the NIDRR- However, the NIDRR- However, the NIDRR- However, the NIDRR- However, the NIDRR- However, the NIDRR- However, the NIDRR- produces a number of exports the NID and products agreements and protocots agreements and protocots agreements and protocots agreements and protocots agreements and protocots agreements and protocots agreements and guidance documents agrices to conduct ROI analyses with their own states' administrative data
		Because we do not yet have Because we do not yet have estimates, there is no estimates, there is no information to date. However, our State However, our State However, our State Information to stengthen making use of ROI making use of ROI making use of ROI making use of ROI making used CRS to investigate and publish VR ROI information.
verified using Access. Consumer surveys are utilized to determine how many continue to be employed a year after closure, and this relies on consumer response.		See answer to #2 above. See answer to #2 above. costs are obtained directly system, and are readly available. The costs of will be estimated from DRS' corresbordned with Imited management system on "in- management system on "in- house" services (e.g., vocational evaluation, house" services (e.g., vocational evaluation, treceived by VR clients – these data, too, are readily available. Information. Data on obtaining adia are available find the phy RR clients – these data, too, are readily benefits data are available trensibilation regimering) received by VR clients – these data, too, are readily available information. Data on obtained grant records, which is evalibable information. Data on obtained from the PICs on accessing ul wage data. In collaboration data actracts, we have long- standing agreements in place with the VEC for accessing ul wage data. In collaboration with the VEC for accessing ul wage data. In collaboration data actracts, we have long- standing agreements in place with the VEC for accessing ul wage data. In collaboration data actracts, we have long- standing agreements in place with the VEC for accessing ul wage data. In collaboration data cutacts, we have long- standing agreements in place with the VEC for accessing ul wage data. In collaboration obtaining earning data form
		Earlier models by Drs. David by Drs. David Bureau of Estemator of the Bureau of Esconomics funded RCI funded RCI funded RCI Steven Stat Steven Stat Steven Stat Steven Stat an Interest in the economics with disability.
closure as rehabilitated.		Earlier ROI estimates included only purchased case support purchased cases succe costs for VR, compared with wadges reported in Vrignia UI records However, the models that Dr. Dean and his research colleagues are developing include not only purchase case provide costs, for support and other direct service costs for the direct service costs in our case by management system). The primary benefits that will be included in the models are participant wages over time formanty the quarterly wage data available from state management system or the programs, although earlings data management system or there for the state data available from state data available and the fourte state data available and the state data available and data available and dotter data available and dotter
No PA Office of Vocational	No FA Office of Yocaronal measure of formula for ROI based on empirical data.	While we do not routinely measure RCI for our YR project warve eveloped ROI estimates for same cohors of WC elimits. We have used the participant RCI measure developed by the U.S. Department of Labor-Inded "Integrated Into Klates" (IPI Bueprint Nordence Development: A Blueprint for States" (IPI Bueprint for States") (IPI Bind for States") (IPI Bind for States") (IPI Bind for the RT program has measure of the RT program has metanified. We have just started a three-yeat collaborative project with Dr. David to develop state-kirel models and a the University of RCImond to develop state-kirel models collaborative project with Dr. David do develop state-kirel models are a the University of RCImond to develop state-kirel models social acted in the VR agencies and other sources.
	PA	VA

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	Steven W. Collins, Ph. D. Fonda Dwistin of Vocational Rehabilitation Steven collins@or fidce.org (850) 245-3429 (850) 245-3429					Tarea Stout 601-853-5232
	See attached sample profile and powerpoint presentation.					The majority of the information used is obtained through reports
interest by timenal staff as well as the full array of ACRS statistical data regarding the agency's exturn on public intersement's efforts to secure and retain funding We also beleare the model will be instrumential in our efforts to more beyond simple counts of experiments, bu a more recaingful messure of the meaningful messure of the impact of services over time.	Our ROI information is shared with begistator. on a detailed district profile for each legislator. This provides them with information on pacement of VR customers and economy Again, its economy Again, its economy Again, its aduation may require aduation may require director					ROI is presented to our state Rehabilitation council as well as various members of the
	Data is compiled from performance based budgeting reports drawn from the base Division's Rehabilitation Division's Rehabilitation Linformation Management System (RIMS).					Data is obtained from the agency's electronic case
the book were the book were chiefly adapted for Abutum University Moutument government.	Linda Hantnig Please nowraetired. Please cowraetired. Steve Collins now.					MDRS' methodology was developed by
organization is creation screation s	Earnings for customers gainfully employed in ALL countes projected from wages at placement X. Testmater teturn to the state enned] earned					Through our accounting systems, we obtain expenditure information to determine the total costs expended
pudetter method is greatly desired. The ADRS Leadership Team has tellored, with interest the enhancements to RCI calculation developed jointy by rightina and the University of Richmond. The agency's convertise in this regard have led to a streasarch pattnership with the Auburn University Mengometh Auburn University Mengometh at a streasarch pattnership with the Auburn University Mengometh at a streasarch pattnership with the autorn University Mengometh at a streasarch pattnership with the autorn University Mengometh at a streasarch pattnership with the autorn University Mengometh at a streasarch pattnership with the expoused in the recent book. Content of these model that is assert application of these model are pattnership has not y vy bioled a the pattnership has not y vy bioled a the stated for this fiscal year.	Currently we define our statewide measure of KOI as the estimated dollars enturned to the state through taxes paid by gardingh employed customets. However, it is recognized that this definition will require revision in future analysis cycles.	No	No	N	No	A Return on Investment as calculated by our agency is used to determine the average increase in wages a
	교	FL-B	GA	ξ	KY-B	MS

	Jeff Stevens, our Social Research Specialist and Statistician is the primary Statistician is the primary studies and would serve as the best contact in this area. Jeff Stevens@dhhs.nc.gov Phil Prozz@dhhs.nc.gov Phil Prozz@dhhs.nc.gov
generated from our in- house cases management system and the State of Mississippi automated Mississippi automated any documentation upon request.	but recomments: Joshua D: Bigham & Joshua D: Bigham & Joshua D: Bigham & Return on Investment in the Public Sector (2004). One aspect of ROI that we have not yet covered but may be addressed in the tuture is the value of social equity. One of our program goals is to rounderseved. A measure of the partices ensure equity in services historically been unserved historically been unserved historically been unserved the public's investment, such as whithe community in service provided through such as whithe community inclusion provided through
Mississippi State legislature and other stakeholders	Information is used to evaluate the relative efficacy of particular vendors, CRPs constellations of services, and the VR program on whole. ROI information is also reported as a requested also vepted as a requested on voi State Rehabilitation Council (SRC) or third-party requestors in and third party requestors in and third party requestors in and third party requestors and third party requestors of and third party requestors of and third party requestors and third party reque
management system management system 2 report Data for the RSA 2 is collected RSA 2 is collected autom tet accounting system and the case management system.	We use agency information. Information reading VR Program participants, variables (a particular service or constellation of services, participation in a particular mounty of residence, participation in a particular amounts are obtained from our Case Automation and the North Carolina the North Carolina these databases are serviced the North Carolina these databases are serviced the north Carolina these databases are serviced periodically as sequential files for reference.
upper the angienment of the Office of Vocational Methabilitation, Methabilitation, Methabilitation, Methabilitation, Management.	Our Division maintains the planning and evaluation team who, individually and and successing more recent focus more recent book more recent book have for the most have for the most have for the most developed on an ad hoc basis.
through the grant program for a given fiscal year. Then from our automated case service system, we obtain client information, such as; the average wage at a palication, the average wage at obsure, the average hours worked at closure. Conce all data is obtained, closure. Conce all data is obtained, calculations are performed to calculations are performed to the area field to be a so determine a gross increase in wages increase in wages is then used to determine a gross increase and the sales tax rate. FICA har rates and the sales tax rate. FICA har rates and the sales tax rate. FICA har rates savings regarding Public Assistance are calculated using Public Assistance through our in-house systems.	We have different measures for each definition, and these are used for different monitoring and reporting purposes. The following outlines our measurement definitions: a. The monetary return to the individual with a disability exiting the VR Program in employment from the VR Program in employment from the VR Program in services provided in goods and services provided towards that individual 's employment measured as: - The annualized earnings, as extrapolated from weekly earnings at closure, of an individual or group for individual 's plan. Program in employment during a specific time peniod is divided by the rodard from westhing the osci- assed annualized earnings 515,000, the where an individual 's plan. To cost-based as anrualized earnings 515,000, the the individual's plan. To cost-based annualized earnings 515,000, the where an individual 's plan. To that individual's 23 00 for earning's of that was invested in planned services for that individual's 2000 the was invested in planned services for that individual. The annualized parting vidual. The annualized for more an individual's 2000 the was invested in planned services for that individual. The annualized for was invested in planned services for that individual. The annualized for more annualized annualized for more annualized annualized for more and annualized for that was invested in planned services for that individual. The annualized for more annualized for that was invested in planned services for that individual. The annualized for more annualized for more annualized for more annualized for more annualized for more annualized for that more annualized
client receives from application to closure, the average savings through Public Assistance that is obtained through clients returning to work and through clients returning to work and through clients. State, FICA and Sales Tax) throughout their working career.	Ves, we at the NC Division of Vocations Rehabilitation Services have recently stated measuring return on investment in some preliminary and limited contexts, and have considered RCI at the avec considered RCI at the have considered RCI at the individual and community-level according to the following conceptual definitions: a. The montary return to the individual with a disability exiting the VR Program in employment, from the VR Program in employment from the UR Program in employment from the Canolina. or its subdivisions, from the state of North Carolina's monetary investment in the VR Program.
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						—
						Denise Koon at
						Yes. We have an
						The ROI information is used
						Agency data sources include
						It has been used
was invested in the particular CRP or service that serves as a grouping variable.	 The return to the State of North Carolina, or its subdivisions, from the State of North carolina's nonetary investment in the VR Program, particularly with regard to funding the state match requirement. 	-The immediate return on the State of North Carolinas investment is measured as the ratio of the federal grant and the state match. We typically approximate that S4.00 in deteral funding is applied to the benefit of the North Carolina's general economy for every \$1.00 the State of North Carolina's grant economy for every \$1.00 the VR Program.	-ROI to the State of North Carolina, and its subvisions, is also measured in the annualized earnings of individuals with disabilities exiting the NR Program in easuse, the twa number of individuals exiting the NR Program in employment during a given period is also considered a ROI measure.	-We have also, preliminarily, estimate the RCI to the State of North Carolina with regard to tax revenue from morne that, prospectively, would be paid from the earnings of individuals exiting in the earnings of individuals exiting in the sales tax rate applied to purchased services, and the State purchased services, and the State purchased services and the State proches and congressional (counties and congressional continues uch mitorretion)		The above factors are used in
					No	The SCVRD Cost Benefit Analysis
					NC-B	sc

