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Summary of the Literature on Benefit Cost Analysis and Cost Effectiveness Analysis of Employment and Other Programs for the Rehabilitation of the Disabled

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Contents

List of Abbreviations

ADA	Americans with Disabilities Act
BCA	Benefit Cost Analysis
BC Ratio	Benefit Cost Ratio
CBF	Cost Benefit Framework
CEA	Cost Effectiveness Analysis
CSST	Quebec Workers' Compensation Board
DWP	Department of Work and Pensions
IB	Incapacity Benefits
NDDP	New Deal for Disabled People
NHS	National Health Service
QALY	Quality Adjusted Life Year
SE	Supported Employment
SPI	State Partnership Initiative
SSDI	Social Security and Disability Insurance
SSI	Supplemental Security Income
STETS	Structured Training and Employment Transitional Services
TETD	Transitional Employment Training Demonstration
TTW	Ticket To Work
VR	Vocational Rehabilitation
WFI	Work Focused Interviews

1. Introduction

This report provides a review of the literature on Benefit Cost (BCA) and Cost Effectiveness Analysis (CEA) of employment programs for the disabled as well as some other related rehabilitation programs. In order to conduct this analysis a comprehensive review of the literature was performed. This report reviews all the major papers in the literature as well as a number of additional papers in order to illustrate the range of analyzes conducted.

Each study is reviewed using the following framework with the major features provided in a summary table:

- Program characteristics:
    - Nature of the intervention
    - Mandatory or voluntary participation
    - The specific target population

- Methodology of the analysis:
    - Control group
    - Timeframe
    - Definition of the benefits
    - Definition of the costs

- The findings:
    - Actual cost per individual
    - Cost effectiveness ratios
    - Benefit cost measures:
        - Net benefits (benefits–costs)
        - Benefit cost ratio
        - By perspective: Society, government, and individual
    - Discussion by the authors of the conclusions that can be reached from the findings

- Summary and discussion

The paper is organized as follows: In Chapter 2, we present the basic methodological framework. In addition, we define the various measures used in the studies reviewed, and discuss commonly omitted benefit and cost measures in BCA and CEA. In Chapter 3, we provide the description of Direct Employment Type Interventions for the United Kingdom, the United States, and Canada (Section 3.A). In Section 3.B, we review papers that examine the BCA and CEA for other interventions. In Section 3.C, we illustrate the use of a non-economic benefit measure – Quality Adjusted Life Year (QALY). In Section 3.D, we provide an example of an attempt to estimate the lifetime costs to society that result from autism. In Chapter 4, we summarize the key points of the literature review.

2. Framework for Benefit Cost Analysis and CEA of Employment Programs for the Disabled

In this section, we present the framework for BCA and CEA, beginning with BCA. The broad purpose of BCA and CEA is to help with social decision-making. More specifically, the objective is to facilitate a more efficient allocation of society's resources. In this section, we heavily rely on the framework of Boardman, Greenberg, Vining, and Weimer (BGVW), 2006. Thus, they are used to answer two questions. One is whether a particular social program is worthwhile. The second is what is the most effective way of achieving a particular outcome, by comparing among alternatives. BCA and CEA are used in many different ways, which can be a source of confusion. Generally speaking, BCA is used in contexts in which it is possible to attach a monetary value to both the benefits and the costs. Whereas CEA is used more to relate a non-monetized benefit to its cost. As a result, the BC framework is particularly suited to addressing the question of whether a social program is worthwhile. The BCA and CEA are used to determine the most effective way of achieving a particular outcome by comparing among alternatives. We elaborate below on each of these approaches.

A. Benefit Cost Analysis (BCA)

A.1 The first step in BCA is to systematically catalogue the benefits and costs of social programs (such as employment programs for the disabled) and attach a monetary value to each. The comparison of the benefits and costs is then usually presented in terms of the net benefits (benefits minus costs) and in terms of the ratio of benefits to the costs (BGVW, 2006).