Mark Wade at Mark Wade at Mark Wade at mmade@ascrut state scuts of 903-999-6503.		
extensive manual with details on how our program was created.		
ray raying publications provided to the public and used during the state that tax tolars spent to help spectros with dasbilities achieve an employment outcome is an outstanding investment of public money.		
fiscal and client management system which is easily extracted by the ROI pergaram non-Agency data is obtained from the interret to include the unemployment rate and 30 year bond discount rate.		
stime beartment struct be early 1980's whe and formula was formula was Minnesota Minnesota Minnesota Analysis and validated by the Validated b		
conjunction with data from the South Carolina Vocanta Rehabilitation Department's clional Rehabilitation and financial systems. The cost benefit report is ran on a state iscal for cases that are closed in status 26 during the fiscal year period.		
Modeli isseat at SCNRD for adtermining the benefit the Nation adtermining the benefit the Nation adtermining the benefit the Nation Internet. The purpose of this system is to analyze the economic impact of coational vibration Departments. The SCNRD benefit procedure developed by coational rehabilitation Carolina by using a modified was vulgated in 1956 by the Strom University and most remetly at a score, and the Aralysis is performed was vulgated in 1956 by the Strom University and most remetly at a consulting organizational psychologisti in 2007. The analysis is performed an a state fiscal year accordinal returns fiscal year accordinal returns of the posterios. Successfully returns agained due to vocational returns gained due to vocational returns gained due to vocational returns gained due to vocational returns gained due vocational returns gained due vocational returns gained due vocational returns and exparents and exparents. For rehabilitation are ruces. For raxpayers. The benefits of vocational returns and exparents and exparents for rehabilitation accurdes to payrimets are analyzed in terms of economic returns agained due to vocational rehabilitation accurdes to prove increase disability code, aga at the result of costibenetits analyses of rouces disability code. aga to ruces disability code. aga to runs are reported on a stratewide basis by courselion.	Q	Q
	SC-B	TN

Region 5	<u>루 8</u> 달
Does your agency measure are non investment (ROI), if yes, are provide the definition of ROI	e short answer is that DRS is not ing any ROI analysis on VR at this te.
(2) How does your agency measure ROP? Please leanty: the thems included in the formula for investment (such as the formula for investment (such as and agency costs, costs of some consellation of specific services, etc.), the items included in the formula for return (such as wages earned, #hts worked per week, taxes paid on worked per week and the taxes worked per week taxes paid on worked per worked per week taxes per week taxes per worked per worked per worked per week taxes per worked per w	Traditionally return on investment Traditionally return on investment (ROU) research for Xris looked at as something like "for every dollar invested in Wr, uustomers earn SX and pay SX in taxes", or "SX in the every dollar penefits. "Some of the research gees back to the 1965. We trade the fore the 1965. We trade of the search of the research gees back to the 1965. We there was but apparently at least some numbers. ROI fell out of favor with the dawn of the independent furition movement, where spending on people with desbillers was not seare as requiring the government to make a profit on the independent furition move concepts and the independent furition proceedens of human valuation hote of human valuation other concepts and the stratefederal investment. DRS predence the average cost per tequire expensive scales and droped a goal some years ago to reduce the average cost per stratefederal investment. DRS fikely to require higher than average spending.
(3) Who developed your methodoloav?	
(4) What data sources are used to conduct the analysis? For each source, indicate whether this is agency or non-agency data, agency or non-agency data, collect if	
 (5) What does your agency do with its ROI ursof7 How is it ursof7 	
(6) Does your agency have any information (methodogical manuals, reports of results, other data) that you are willing to share 7	
(7) Who should be contacted for more information about ROI measurement at your agenty	Doug Morton at 312-814-1996

	Director Greg McAloon@fssa.in.go ⊻	Dr. Vrigrina Thielsen Co-Principal Investigator: Project Excellence (517) 432-4657 thielsen@msu.edu
	Yes. See below for what we have developed	All methology and an arrative examples are included in this document.
	Real currently using the ROI to justify the hiring of ROI to justify the hiring of Counselors. We have 18 counselors was not being allowed that we are not being allowed to allow us of ill and water to develop a strong case to allow us of these important positions.	Annual updates to Michigan Monual updates to Michigan Bejakatos, highlighting tustomer actioner and tustomer actions, and Program funding brochure, also shared annuality with Michigan legislators.
	system tracks all of the above system tracks all of the above for us. It is all agency data for any time period, individual office, individual counselor, or state as a whole.	RSA-911 data for vage, cost of services, status and amount of public support amount of public support amount of public support RSA-2 data (for indirect cost) Mebsite for tax rate information
	Training and Training and Professional Professional comments from comments from other staff staff	Project Excellence starf at Michigan State University in disputition with a disputition with a disputition Upjohn Institute.
Individuals who achieve a competitive employment outcome trinning the twist we don't compare this tighter to waits we spent com services for the customers in an ROI service analysis. I think it's acceptable to say that about 5,000 acceptable to say that about 5,000 acceptable to say that about 5,000 collectively that they vould have whort VR services and pay about 55,000 on state and releated takes that they otherwise would not the apol had they remained the apol had they remained the apol had they remained	Our current ROI is being used to lustify himg courselors. It involves the following equations a. Total case Expenditures (What our case Expenditures (What our courselors septid each year – all serving) VS (Nt income Generated by Successful Closures only + SSA Reinhoursenentt). The serving et al. SAA Reinhoursenentt, courselor staff. Close of Himing a courselor staff. Close of Himing a courselor staff. Close of Himing a courselor staff. Close of Himing a rereage per courselor] VS (Niverage Indivates Henefits)] VS (Niverage Indivates Henefits)] VS (Niverage Indivates Henefits)] VS (Niverage Indivates Henefits)] VS (Niverage Indivates of How ROI is furthered by reduction of usage of benefits, etc. We eaccorded with he- eligibility diagnostics and ourseling/guidance.	For ROM, Mchigan Rehabilitation Services (MRS) has investigated the economic impact on the customers with disabilities wind actioned a competitive employment as a result of VR envices in each ficcal year. Specifically MRS includes the changes by the group as a whole in their estimated amount of taxes paid to the satimated amount of taxes paid to the sate and defeat and the estimated amount of taxes paid to the sate and defeat government in the first year post- close
	Yes. We have not not exessarily defined it yet but see it as a means to justify hing counselors. So, the current ROI has to do with field services only and not the program as a whole. A sevil, un current ROI see #23 is more plece mail at the moment than comprehensive. We are considering contracting with a university to formalize the process.	MRS measures ROI annually ROI is one method used by MRS to define, measure, and communicate the monetary benefits to customers and society that result from services provided by MRS.
	Z	×

	Constance Zanger 517/335.3639 zangerc@michigan.gov
	While the agency does not have a
	The information is forwarded to its parent agency, and is used in its annual report
	Data comes from the agency's internal client database.
	Methodology was developed internally.
estimated taxes and estimated taxes and conservative assumptions; that the customers maintaned the same perivek for one year and that the customers maintaned the same perivek for one year and that under customers and society for ROI have been computed. (RSA-911 and RSA-2), "repay periods" and 'costo thenest analysis periods" and 'costo the RRA-2), "repay periods" and 'costo the RRA-2, "repay analysis. Data elements used for the ROI torcustomers and included in analysis. Data elements used for the ROI by MRS-841 (RSA-911 data) indirect cost of VR services (sum not amplyment (RSA-911 data) Competitive employment variable (RSA-911 data) Estimated tax amount from changes from customers with an competitive employment (RSA-911 data) Estimated as amount from changes from customers with an competitive monthy amount of Commeter and Tax Foundations) for customers with an competitive employment (RSA-911 data) for customers with an competitive monthy amount of RSA-911 data) for customers with an competitive environge (or eluctorio) in the monthy amount of the customers with an competitive environge (or eluctorio) in the monthy an out of the supports) between all Other Supports) between and Other Supports) between and Other Supports) between and outsomers with an competitive employment (RSA-911 data)	Using the RSA-911, and the agency's internal database, the number of cases closed to
	Yes, the Michigan Commission for the Blind uses number of closures to competitive employment, average
	MI-B

				Suzanne Lee - suzanne Lee @dwd.wi Suzanne.lee@dwd.wi 541-3570
methodological manual, shorthy the 2010 ROI can be forwarded.				We don't have any manuals associated with this
				We have used this type of snapshot to communicate with department. Insignment, budget staff, legislators, the general public, Renabilitation Council, Renabilitation Council, Renabilitation Council, and the service and many others. It is an essiby be explained and does not others and and does not explained and does not communication strategy has neleases of the noticing Disability Awareness Disability Awar
				collected at successful collected at successful closure. We update our data diny and this report is likewise updated nginty and interactory teapbeard. The agency dashboard. The report can also be accessed on our dashboard for a con our dashboard for a on our dashboard for a no our dashboard for a prior fiscal year. Again, this is available to all staff.
				director, Manuel Lugo
employment is calculated and the employment wage is identified. System developers are presently designing a standard ROI report that can be generated for any time period.				We take the number of evaluations in a given fiscal evaluation wage for transmission week, week for transpace makindials week, week for transpace makindials week proving the result of multiphy the average wage by nour for the rehabilitations by the average proving per wage transmission wage thrankes the number of exhibitions times 25 weeks in a verse framed 5 month earlings which is just the annual earlings divided by 4. No compute the total case envices costs divided by the estimated annual earlings to get a ratio to the rehabilitations in the earlings for those individuals. Then we take the total services costs divided by the estimated annual earlings to get a ratio which is multiphed by 22, weeks number the annual earlings foct taking the annual earlings foct taking the annual earlings foct taking the annual earlings foct taking the annual earlings foct tration in this case the lower the number of base vices costs which gives an annual earlings foct trate. In this case the bibler the number of base vices costs which gives an annual earlings foct trate. In this case the bibler the
starting wage, calculates the projected amount of state and federal income taxes the individuals would pay, and calculates the repayment period for the total investment made to assist individuals with employment.	No	No		Wisconsis in uses a Casefload and Rehab outcomes report for providing information on Return on Investment I have attached a copy of that report (printer fritendly found and the snapshot of the dishbard screen that generates the report.
	MN	ч <mark>и</mark> в	НО	ž

Para agency the acciding the the formula for the formula for the contratellation of etc); the thems armed, thris armed, th				the formula NMVR has meer of clients traditionally and traditionally to an earning sof those earning sof those earning sof those traditioned to contracted the all incorne in Robert all incorne in Robert Curl ast contracted decrease in the more served tarte the period with a for goods and deformed the for all incorne the represent value, with New Mexico my Cassberget who Grassberget who all incorne the castra the more served at a low of goods and g bood remoted an vector was and the for goods and the for goods and the for an wage and minedeelaly
(2) Hwa does your agenc measure ROT Please lea invession Routed in the form invession floated in the form invession actual as a sub- spectic services, etc.) the induded in the formula for spectic services, etc.) worked any etc. worked				 accontinentiation (itema included in the form pareas the dollar the dollar the other state the state the state second scinar the state second of state the state second of doclars
Region 6 (1) Dees your agency return of the the defini- please provide the defini-	AR AR	R-B	LA	NMDF5 RCI is a cost that essentially compare amount that is returned treasury for every S1 of appropriation. NM

		mobien@okdis.gov	Bill Agnell Bill Agnell@dars state tx us
		We have a study that was completed in 2008. It was an attempt to replicate the Massachusetts study. We Massachusetts study attempts since then to replicate, but have been reverwig materials in the past flew months.	Not at this time.
		garner legislative support for the agency.	Business management/evaluation; internal & external reporting, including the DARS annual report.
		This study teled on non- experimental, retrospective data from DRS Fedepective Service Service Report (annual RSA-911) Report (annual RSA-911) Report (annual RSA-911) dataset for Saral Years 2003 through through the Polationna Emblymmet Security Commission (CESC) Emblymmet Security Commission (CESC) Commission (CESC) Discription consumers working Unemplyment insurance- covered employment.	All are agency data except for tax rates.
		developed with staff from our agency and staff at OU, at OU.	DARS Program Reporting and Analysis group.
The generated gross eccepts tax from the purchase of goods and services The state benefits from increase revenuee due to taxes from revenues and selary income			 Projected total taxes paid by VR rehabilitaris (consumers with successfully closed cases) during their average remaining work lives, based on their annual taxes paid on wage in the closure SPY, cornorated with the crst of the
		In ressonse to the questions, OK BRS summitted a study study, the Oklahma study study, the Oklahma study study, the oblahma study study, the average costs of 'vocational rehabilitation services in Oklahoma were estimated to inclue 52,205 for process in Oklahoma were estimated to inclue 52,205 for process of the study study the adminisg guidance and generated two streams of the adminisg seconded by DRS benefits agrine streams of the streams of the adminisg neoded by DRS benefits generated two streams of benefits generated two streams of branch generated bubic approximation and (step) or approximation and (step) or administence outs or a 30, years recluced public and proxime and 53, 71 in recluced public assimilation readibilitation or a 30-years are streams of the two approximents bagets that for an occurrents bagets that for a every dollar invested in or scotek (i.e., taxpayers and constrinels angread of S0, 77 represent and constrrents bagets that for an occurrents bagets that for and constrrents bagets that for and constrrent baget and baget and constrrents bagets that for and constrrent baget and baget and constrrent baget and baget and constrrent baget and baget and constrrent baget and baget and construct baget of S0, Win 2012.	ROI – Total tax revenue resulted from vocational rehabilitation (VR) less the cost associated with the VR programs
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		Tim Gaines (Program) Autu Learning and Rehabilitating and Vers Francing Chy, MO 573-528-7013 S73-528-7015 RitcLongley (Financial) 573-528-7015	Mark Laird, Assistant Chef Bind Jefferson City, MO Jefferson City, MO Ha02-751-4249 mark, laird@dss mo aov	Mark Schultz NE VR State Director Lincon, NE 402-41-949 mark schultz@nebraska.gov
		Yes, but the report is almost 8 years old. Glad to share to share	No, but they will share anything asked of agency	Yes
		Legislative inquiries, public questions, SRC, staff feedback	Reported to legislative inquiries, SRC, advocates, and interested crizens	Legislative program and financial inquires for tunding based on economic benefit is not adequate, must use actual increase in taxes and actual increase in taxes and scale chickors in state benefits.
		RSA 15, 911, earnings reported at closure	Earmings at closure Estimate draws paid divided by the program costs of state match and Title 1 totals	State data "Talex gives work mithers" Federal and state tax return table Multiplier on state expenditures
0. U		management heam team	Mark Laird, RSB State Director	Mark Schultz, State VR Director and Data Center staff
		Earnings at referan compared to earnings at #26 closure Earnings at #26 closure Earnings at #26 closure divided by trubit program divided by trubial cost, divided by number of #28 closures in year 1. 1980-2003 Comptenersive study by 1980-2003 Comptener divident 1980-2003 Comptener and analyzing outcome data looking at earnings across mubiple years and broken outcome data looking at earnings across mubiple years in state and the secont for increases in state and Federal income taxes. No more reconducted.	Specific Amounts Not Routlinely Calculated but membor made of below. Savings- Savings- Savings- Medicard/Medicare, SSA cash Medicard/Medicare, SSA cash medicard/Medicare, SSA cash medicard/medicare, SSA cash medicared and State Income Taxes, earnings. Natrative Social Impact Increased- and integrated participation in the annings. Natrative Social Impact Meriane and State Income Taxes, earnings. Natrative Social Impact Increased and State Income Taxes, with the worth of independence and integrated participation in the enrological audio outputs for computers, curb cuts, amps, Wock Increatives and Tax Credits'. Data reported on BP2R andoph- Data reported on BP2R andoph-	Tax dollars expended divided by public benefits (state and Federal taxes, SSA benefits (state and Federal). Standard mutbjens for Federal and state income tax, years expected to work, increases based on earnings dork.
	disabilities input and consultation. Don't design something that carries a high cost.	Yes Earnings Data Reduction in costs	Yes. Social and Economic Impact Not a formalized system	Yes Cost Benefit –Taxes and reduced state benefits
		OW	β	PE

RE B	We only have an internal method NCEVI does measure ROI by looking at the quality jobs our clients get	A We look at the number of clents week or more, or making at least \$217.50 per week, (which is 30 ins per week or more), or making at least \$217.50 per week, (which is 30 ins times minimum wage). The level of education each of the successful closure have. In the adal cost in their case, including squiment, or agency gets per year. This aso gives us an idea of the number of includuals who get war. This aso gives us an idea of the week they earned and the kind of Benefix.	The VR deputy director (Carlos Servan) and district supervisors	We use our own data collection and also the Department of Labor data to Department of Labor data to obtain information on wages earnet. We develop our own data system and in egrads to the information, we have an inter-agency agreement in place.	offset some costs. offset sommendation that if made to make sure its useful, not toake sure its useful, not toake sure its useful, not toake sure its useful, not toake sure its ingues comprehensible to many audiences, including ingues comprehensible to many audiences, including ingues comprehensible to many audiences, including the information to determine if the also present some supervisors new strategies on serving une of vhy something is not workting and what we need to drange to make it work. We change to make it work. We and workting and what we need to drange to make it work. We state Staff Meeting as a training bol.	Only our internal result	
8 noig98	 Does your agency measure return on investment (ROI). If yes, preturn on investment (ROI). If yes, these provide the definition of ROI that your agency uses. 	The service for the formula for measure for the formula for newerment (such as total agency costs of some constellation of specific services, etc), the items included in the formula for return (such as wages each #hts worked per week taxes paid on wages, contribution to general econy etc), with s included in pour sample (such as all clients, clients admitted for services, clients actually served, etc) at what point in me (such as intake or exit or some other point).	(3) Who developed your agency? methodology?	(4) What data sources are used to conduct the analysis? For each source, indicate whether this is agency or non-agency data, and how (and how easily) you collect it.	(5) What does your agenc) do with its ROI information? How is it used?		 (6) Does your agency have any information (methodogical manuals, reports of results, other dath that you are willing to share? you are willing
MT	Yes- Montana DVR is currently engaged in an ROI study. The project is in process and does not have results yet. It is based upon the West Virginia model of ROI and is being completed by the University of		The Model is being developed by Montana DVR and the Bureau of Business and Economic	The data sources are primarily the RSA- 911 and RSA-2 and unemployment insurance data.			