The Department of Work and Pensions (DWP) in the UK developed a Cost Benefit Framework (CBF), similar to the stylized version in Table 1. The CBF examines the benefits and costs from three perspectives – society, government, and the participant. The framework is used "to rank DWP programs in terms of their relative cost-effectiveness in a systematic and consistent way. The primary purpose of doing this is to help ensure that public funds are spent efficiently so that they generate the greatest net benefits to society."

A.2 BCA Perspectives

Table 1 highlights the three standard BCA perspectives: Society (economic output), government (budget) and the program participant (personal status). The following definitions provide a general description of each perspective.

A.2.1 Society (economic output): The impact of a program on the net societal economic output is the difference between the benefits as reflected in increased outputs and the costs of real resources used to implement the program.

Benefits to society:

- Gross earnings and fringe benefits due to increased employment
- Reduction in the administrative costs of transfer programs as a result of a decrease in the number of recipients

Costs to society:

- Employment program operating costs
- Expenditures that participants incur when they return to work, such as childcare and transportation

***A.2.2 Government (budget)*:** The impact of the program on the government is the difference between benefits as reflected in increased revenues and reduced expenditures and the cost of the operation of the program. Despite the classic distinction between society and government, the savings in the government budget can also be viewed as a something that society in general benefits from.

Benefits to the government:

- Increased tax payments and reduced benefit payments due to an increase in employment
- Reduced costs of transfer programs as a result of a decrease in the number of recipients

Costs to the government:

- Employment program costs
- Any cash payments provided to participants as part of the employment program

***A.2.3 Program participant (personal status)*:** The impact of the program on the individual participant's status. In terms of economic status, it is measured as the difference between benefits as reflected in increased earnings and the costs as reflected in forgone welfare benefits and work related expenditures.

Benefits to the participant:

- Gross earnings and fringe benefits due to increased employment
- Any reimbursements provided to participants as part of the employment program

Costs to the participant:

- Increased tax payments and reduced benefit payments due to an increase in overall employment
- Expenditures that participants incur when they return to work, such as childcare and transportation

A.2.4 Employer: A fourth perspective that is sometimes included in the BCA is that of the employer. For the employer, the benefits of an intervention are associated with retaining or enhancing the productivity of a current employee. By retaining the employee, the employer avoids the costs associated with finding, interviewing, and hiring a new employee. A second benefit to the

employer is the increase in productivity of the disabled employee, as a result of better workplace accommodations, for example. The typical costs to the employer are the direct capital costs of transforming the work place. Another cost to the employer is that of staff time for training or for implementing the accommodation.

A.3 Discounting: The benefit and costs do not necessarily accrue over a single year. They may be experienced over multiple years or even a lifetime. If this is the case, those benefits and costs that extend into the future need to be discounted into present value terms, using a social discount rate – typically 3%–3.5% per year – and sensitivity analysis to the discount rate is often performed. There are two "generally accepted" reasons why benefits and costs that are incurred in the future need to be discounted:

1. Benefits received in the future are worth less today than the same amount currently available. This is because investment of the current resources can be converted into a greater amount of resources in the future (BGVW).
2. People generally prefer to consume a given amount of resources now rather than in the future (BGVW).

B. Cost Effectiveness Analysis (CEA)

Cost Effectiveness Analysis (CEA) is a widely used alternative to BCA. CEA is used primarily when constraints prevent the estimation of BCA. According to BGVW, the primary reason that CEA is used is that sometimes it is impossible, or there is no interest for various reasons, to monetize the most important policy benefit. The reason for that can be the cost or duration of measurement etc. Another consideration is that sometimes only one of the main benefits can be monetized so there is danger of giving the impression that all benefits have been addressed.

Under CEA, programs are evaluated on the basis of their costs and a single quantified but not monetized effectiveness measure, such as dollars per job placement (BGVW).