	Montana.		Research at the University of Montana. It is based upon the West Vriginia model of Return on Investment (se WV informaton)				
9	Cost Bentit based on Clert Income For every dollar spent by VR. Cost every dollar spent by VR. Loss every dollar spent by VR. pay back SXX amount in taxes.	Cost Benefit based on Clert Income arene and the instance of this ratio is the average adjusted income projected for the remainder of the clean's work, lives. The denominator is the average cost to rehabilitate the cleans. Cost Benefit based on Clert cost Benefit based on Clert income projected both the immander of the cleans' work lives. The denominator is the average adjusted income projected both the immander of the cleans' work lives. The denominator is the average adjusted addits. The program asks for the following dats. Average age of 'saths 26s at cost adjusted clients' average age of 'saths 26s at cost adjusted income of 'saths 26s at costs adjusted, moder a choose from State Economy - or boose from	Rehabilitation Research Training Center, Varianing Center, University, 1992 University, 1992	The age and wage data comes from the RSA- gril. The total expenditures correst from our accounting system. It's way to collect the data.	It's one of our strategic plan goals, and is published in our annual report.	Yes, if's a simple DOS. Executable file	Warren Gaanlor 201.328 8975 wsgaarlo.gind.gov
SD	No						
SD-B	South Dakota SBVI does not have a form of the contract of the contract of the cost ratios based on consumer income and consumer payback	The software designed by the West Virginia RRTC solutaies benefit cost ratios of consumer income and cost ratios of consumer income and consumer payback. The formula consultates how much consumers are expected to increase their earnings for each S1 which is spent for	They use software developed by the West Virginia RRTC "many years ago."	The data sources are the RSA-911 data, age data and expenditure data.		The agency has calculations for FY2010.	Eric Weiss at eric.weiss@state.sd.us

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	Yes. The ROI is defined in the formula in question #2.	Wyowing does not have a formal ROI but did have a study of Job Attainment and Wages of Wyoming Vocational Rehabilitation Clients	 Does your agency measure return on investment (ROI). If yee, please provide the definition of ROI platese provide the definition of ROI 	
rehabilitated consumers. Similarly, it calculates the expected tax payback of rehabilitated consumers for every \$1 spent.	The formula included increases in tax revenue due to employment, dax revenue due to employment, SSD, TANF. GA and several of her community assistance (SSI). TANF. GA and several of her community assistance programs) community assistance program group consisted of the tax program group gr	The study examined the effect of successful closure versus unsuccessful closure on po attainment and wage.	(2) Hwat doesy our agency measure ROI? Please identify: the items included in the formula for investment (such as toolan agency costs, costs of some constallation of specific services, etc.); the items included in the formula for return suched in the formula for return worked per week, twas paid on worked per week areas paid on worked per week areas and clents, clents admitted for services clents actually served, etc.) at what point in the for service or exit or some other point).	
	Dr. Sarah Wilhelm and Jamifer Robinson from Public Poticy and Administration and Lutwershy of Utah developer this methodology:	Patrick Manning, principle economist, Research and Planning, Wyroming Department of Employment	(3) Who developed your methodoly?	
	Wo data services were used dataset corres from the dataset corres from the USOR MISs system which is called RIS. This data includes information regarding background, services and outcomes of dataset viso sobained from the Department of Workforce Services (Utah's agency tunded by the Department of working in the Unemployment involving in the Unemployment insurance covered arthore aptricipator uparties prior to applicitation and 12 quarties after closure.	Two main data sources: VR program data and Wyorring datapatment of Employment databases (these included wage records and demographic information.	(4) What data sources are used to conduct the analysis? For each source, indicate whether this agency or non-agency data, agency or non-agency data, and how (and how easily) you collect it.	
	The ROI has used up at the state legislature as information to inform our state senators and representatives can also and representatives of the summy reports have been used with employers to work with us in setting up on work with us in setting up on for VR clients.		(5) What does your agency do with its ROI information? How is it used?	
	The following is a link to several documents related to Utal's Return on Investment of Economic Impact Study Intro//www.usor.utah.gov/ http://wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww	A link to a summary of this study can be found at the Program Evaluation Summif Group page at http://media.nctm.org/pre sentations/QAMVY.JobWa ges.pdf	(5) Does your agency have any information (methodological manuals, reports of results, other reports of reports of results, other reports of reports	
	Don Uchida, USOR's executive director and/or Michael Shoemaker, Utaris Program Program Program Program Program Program Evaluation Specialist can be contracted. Michaele email is mitsheemaker@utah.gov.and direct phone number is (801) SS3-7746.	Brian Hickman at Drian Inickman@wyo gov or 307-177-0541. The Depathment of Research and Planning at doserd_r&p_web@state.wy.u s	(7) Who should be contacted for more information about ROI mesurement at your agency?	

(7) Who should be contacted for more information about ROI mesurement at your agency?	Jane McIntosh, 907-269. 3572, Tare mcntosh@alaska.gov
 (6) Does your agency have any information (methodological manuals, reports of results, other reports of results, other results, other reports of results, other reports of reports of results, other reports of results, other reports of results, other reports of reports of reports	We do nd generate a formal report on our results.
 (5) What does your agency do with its ROI unformation? How is it used? 	Alaska DYR uses the information very judiciously. We believe that there is an intrinsic, intrapible value to the YR program and the services we provide that cannot be quartified. At the same thre, we fully understand the need to show a quartitative value to the program is doing over the program performance the economits and do not want to verture into precising the optim and ab out analyzing program performance. A part oth here over view of the program and have been asked about by the legislature during budget thearings.
(4) What data sources are used to conduct the analysis? For each source, indicate whether this so agency or non-agency data, and how (and how easily) you collect.	The data used comes from the RSA2 and the RSA211 Which is 292 and the RSA211 DVR. We also use a discount rate table.
(3) Who developed your agency's methodolgy?	West Virginia Research & Training Carler on laska DVR went on develop assumptons assumptons methodology.
(2) How does your agency measure for there included in the formula for measure RO1? Prepare lifethy, the measure RO1? Prepare RO1? Shear exists of some constaliation of specific services, etc.); the items included in the formula for return (such as wages contribution to genaral and worked per week taxes paid on the taxes (sents a strated for services, clearly served, etc.) at what point in time (such as indicke or exit or some other point).	By federal fiscal year, total agency costs and number of successful closures. For those closed chabilitated, age at application and closure, income at application and closure, discount and closure, estimated tax rate and closure, estimated tax rate
(1) Does your agency measure return on investment (ROI), If yes, please provide the definition of ROI that your agency uses.	Yes, Alaska DVR does an annual costbenetif analysis. We use a very traditional view of RO1 – a rado of the income of the VR program, a ratio of the payback of takes to cost, a ratio of takes + public support to norg-term reduction in public support and the long-term benefit to the individual.
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				Dacia Johnson, Rehabilitaton S. 873-1588. Dacia johnsong	DVR: Kelly Fran fitania <u>0ddiswa</u> 725-3810
				Nothing other than the attached.	See report at above website.
an anually. Vie did not want to be dependent upon himg a contractor on a regular basis to gave us this type of the arc cost/benefit models can be very comprisated to develop and maintain, thus the primary reason for our the primary reason for our the primarion.				The primary function of the information is to demonstrate that the investment of scale that the agency is a good timestiment and is paid back over time and/or is a cost servings.	
				It is referenced in the document I takes several steps to obtain the steps to obtain the information. We comple every 2 years for the Oregon Legislative Session.	(2) The report states that earnings records were used and that program cost data was provided "by the state," but does not specify where the data came from.
				Our administrator based on other based on other vR agencies analysis and other factors that would the Oregon Legislature a Legislature a corropeling case that the agency is a good investment of state resources.	(1) Unknown
				The attached document outlines what we use and how.	For this project the benefits that were calculated included the following officeround officeround the finage benefits associated with those earings (regative benefit to participants; benefit to society) • Reductions in U benefits (negative benefit to participants; benefit to society) • Reductions in TAVF Penefits (negative benefit to society) • Reductions in TAVF penefits penefit to society)
				We are using a cost savings calculation to demonstrate return on investment, which is attached.	The Washington Agencies submit information for a Workcree Training Board report that is completed every four years and includes a benefit-cost analysis current report is available at http://www.kub.wa.gov/dccuments/net imaectco05 but, an updated report is in development).
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	D5B. Don Alve: don.alveshere@ (206.906-5523)
	See report at above website.
	DSB uses this information to communicate with statebulders and to evaluate our service delivery model." (12/21/2010) Alveshere, (12/21/2010)
	(4) The report states that earnings records were used and that program cost data was provided "by the state," but does not specify where the data came from.
	Dhknown
 Reductions in Food Stamp benefits: head addive terrefit to participants; benefit to society) Reductions in Medicaid benefits (negative benefit to participants; benefit to participants; for the participants; for the participant; for the participant; 	 For this project, the benefits that here can ingo a local valed included the wave realizated included the wave each vale of discounted). Finge benefits associated with those earlings (negative benefit to society). Reductions in UI benefits (negative benefit to society). Reductions in TANF periopants, benefit to participants, benefit to society). Reductions in TANF periof to participants, benefit to society). Reductions in FANF periof to participants, benefit to society). Reductions in FANF periof to participants, benefit to society). Reductions in Food Stamp periopants, benefit to society). Reductions in Food Stamp participants, benefit to society). Reductions in Food Stamp periopants, period of training). Frogone earlings (reduced annimity earling the period of training).
	The Washington Agencies submit information for a Wordcree Training board report that is completed every four years and includes a benefit cost analysis (current report is available at <u>http://www.wbw.agov/dccurrents/net</u> in development),
	B-WA-

Appendix C: Mathematical Exposition of the Net Impact Problem

The net impact evaluation problem may be stated as follows: Individual *i*, who has characteristics X_{it} , will be observed to have outcome(s) $Y_{it}(1)$ if he or she receives a "treatment," such as receiving VR services at time *t*, and will be observed to have outcome(s) $Y_{it}(0)$ if he or she doesn't receive the services. The net impact of the treatment for individual *i* is $Y_{it}(1) - Y_{it}(0)$. But of course, this difference is never observed because an individual cannot simultaneously receive and not receive the treatment.

To simplify the notation without loss of generality, we omit the time subscript in the following discussion. Let $W_i = 1$ if individual *i* receives the treatment, and $W_i = 0$ if *i* does not receive the treatment. Let *T* represent the data set with observations about individuals who receive the treatment for whom we have data, and let n_T represent the number of individuals with data in *T*. Let *U* represent the data set with observations about individuals who may be similar to individuals who received the treatment for whom we have data, and let n_U be its sample size. In some of the techniques described below, we identify a subset of *U* that contains observations that "match" those in *T*. We will call this subset *C*, and let n_C be its sample size.

Receiving the treatment is assumed to be a random event individuals happened to be in the right place at the right time to learn about the VR services, or they may have experienced randomly the eligibility criteria for the program—so W_i is a stochastic outcome that can be represented as follows:

(1) $W_i = g(X_i, e_{pi}),$

Where e_{pi} is a random variable that includes unobserved or unobservable characteristics about individual *i* as well as a purely random component.
An assumption that we make about g(.) is that $0 < \operatorname{prob}(W_i = 1|X_i) < 1$. This is referred to as the "support" or "overlap" condition that is necessary so that the outcome functions described below are defined for all X.¹⁵

In general, outcomes are also assumed to be stochastically generated. As individuals in the treatment group encounter the treatment, they gain certain skills and knowledge and encounter certain networks of individuals. Their outcomes are generated by the following mapping:

(2) $Y_i(1) = f_1(X_i) + e_{1i}$

Individuals not in the treatment group progress through time and also achieve certain outcomes according to another stochastic process, as follows:

(3)
$$Y_i(0) = f_0(X_i) + e_{0i}$$

Let $f_k(X_i) = E(Y_i(k)|X_i)$, for k = 0,1, so e_{ki} are deviations from expected values that reflect unobserved or unobservable characteristics.

As mentioned, the problem is that $Y_i(1)$ and $Y_i(0)$ are never observed simultaneously. What is observed is the following:

(4) $Y_i = (1 - W_i)Y_i(0) + W_iY_i(1)$

The expected value for the net impact of the treatment on the sample of individuals treated:

(5)	$E[Y_{i}(1) - Y_{i}(0) X, W_{i} = 1] = E(\Delta$	$X \mid X, W = 1$
	= E[Y(1) X, W = 1] - E[Y(0) X, W = 1]	W = 0]
	+ E[Y(0) X, W = 0] - E[Y(0) X, W = 0]	W = 1]
	$= \hat{f}_1(X) - \hat{f}_0(X) + \text{BIAS},$	where
	$\hat{f}_{ak}(X), k = 1, 0$, are the outcome	e means for the
	treatment and comparison group	samples,
	respectively, and	
	BIAS represents the expected di	fference in the $Y(0)$
	outcome between the compariso	n group (actually
	observed) and the treatment grou	up (the
	counterfactual)	-

¹⁵ Note that Imbens (2004) showed that this condition can be slightly weakened to $Pr(W_i = 1|X_i) < 1$.

The BIAS term may be called selection bias.

A key assumption that allows estimation of Equation 5 is that $Y(0) \perp W|X$. This orthogonality assumption states that given X, the outcome Y(0) is a random variable whether the individual is a participant or not. In other words, participation in the treatment can be explained by X up to a random error term. The assumption is called "unconfoundedness," "conditional independence," or "selection on observables."¹⁶ If the assumption holds, then the net impact is identified because the BIAS goes to 0, or

(6)
$$E[\Delta Y|X, W=1] = \hat{f}_1(X) - \hat{f}_0(X)$$

Reference

Imbens, G. (2004). Nonparametric estimation of average treatment effects under exogeneity: A review. *Review of Economics and Statistics*, 86, 4-29.

¹⁶ Imbens (2004) referred to this as the "unconfoundedness for controls" assumption.

Appendix D: Full Sample and Matching Quasi-experimental Estimators

T represents the data set with treatment observations, and *U* represents a data set from which the comparison set of observations may be chosen. They have n_T and n_U observations. Note that *T* and *U* may come from the same source of data or may be entirely different data sets. In the former situation, *U* has been purged of all observations that are also in *T*.

In general, labor market outcomes for individuals are assumed to be stochastically generated. An individual in the treatment group with characteristics X_i will encounter the treatment and gain certain skills and knowledge and participate in certain networks of individuals. That individual's outcomes are generated by the following mapping:

(1)
$$Y_i(1) = f_1(X_i) + e_{1i}$$

Another individual *i*, not in the treatment group, progresses through time and achieves certain outcomes according to another stochastic process, as follows:

(2)
$$Y_i(0) = f_0(X_i) + e_{0i}$$

Full sample estimators. Assuming that T and U have some resemblance to each other, a baseline estimator that can be calculated is the simple difference in means of the outcome variables. This estimator essentially assumes away selection bias. It may be represented as follows:

(3)
$$\tau = \frac{1}{n_T} \sum_{i \in T} Y_1(1) - \frac{1}{n_U} \sum_{i \in U} Y_j(0)$$

This estimator can be regression adjusted. If we assume that the same functional form holds for both Y(1) and Y(0), then the treatment effect can be estimated from a linear equation such as the following using the observations in the union of T and U:

(4)
$$Y_i = a + B'X_i + \tau W_i + e_i.$$

Wi is a treatment dummy variable that is equal to 1 if i is in the T and 0 if i is in U. More generally, τ can be estimated by using two separate regression functions for the two regimes (Y(1) regressed on X in T and Y(0) regressed on X in U), using both models to predict a "treated" and "nontreated" outcome for all observations in both T and U.¹⁷ The following average treatment effect can then be calculated:

(5)
$$\tau = \frac{1}{N} \sum_{i \in T, U} \left[\hat{f}_1(X_i) - \hat{f}_0(X_i) \right], \text{ where}$$
$$N = n_T + n_U \text{ and } \hat{f}_k(X_i) \text{ is predicted value for } k = 1,$$

0.

Equation 4 and the more general regression in the first stage of Equation 5 require strong parameterization assumptions. Heckman, Ichimura, Smith, and Todd (1998) relaxed those assumptions in a nonparametric kernel method. This method amounts to weighting the observations in U such that the observations closest to the treatment observations receive the highest weights. This estimator may be written as follows (following Imbens, 2004):

(6)
$$\hat{f}_k(X_i) = \frac{\sum_j Y_j K\left(\frac{X_j - X_i}{h}\right)}{\sum_j K\left(\frac{X_j - X_i}{h}\right)}$$
 for $k = 1, 0$

where $j \in T$ if k = 1 and $j \in U$ if k = 0 and K(X) is a kernel function with bandwidth h.

(7)
$$\tau = \frac{1}{N} \sum_{i} \left[\hat{f}_{1}(X_{i}) - \hat{f}_{0}(X_{i}) \right]$$

¹⁷ Imbens (2004) pointed out this generalization. The intuition is similar to that of the basic Roy (1951) model with two regimes, and individuals pursue the regime for which they have a comparative advantage. However, Imbens (2004) noted, "These simple regression estimators may be very sensitive to differences in the covariate distributions for treated and control units" (p. 12).

Several of the full sample estimators rely on the observations' propensity scores, which are the estimated probabilities of being in the treatment group. Rosenbaum and Rubin (1983) showed that the conditional independence assumption, $Y(0) \perp W|X$, implies that $Y(0) \perp W|p(X)$, where p(X) is the conditional probability of receiving the treatment = Prob(W = 1|X).

This result implies that the regression approaches in Equations 4 through 6 can be reestimated, at reduced dimensionality, with the X_i replaced by $p(X_i)$. That is, estimates can be generated as follows:

(4')
$$Y_{i} = a + B'p(X_{i}) + \tau W_{i} + e_{i}.$$

(5') $\tau = \frac{1}{N} \sum_{i \in T, U} \left[\left(\hat{f}_{1} \left(p(X_{i}) \right) - \hat{f}_{0} \left(p(X_{i}) \right) \right) \right]$
(6') $\hat{f}_{k} \left(X_{i} \right) = \frac{\sum_{j} Y_{j} K \left(\frac{p(X_{j}) - p(X_{i})}{h} \right)}{\sum_{j} K \left(\frac{p(X_{j}) - p(X_{i})}{h} \right)} \text{ for } k = 1, 0$

The final type of full sample estimator is computed by a technique known as blocking on the propensity score (see Dehejia & Wahba, 2002). The intuition here is to partition the union of the treatment and full sample into "blocks" or strata by propensity score, such that there is no statistical difference between the covariates, X, in each block. This essentially achieves the conditional independence assumption locally in each block. Then the average treatment effect is a weighted average of the treatment effects in each block.

Let the *k*th block be defined as all treatment or full comparison sample cases with values of *X* such that $p(X) \in [p_{1k}, p_{2k}]$. Let NT_k be the number of treatment cases in the *k*th block and NU_k be the number of comparison cases from the full sample. The treatment effect with each block *k* is as follows:

(8)
$$\tau_{k} = \sum_{i=1}^{NT_{k}} \frac{1}{NT_{k}} Y_{i}(1) - \sum_{j=1}^{NU_{k}} \frac{1}{NU_{k}} Y_{j}(0)$$

and the overall estimated average treatment effect is given as follows:

(9)
$$\tau = \sum_{k} \frac{NT_{k}}{N} \tau_{k}$$

Matching estimators. As above, U denotes the set of observations from which a subset C (for matched comparison group) is chosen for the net impact analyses. The idea is to have C comprise the observations where individuals are most 'like' the individuals comprising T. Matching adds a whole new layer of complexity to the net impact estimation problem. The estimator becomes a function of how the match is done in addition to the characteristics of the sample. Since the matching process is a structured algorithm specified by the analyst, the statistical error associated with the net impact estimator now includes a component that may be identified as matching error in addition to the sampling error and model specification error.¹⁸

There is a substantial and growing literature on how to sample individuals to construct the comparison sample.¹⁹ The first candidate approach is *cell-matching algorithms*. Variables that are common to both data sets would be used to partition (cross-tabulate) the data into cells. Then for each treatment observation, the cell would be randomly sampled (with or without replacement) to select a comparison group observation. A substantial drawback to cell-matching is that the cross-tabulation of data, if there are many common variables, may result in small or empty cells.²⁰

More sophisticated comparison group construction can be accomplished with *nearest-neighbor algorithms*. These algorithms minimize a distance metric between observations in T and U. If we let X represent the vector of variables that are common to both Tand U, and let X_j , X_k be the values of X taken on by the *j*th observation in T and *k*th observation in U, then C will be composed of the *k* observations in U that minimize the distance

¹⁸ This forces the analyst to use bootstrapping techniques to calculate standard errors.