Table 1: Cost Benefit Framework of Employment and Training Programs

	Society Economic Output	**Government**	**Participant**
Output Produced by Participant			
Gross Earnings	+	No effect	+
Fringe Benefits	+	No effect	+
Participant Work-Related Expenses			
Tax Payments	No effect	+	-
Use of Transfer Programs by Participant			
Benefit Payments	No effect	+	-
Transfer Programs Operating Cost	+	+	No effect
Use of Employment Programs by Participants			
Employment Program Operating Costs	-	-	No effect
Reimbursement of job-related expenditures	No effect	-	+

Source: Greenberg, David H., and Genevieve Knight (2007)

Notes:

1. The plus signs indicate anticipated sources of benefits and minus signs anticipated sources of costs from different perspectives.
2. The first column represents society or the economy as a whole. The second column represents the government, sometimes called the "fiscal perspective." The third column represents those participants or clients served by the program.

C. Benefits and Costs Omitted from BCA

Ideally, all costs and benefits should be taken into consideration as a basis for allocating resources. Both BCA and CEA relate to a partial subset of benefits and costs for a variety of reasons.

There are a number of additional benefits and costs that, if quantifiable, should be included in order to capture the full social benefits and costs. However, these benefits and costs are difficult to estimate and currently there is no standardized way to measure them. By not including these benefits and costs, the BCA may be over- or underestimated and the relative CEA of the different programs may be distorted. Table 2 provides a list of some of the commonly excluded benefits and costs and the perspective impacted by their exclusion.

C.1 Society (Economic Output)

Changes in Utilization of Related Health and Social Services: A reduction in the use of health and social services. If there is an improvement in health and dependency levels, there could be a reduction in society expenditures for treatment.

Cost to Family Caregivers: An increase in independence of people with disabilities could reduce the burden on family caregivers and allow them to work more.

Broader Impact of the Program on Employment Behavior of non-Participants: A program that increases employment may lead to a broader cultural shift within the disabled population or employers. It may encourage disabled people who were not employed and not participating in any of the employment programs to actively pursue employment.

Value Placed on Reductions in Welfare: Society may derive some benefit from knowing that disabled individuals are employed and no longer on welfare.

Displacement of Other Workers: If a disabled person becomes employed, his job may have come at the expense of others members of society competing for the same job.

Reductions in Deadweight Costs of Taxation: There may be smaller deadweight welfare losses associated with taxation if there are government budgetary savings.

Work Related Expenditures: These typically include childcare and transportation costs that accrue to the individual due to moving into work. Adam et al. note that travel costs may be especially large for some disabled individuals.

C.2 Government (Budget)

Changes in Tax and Benefit Administration Costs: The reduced reliance on welfare will lower the administrating cost to the welfare office due to a reduction in the number of recipients. While an increase in the number of taxpayers will increase tax administration costs.

Changes in Utilization of Related Health and Social Services: A reduction in the use of health and social services. If there is an improvement in health and dependency levels, there could be a reduction in government expenditures for treatment.

Expanded Work Related Taxation of Family Caregivers: An increase in independence of people with disabilities could reduce the burden on family caregivers and allow them to work more.

Work Related Expenditures: These typically include childcare and transportation costs that accrue to the individual due to moving into work. Adam et al. note that travel costs may be especially large for some disabled individuals. The government sometimes subsidizes these expenditures.

C.3 Participant (Personal Status)

Changes in Life Expectancy, Health Status and Quality of Life: Some of the programs that impact employment may affect health and other aspects of quality of life. Positive impacts include improved activity, health, self-esteem or outlook on life. Conversely, the impacts may be negative such as, increased stress and anxiety (Adam et al.).

Work Related Expenditures: These typically include childcare and transportation costs that accrue to the individual due to moving into work. Adam et al. note that travel costs may be especially large

for some disabled individuals. Participants may be required to pay these expenditures if they are not subsidized.

Table 2: Additional Types of Costs and Benefits that are Usually Omitted from the Analysis – Benefit-Cost Analysis – and the Perspective Effected

	Societal	Government	Participant
Displacement of Other Workers	√		
Value Placed on Reductions in Welfare	√		
Reductions in Deadweight Costs of Taxation	√		
Broader Impact of the Program on Employment Behavior of non-Participants	√	√	
Cost to Caregivers	√	√	
Work-Related Expenditures	√	√	√
Changes in Tax and Benefit Administration Costs		√	
Changes in Utilization of Related Health and Social Services		√	
Changes in Life Expectancy, Health Status, & Quality Of Life			√

Source: Adapted from Adam, Stuart., Bozio, Antoine., Emmerson, Carl., Greenberg, David., and Genevieve Knight (2008)

Notes:

1. This table indicates the primary perspectives' net benefits most likely to be impacted.

D. Important Definitions

Present Value: "Future benefits and costs are discounted relative to present benefits and costs in order to obtain their present values, PV" by the discount rate (BGVW).