¹⁹ See Heckman, Lalonde, and Smith (1999) and references cited there.

²⁰ King (1994) used a variation of this approach.

metric $|(X_j - X_k)|$ for all *j*. This approach is very mechanistic, but it does allow use of all of the *X* variables.

The literature usually suggests that the distance metric be a weighted least squares distance; $(X_j - X_k)N\Sigma^{B^1}(X_j - X_k)$, where Σ^{B^1} is the inverse of the covariance matrix of *X* in the comparison sample. This is called the Mahalanobis metric. If we assume that the X_j are uncorrelated, then this metric simply becomes least squared error. Imbens (2004) discussed the effect of using different metrics, although in practice the Mahalanobis metric is used most often.²¹

In his work on training program evaluation, Ashenfelter (1978) demonstrated that participants' preprogram earnings usually decrease just prior to enrollment in a program. This implies that a potential problem with the nearest-neighbor approach is that individuals whose earnings have 'dipped' might be matched with individuals whose earnings have not. Thus, even though their earnings *levels* would be close, these individuals would not be good comparison group matches.

An alternative nearest-neighbor type of algorithm involves use of propensity scores (see Dehejia & Wahba, 2002). Essentially, observations in T and U are pooled, and the probability of being in T would be estimated using logistic regression. The predicted probability is called a propensity score. Treatment observations are matched to observations in the comparison sample with the closest propensity scores.

An important consideration in implementing the matching approach is whether to sample from U with or without replacement. Sampling with replacement reduces the "distance" between the treatment and comparison group cases, but it may result in the use of multiple repetitions of observations, which may artificially dampen the standard error of the net impact estimator. Another consideration is the number of cases to uses from U in constructing C. Commonly, matching is done on a one-to-one basis, where the nearest neighbor is chosen. However, it is also

²¹ Note that Zhao (2004) used a metric that weights distances by the coefficients in the propensity score logit. This is similar to the technique that Schroeder implemented in Hollenbeck, King, and Schroeder (2003).

possible to take multiple nearest neighbors, such as one-to-five and one-to-10 matching.

The whole reason for matching is to find similar observations in the comparison group to those in the treatment group when the 'overlap' or statistical support is weak. Consequently, the nearest-neighbor approach may be adjusted to require that the distance between the observations that are paired be less than some criterion distance. This is called *caliper or radii matching*.

Once the matched sample C has been constructed, the net impact estimation can be done using the estimators analogous to those in Equations 6 through 9. The outcome variable can be in terms of levels or difference-in-differences if the underlying data are longitudinal.

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Appendix E: Summary of 16 ROI Studies from States and the CSAVR

	Source*	Alabama Department of Rehabilitation, 2007	Hemenway & Rohani, 1999
Conducted	in house?	Unknown	No, Florida State University
Control	group?	Unknown	N
	Model	 The annual report lists the estimated first-year earnings of consumers who were unemployed at application (\$102,518,280) and the estimated total taxes paid (\$2,050,365). Costs were not revealed. Total returned to economy for each dollar invested in rehabilitation: \$21.95 (unsperified time period) 	 Study included all closed cases from FY 1998: 29,475 (including 9,598 successful closures). The average cost for closed cases was estimated by calculating average expenditures for each cost
	Benefits	Unknown source, possibly RSA- 911 and/or Ul wage data.	RSA-911 data for earnings and public assistance. Tax revenue was estimated based on
	Costs	Unknown source, possibly RSA data.	Costs of VR per closed case and per successfull y closed case from RSA data.
Sample	years	Unknown	FY 1998
	State	AL	FL

	Sample				Control	Conducted	
State	years	Costs	Benefits	Model	group?	in house?	Source*
			projected	category and then			
			earnings.	summing the categories to			
			Benefits	obtain an estimated total			
			included	average cost. Average VR			
			increased	costs per closed case were			
			earnings, tax	\$2,917 and \$5,010 per			
			revenue, and	successful closure. Overall			
			reductions in	average increase in annual			
			public	earnings: \$3,011. Average			
			assistance	increase for successfully			
			expenditures.	closed cases: \$10,407.			
				Benefits to the state			
				included an average annual			
				reduction in public			
				assistance payments of			
				\$179/case in addition to an			
				estimated reduction in			
				administrative costs of			
				\$18/case. Tax revenue was			
				estimated at 23% of the			
				increase in earnings. The			
				study also included a 30-			
				year work life estimation			
				using 3%, 5%, and 10%			
				discount rates.			
				 Cost-benefit ratios for all 			
				closed cases (in dollars):			

Costs	Benefits	Model	Control aroup?	Conducted in house?	Source*
		1:9.79 (10% discount rate), 1:15.96 (5%), and 1:20.35 (3%).	-		
	Unknown	 There were 2,121 	No	Unknown	lowa State
•	source,	successful closures in FY			Rehabilitation
-	estimated	2005, with an estimated			Council, 2006
0,	state tax	\$35,600,916 in annual			
<u> </u>	evenue and	earnings and a \$274,092			
E	eduction of	annual reduction in TANF			
ā	ublic	expenditures.			
as	ssistance	 The 5-vear ROI for state 			
ã	enefits from	tax dollars was 1.9.27.			
ţ	e earnings				
of	individuals				
Wil	th				
SU	ccessful				
Clo Clo	sures in				
Pro	zuus. posal	This proposal is for an ROI	Yes	No. Upiohn	Hollenbeck, 2008
rec	commendat	analysis of the entire Indiana		Institute	
ē	ns included	workforce system, which			
	wage and	includes VR services. The			
S	tate	tasks are indicated below.			
а	dministration	1. Match/merge earnings			
0	lata to	records from as far back as			
Ψ	estimate the	possible to the			
	et impacts of	administrative data on			

State	Sample vears	Costs	Benefits	Model	Control aroup?	Conducted in house?	Source*
		the	employment	individuals available from			
		workforce	rates,	the agencies. An important			
		developme	quarterly	component of the match is			
		nt system.	earnings, and	labor market experience,			
	_	Costs	receipt of	so it is necessary to go			
		include the	public	back as far as possible to			
		overall	assistance.	track people's employment			
		costs of		and earnings histories. This			
		services		subtask will require			
		funded by		considerable time and			
		tax dollars.		effort.			
				2. Create several summary			
				statistics to characterize			
				the individuals' work			
				experiences: percent of			
	_			quarters employed,			
				earnings trend, variance in			
				earnings, indicators of			
				turnover, and indicators of			
				earnings dips.			
				3. Run logistic regressions on			
				each agency's data sets to			
				calculate a propensity			
				score. Using adult			
				education as an example, a			
				data set will be created that			
				combines all of the adult			

ModelControlControlModelgroup?In Ieducation exiter recordsgroup?in Ieducation exiter recordsnogroup?in Irecords. A logisticregression will be run on this combined data set, in which the dependent variable is a dummy variable indicating that the record. Independent variables, and any other variables, and any other variables that are common in the two datacontrolControl	Benefits Model Control Control <thcontrol< th=""> <thcontrol< th=""> <thco< th=""><th>Costs Benefits Model Control Control Benefits Model group? in t with all of the WorkOne records. A logistic group? in t regression will be run on this combined data set, in which the dependent variable is a dummy in t variable indicating that the record. Independent variables will include labor in the wordates, and any other variables, and any other variables that are any other variables that are common in the two data</th></thco<></thcontrol<></thcontrol<>	Costs Benefits Model Control Control Benefits Model group? in t with all of the WorkOne records. A logistic group? in t regression will be run on this combined data set, in which the dependent variable is a dummy in t variable indicating that the record. Independent variables will include labor in the wordates, and any other variables, and any other variables that are any other variables that are common in the two data
Andel Model Gr education exiter records with all of the WorkOne records. A logistic regression will be run on this combined data set, in which the dependent variable is a dummy variable is an adult education record. Independent variables will include labor market summary variables, demographic variables, and any other variables that are common in the two data	Benefits Model Cr Benefits Model gr education exiter records with all of the WorkOne records. A logistic regression will be run on this combined data set, in which the dependent variable is a dummy variable indicating that the record. Independent variables will include labor market summary variables, demographic variables, and any other variables that are common in the two data	Costs Benefits Model Qr Cr with all of the WorkOne records. A logistic gr control gr records. records. A logistic records gr gr gr which the dependent variable is a dummy variable is a dummy variables, in gr gr record. Independent variables will include labor market summary variables, and any other variables, and <
	Benefits	Costs Benefits
Sample years Costs	years	

	Sample				Control	Conducted	
State	years	Costs	Benefits	Model	group?	in house?	Source*
				that has the closest			
				propensity score. (A			
				technicality is that we will			
				do one-to-one matching			
				with replacement and a			
				caliper.) After each match,			
				we will calculate match			
				quality statistics.			
				5. Calculate the mean			
				differences in outcome			
				variables between the			
				program participants and			
				their matched comparison			
				group. These differences			
				constitute the net impact of			
				the program. As tests of			
				their robustness			
				(believability), we will			
				calculate regression-			
				adjusted differences, and			
				difference-in-differences.			
				6. Extrapolate the impacts			
				into the future and impute			
				fringe benefits and tax			
				liabilities. Similarly, we will			
				forecast transfer payment			
				net impacts.			

	Sample		i		Control	Conducted	
State	years	Costs	Benefits	Model	group?	in house?	Source*
				7. Calculate the future			
				benefits of training. We will			
				collect data on the per-			
				participant cost, and from			
				these two flows, we will be			
				able to calculate a benefit-			
				cost ratio and rate of return			
				(Hollenbeck, 2008, pp. 19- 20).			
MA	FY 1999	RSA data,	RSA-911 and	 Using RSA-911 and U/I 	Yes	No, Common-	Uvin,
	and 2000	total	UI data	data, the increased		wealth	Karaaslanli,
	case	average	(1/1995-	earnings from application to		Corporation	& White, 2004
	closures	cost per	9/2003).	closure were calculated.			
		case, plus	Benefits	Costs were based on total			
		cost to the	included esti-	FY budgets for VR. There			
		VR	mated	were two groups (excluding			
		consumer.	increased tax	consumers ≥50 years):			
			revenues and	Program group, Status 26			
			reduction in	and 28 closures; and			
			public	Comparison group, Status			
			assistance	30 closures. Several			
			payments.	different approaches were			
			Benefits to	used to estimate the impact			
			the individual	of VR services on earnings			
			VR consumer	and employment.			
			are also	 Results indicate the 			
			discussed.				

Conducted		Unknown Michigan Rehabilitation Services & Michigan Commission for the Blind, 2010	Unknown North Carolina Division of Vocational Rehabilitation Services, 2009
Control		°Z	°N N
	average projected increase in lifetime earnings for VR consumers was \$60,000. ROI for society is 1:14–18. FL method benefit-cost– 1:7. Net impact method benefit-cost: 1:5.	 Increased annual earnings for successfully closed cases in FY 2009: \$64 million. Additional state and federal income taxes: \$19 million. 	 The difference between earnings at application and at closure for successfully closed cases. Nonsuccessful closures were not discussed. Total increase in weekly earnings for consumers
Donofile		Unknown sources for increase in consumers' overall increase in annual earnings and the estimated annual taxes.	Unknown source, possibly RSA- 911 data. Benefits include the increase in average
Contro C	6600	FY 2009 VR budget, includes FY 2008 carryover.	Unknown source, average total cost per successful outcome in 2009.
Sample) det o	FY 2009	FY 2009
Ctoto		IW	NC

y cars	o Loc			aroun2	in houseo?	Source*
	20213	closure.	FY 2009: \$1,429,804.	gioup:		200100
FY 2009 1	Unknown	Unknown	 Used average cost per 	Unknown	Unknown	Nebraska State
	source,	source,	consumer and the average			Rehabilitation
	average	possibly RSA-	annual earnings after VR			Council, 2009
<u> </u>	cost of VR	911 data for	services and the estimated			
	services	earnings at	taxes paid on earnings			
<u></u>	per	closure.	(federal and state income			
0	consumer.	Benefits	taxes, state/local sales			
		include	taxes, and Social Security			
		estimated tax	taxes). Estimated total			
		revenue over	benefits using 30 years of			
		30 years of	future employment.			
		employment.	 Based on an estimated 30- 			
			year work life, the average			
			successfully employed			
			consumer returned \$9.75 to			
			the taxpayers for each			
			dollar spent on VR			
			services.			
FY 2006	RSA, total	Benefits were	 Estimations of additional 	No	No, NM State	Grassberger,
_	VR	calculated	state and local tax revenue		University	2006
	spending	using RSA-	were calculated using the			
Ţ	from	911 and UI	marginal increases in			
f	federal and	wage data.	income for the sample.			
	state	Benefits	Reduction in state-funded			
0)	sources.	included in	public assistance was			

-																											
	Source*																										Kisker, Strech, Vetter, & Foote,
Conducted	in house?																										No, University of Oklahoma
Control	group?																										Yes
	Model	calculated using RSA-911	data. Future projections	used a discount rate of	2.31%, and expected work	life was based on	consumer age and	education level, with the	average for the sample	being 17.74 years. An	inflation rate of 2.39% was	used for future payments	and earnings.	 For consumers 	successfully rehabilitated,	the state's return on	investment was 1:5.13.	Combining increased state	income tax revenue on	increased lifetime earnings,	decreased public	assistance payments, and	tax revenue from federal	expenditures in NM, the	2006 cost-benefit ratio	became 1:5.63.	 Closed cases from FY
	Benefits	the study	were	increases in	tax revenue	and reduction	in public	assistance	payments.																		State- provided
	Costs																										RSA data.
Sample	years																										FY 2003- 2005
	State																										УО

Coursos*	Source	2008																										
Conducted	in nouse?																											
Control	group:																											
	INIOGEI	2003-2005. Assessed the	effect of VR services on	employment rates and	earnings. Benefits were	estimated using UI	earnings data and	projections of tax revenue	and reduction in public	assistance payments. Net	impacts included the costs	to the public and the	individual receiving	services (e.g., a temporary	reduction in earnings and	increased taxes).	 For every dollar invested in 	VR services, \$2.30 was	returned to the public in	increased taxes and	reduced public assistance,	if individuals experienced	the earnings increase for	10 years after closure. The	ROI is 1:5.30 if the trend	continues for 30 years of	the individual's work life.	The ratio of participant
Domofile	Denenils	wage and	RSA-911	data. Benefits	included	increased	taxes and	reduced	public	assistance.	From the VR	consumer	perspective,	benefits	included	increased	earnings.											
Jocto Cocto	COSIS																											
Sample	years	_										_										_						
Ctato	Släle																											

Source*		outh Carolina Vocational Department	Wilhelm & bbinson, 2010
onducted house?		R Sc R	University of Utah Ro
Control Cc aroup? in	-	N	Yes No,
Model	benefits to dollars invested is 15:1.	 Average cost per consumer served and average cost per consumer rehabilitated. Competitively employed consumers paid back \$3.33 in taxes for each dollar spent on their rehabilitation. Employed consumers realized a \$13.12 increase in earnings for each dollar of VR funds invested in them. The average competitively employed consumer would repay the cost of the VR in 5.5 years. ROI: 1.3.33 for consumers, an 18.1% annual rate of return on the taxpayer investment. 	 The study measured the outcome/impact of VR on quarterly employment rates and earnings using UI
Benefits		Unknown source, possibly RSA- 911 data for earnings increase from application to closure. Benefits included the estimated tax revenue on the earnings.	U/I wage data, RSA- 911 data. Benefits
Costs		Unknown source, possibly RSA data. Used average cost per successful closure.	Total VR spending from federal and
Sample vears	ſ	2008	FY 2005
State		SC	UT

Sample Costs Be	Costs Be	Bé	snefits	Model	Control group?	Conducted in house?	Source*
state included	state included	included		wage data for 12 quarters			
sources. Increased state tax	sources. Indeeded	state tax		model was used to explain			
revenue and	revenue and	revenue and		the variation in earnings			
decreases in	decreases in	decreases in		and employment.			
public	public	public assistance		Comparisons were made			
				received services (Status			
				26 and Status 28 closures)			
				and those that were			
				eligible, but did not receive			
				services (Status 30).			
•	•	•	•	For every state dollar spent			
			U	on VR, \$5.64 was gained			
		Į	Ţ	rom increased taxes and			
			-	decreased public			
				assistance payments.			
				Including the federal			
			•	spending in the state, the			
			0	cost-benefit ratio was			
			•	1:5.77 from the increased			
			0,	state tax revenue.			
Program State- UI wage and • T	State- UI wage and • T	UI wage and ● T	L ●	his report details the	Yes	No, Upjohn	Hollenbeck &
years supplied possibly RSA- in	supplied possibly RSA- in	possibly RSA- ii	.=	mpact and benefit-cost		Institute	Huang, 2006
2001- data. Total 911 data. es	data. Total 911 data. es	911 data. es	ê	stimates for the			
2002 and cost per Benefits and W	cost per Benefits and W	Benefits and W	5	lashington workforce			
2003- consumer costs were	consumer costs were	costs were					

	Source*																							
Conducted	in house?																							
Control	group?																							
	Model	development system, which	includes VR services.	 Cost-benefit analysis 	estimated the value of the	net impact on earnings,	employee benefits, social	welfaré benefits, Ul	benefits, and taxes (federal	and state income, Social	Security, and Medicare	taxes). Estimates were	calculated to age 65 on the	net gains compared to	similar individuals who did	not receive VR services.	Projections utilized a 3%	discount rate.	 The average program cost 	to the public: \$7,381. The	average estimated increase	in public tax revenue over	the work life of the	individual (until 65): \$8,424.
	Benefits	calculated for	the observed	period and,	using a	statistical	model, to age	65. Benefits	included net	impact on	earnings and	benefits,	increased tax	revenue, and	reduction in	public	assistance.							
	Costs	in each	cohort	(fixed and	monthly	costs).																		
Sample	years	2004																						
	State																							

	Source*	Bua-lam & Bias,	2011																										
Conducted	in house?	Yes																											
Control	group?	No																											
	Model	 The total cost for services 	and the average	administrative cost for each	individual in the random	sample of 370 (Status 26	and Status 28 closures).	Benefits include gross	wages for 3 years after	closure, reduction in Social	Security benefit payments,	and tax revenue (federal,	state, Social Security, and	Medicare). Two	components to the model	were presented: the	streamlined component,	with costs compared to	cumulative gross wages,	and the inclusive	component, with costs	compared to earnings, tax	revenue, and Social	Security savings.	 Streamlined: Year 1, 	1:1.86; Year 2, 1:3.75; Year	3, 1:5.51.	 Inclusive: Year 1, 1:1.95; 	Year 2, 1:3.92; Year 3,
	Benefits	UI and RSA-	911 data.	Benefits	included	gross	earnings, tax	revenue, and	reduction in	public	assistance	payments.																	
	Costs	RSA and	state	administrati	ve data.	Total cost	for each	case in the	sample.																				
Sample	years	2007																											
	State	Ŵ																											

	Source*	Wyoming	Division of	Vocational	Rehabilitation,	2006									Council of State	Administrators of	Vocational	Administration,	2008								
Conducted	in house?	Unknown													A/N												
Control	group?	oN													oN												
	Model	 Unknown sources. 	Annualized earnings of	successful closures in 2006	for 1 year, the tax revenue	and the reduction of public	assistance payments as a	result.	 555 rehabilitated 	individuals earned an	estimated annualized	\$9,276,000 and reduced	public assistance payments	by \$1,403,000.	 Costs = \$3.59 billion/year 	on public VR services to	approximately 1 million	unemployed consumers. In	FY 2006, 205,791	individuals with disabilities	became employed and	earned \$3.6 billion in	annual earnings after	receiving VR services. The	cost of VR services was	recovered in 2 to 4 years	on average from the
	Benefits	Unknown	source,	possibly RSA-	911 data.	Benefits	included tax	revenue on	earnings and	reduction in	public	assistance	costs.		Unknown	source.	Benefits are	based on tax	revenue on	new earnings	and reduction	in Social	Security	benefit	payments.		
	Costs	Unknown	source,	possibly	RSA data	for earnings	and public	assistance.							Total public	VR	spending	nationwide.									
Sample	years	State FY	2006												FY 2006												
	State	γv													CSAV	2											

	Source*												
Conducted	in house?												
Control	group?												
	Model	estimated \$966 million/year	in federal, state, and local	taxes generated from the	new earnings. Individuals	who no longer received	Social Security benefits as	a result of their	employment saved the	taxpayers \$754 million per	year. This equated to a 1:7	ratio of dollars spent on VR	to taxpayer savings.
	Benefits												
	Costs												
Sample	years												
	State												

Note: This table was produced by Joseph Hampton, a research specialist with the West Virginia Division of Rehabilitation Services, Charleston, WV. Abbreviations: CSAVR, Council of State Administrators of Vocational Rehabilitation; FY, fiscal year; RSA, Rehabilitation Services Administration; TANF, Temporary Assistance to Needy Families; UI, unemployment insurance. Return on investment (ROI) ratios are presented in dollars.

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Appendix F: Federal Guidelines on the Importance of Using Evidence and Rigorous Evaluation



EXECUTIVE OFFICE OF THE PRESIDENT OFFICE OF MANAGEMENT AND BUDGET WASHINGTON, D.C. 20503

May 18, 2012

M-12-14

MEMORANDUM TO THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM:

Jeffrey D. Zients

SUBJECT:

Use of Evidence and Evaluation in the 2014 Budget

Since taking office, the President has emphasized the need to use evidence and rigorous evaluation in budget, management, and policy decisions to make government work effectively. This need has only grown in the current fiscal environment. Where evidence is strong, we should act on it. Where evidence is suggestive, we should consider it. Where evidence is weak, we should build the knowledge to support better decisions in the future.

Agencies should demonstrate the use of evidence throughout their Fiscal Year (FY) 2014 budget submissions. Budget submissions also should include a separate section on agencies' most innovative uses of evidence and evaluation, addressing some or all of the issues below. Many potential strategies have little immediate cost, and the Budget is more likely to fund requests that demonstrate a commitment to developing and using evidence. The Budget also will allocate limited resources for initiatives to expand the use of evidence, including but not limited to approaches outlined below. Agencies may include these initiatives in their submission at the guidance level or with proposed addbacks.

- 1. <u>Proposing new evaluations</u>. As in 2011 and 2012, OMB invites agencies to propose new evaluations. Areas of potential focus may include the following:
 - Low-cost evaluations using administrative data or new technology: As explained in the <u>Coalition for Evidence-Based Policy's recent brief</u>, agencies can often use administrative data (such as data on wages, employment, emergency room visits or school attendance) to conduct rigorous evaluations, including evaluations that rely on random assignment, at low cost. Similarly, the private sector has used new software and online tools to dramatically reduce the time and cost of experimentation. Agencies should consider whether they can use such data or technology to support rigorous evaluations of their existing programs or new initiatives.
 - Evaluations linked to waivers and performance partnerships: One of the best ways to learn about a program is to test variations and subject them to evaluation, using some element of random assignment or a scientifically controlled design. OMB invites agencies to explain how they will use existing waiver authorities to evaluate different

approaches to improving outcomes. Agencies should also consider seeking authority from Congress, through the FY 2014 budget process, to allow new waivers linked to evaluation or to establish cross-agency "performance partnerships" that enable blending of multiple funding streams to test better ways to align services and improve outcomes. Several agencies are seeking such authority in 2013 for initiatives supporting distressed communities and disconnected youth.

- Expansion of evaluation efforts within existing programs: In addition to specifying evaluations to be performed with dedicated funding, agencies can also add a general policy and requirements favoring evaluation into existing grants, contracts, or waivers. These measures may require new legislation. For example, Congress recently approved the Department of Labor's request for a small cross-agency set-aside for evaluation activities.
- Systemic measurement of costs and cost per outcome: Agencies are encouraged to
 include measurement of costs and costs per outcome as part of the routine reporting of
 funded programs to allow for useful comparison of cost-effectiveness across programs.

Agencies should release evaluations promptly through either their agency websites or alternative means. OMB particularly welcomes agency proposals to improve public access to, and understanding of, evidence about what works and what does not.

2. Using comparative cost-effectiveness data to allocate resources. Through the Pew Charitable Trust's Results First initiative, a dozen States are currently adopting a model developed by the Washington State Institute for Public Policy (WSIPP) that ranks programs based on the evidence of their return on investment. Once evidence-based programs have been identified, such an analysis can improve agency resource allocation and inform public understanding. For example, the Environmental Protection Agency and the U.S. Department of Agriculture are working together to incorporate evidence about the cost-effectiveness of different pollution control strategies in the Chesapeake Bay restoration effort.

OMB invites agencies to identify areas where research provides strong evidence regarding the comparative cost-effectiveness of agency investments. The research may pertain to the allocation of funding <u>across</u> agency programs (e.g., research showing that some funding streams have higher returns on investments) or <u>within</u> programs (e.g., research showing that some types of grantees or programmatic approaches have higher returns). Agencies should describe the body of research and then apply its results to support a proposed resource reallocation. OMB is more likely to support an existing resource allocation or a request for new resources supported in this way, and may feature the agency's reasoning in the 2014 Budget.

3. <u>Infusing evidence into grant-making</u>. Grant-making agencies should demonstrate that, between FY 2013 and FY 2014, they are increasing the use of evidence in formula and competitive programs. Agencies should consider the following approaches, among others:

- Encouraging use of evidence in formula grants: OMB invites agencies to propose ways to increase the use of evidence-based practices within formula grant programs. For example, formula funds can be conditioned on the adoption of evidence-based practices, and high-quality technical assistance can be used to share and support implementation of evidence-based practices. Competitive programs can assign points to applicants based on their integration of such practices into formula streams.
- Evidence-based grants: Several agencies ranging from the Department of Education to the U.S. Agency for International Development — have implemented evidence-based grant programs that apply a tiered framework to assess the evidence supporting a proposed project and to determine appropriate funding levels. Under this approach, programs supported by stronger evidence, as established in a rigorous agency process, are eligible for more funding. All programs are expected to evaluate their results. Examples of tiered-evidence programs include the Department of Education's <u>Investing in Innovation</u> program and the Department of Health and Human Services' <u>Teen Pregnancy Prevention</u> and <u>Home Visiting</u> programs.

Even without creating tiers, agencies can provide points or significant competitive preference to programs that the agency determines are backed by strong evidence, and can build the evidence base by embedding evaluation into programs. Because running evidence-based programs requires more resources, agencies may wish to combine multiple smaller programs into larger, evidence-based efforts.

• **Pay for Success:** Taking the principle of acting on evidence one step further, the Departments of Justice and Labor will be inviting grant applicants to use a "pay for success" approach, under which philanthropic or private entities (the "investors") pay providers upfront and are only repaid by the government if certain outcomes are met. Payment amounts are based, in part, on the amount that the Federal, State, or local government saves. A pay-for-success approach is appropriate where: (i) improved prevention or other up-front services can produce better outcomes that lead to cost savings at the Federal, State, or local level; and (ii) foundations or others are willing to invest.

To date, the Administration has focused its Pay for Success planning on programs financed with discretionary appropriations. OMB invites agencies to apply a pay-for-success model for programs funded by either discretionary or mandatory appropriations. Agencies should also consider using the new authority under the America COMPETES legislation to support incentive prizes of up to \$50 million. Like Pay for Success, well-designed prizes and challenges can yield a very high return on the taxpayer dollar.

- 4. <u>Using evidence to inform enforcement</u>. Rigorous evaluation of strategies for enforcing criminal, environmental, and workplace safety laws often reveals that some approaches are significantly better than others at securing legal compliance. OMB encourages agencies to indicate how their allocation or reallocation of resources among enforcement strategies is informed by such evidence.
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- 5. <u>Strengthening agency evaluation capacity</u>. Agencies should have a high-level official who is responsible for program evaluation and can:
 - Develop and manage the agency's research agenda;
 - Conduct or oversee rigorous and objective studies;
 - Provide independent input to agency policymakers on resource allocation and to program leaders on program management;
 - Attract and retain talented staff and researchers, including through flexible hiring authorities such as the Intergovernmental Personnel Act; and
 - Refine program performance measures, in collaboration with program managers and the Performance Improvement Officer.

These goals can be accomplished by different kinds of leaders, ranging from a chief evaluation officer who reports to the Secretary or Deputy Secretary to the head of an independent institute in the agency. An existing official could play the role, or a forceful new position could replace several less empowered ones. OMB invites agencies to propose in their budget submissions ways to strengthen the agency's evaluation capacity, within tight resource constraints.

Support for Evidence-Based Initiatives

OMB invites your agency to participate in a number of forums to improve use of evidence:

- OMB and the Council of Economic Advisers will organize a series of topical discussions with senior policy officials and research experts in the agencies. The meeting agendas will focus on administrative and policy levers for driving an increasing share of Federal investments into evidence-based practices. We will plan summer meetings in order to help inform agencies' evaluation plans and budget submissions, and will also have follow-up meetings in the fall.
- OMB will reinvigorate the interagency evaluation working group established in 2010 with a series of meetings focused on issues commonly affecting evaluators, such as procurement rules, the Paperwork Reduction Act, and the integration of evidence in agencies' decision-making process.
- The Performance Improvement Council will convene research, performance management, and program officials to develop ways to improve performance measures, validate their correlation with outcome data from program impact evaluations, and use data analytics to support more cost-effective decision-making.
- The Office of Science and Technology Policy has created a "community of practice" for agency personnel involved in designing and managing incentive prizes and has organized a Science of Science Policy working group that is developing tools aimed at establishing a more scientific, empirical evidence basis for science and technology policymaking.