Net Benefits: the difference between total benefits and total costs.

- If the net benefit is positive then the total benefits are larger than the total costs.
- If the net benefits is negative then the total benefits are smaller than the total costs.

Benefit Cost Ratio (BC): Total benefits divided by the total costs.

- If the BC ratio is greater than 1, then the total benefits are greater than the total costs.
- If the BC ratio is less than 1, then the total benefits are less than the total costs.

Quality Adjusted Life Year (QALY): A QALY is a year of life lived in good health.

3. Description of Various Studies and Their Findings

In this chapter, we provide the description of various studies and their findings. In Section A of this chapter, we provide the description of Direct Employment Type Interventions for the United Kingdom, the United States, and Canada. In Section B, we review papers that examine the BCA and CEA for other interventions. In Section C, we illustrate the use of a non-economic benefit measure – Quality Adjusted Life Year (QALY). In Section D, we provide an example of an attempt to estimate the lifetime costs to society that result from autism.

A. Direct Employment Interventions

A.1 United Kingdom

Table 3: Benefit Cost Analysis & Cost Effectiveness Analysis of UK Programs NNDP & Pathways Programs: Program Characteristics and Findings

	New Deal For Disabled People (NDDP) Greenberg and Davis (2007)	Pathways To Work Adam et al., (2008)
PROGRAM CHARACTERISTICS		
Intervention	Multiservice program – participants are assigned a personal advisor, attend WFIs and are provided with an individualized package of activities and services	Multiservice program – participants are assigned a personal advisor, attend WFIs, and are provided with an individualized comprehensive package of activities and services
Mandatory/Voluntary	Voluntary	Mandatory for new incapacity benefit claimants
Target population	Continuing registrant New registrant	Enquiries into program
METHODOLOGY		
1. Control group 2. Matching basis	No control group	IB claimants in comparison sites that do not offer pathways Economic and social composition
Timeframe for measuring the benefits	36 months after registration	18 months 37.5 months
METHODOLOGY		
Discount rate	3.5%	3.5%
Data type	Administrative	Administrative
Costs	Program costs	Program costs
FINDINGS		
Actual Cost per Individual	£700 to £1,100* per average registrant	£340 per average enquiry
Cost Effectiveness	£2,000 - £3,000 per placement £4,000 - £5,000 per sustained placement	Not presented

Benefit Costs Measures	**Net Benefits: Benefits – Costs** **Benefit Cost Ratios: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Benefit Cost Ratios: Benefits/Costs**
Society Net Societal Economic Output	36 months Continuing claimants: £2,915 to £3,163 per average claimant £4 to £5 per pound of program expenditure 36 months New claimants: £613 to £861 per average claimant £2 per pound of program expenditure	18 months: £701 per average enquirer £3.06 per pound of program expenditure 37.5 months: £1,683 per average enquirer £5.95 per pound of program expenditure

FINDINGS **Benefit Costs Measures**	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Benefit Cost Ratios: Benefits/Costs**
Government: Net Government Budget Savings	36 months Continuing claimants: reduced Budget by £2,500 per average claimant £3.41 to £4.5 per pound of program expenditure 36 Months New Claimants: Reduced budget by £750 per average claimant £1.71 to £2.26 per pound of program expenditure	18 months: Reduced Budget by £175 per average enquirer £1.51 per pound of program expenditure 37.5 months: Reduced Budget by £748 per average enquirer £3.20 per pound of program expenditure
Individual Individual Economic Status	not presented	18 months: Increased net benefits for the average enquirer into Pathways by £526 37.5 months: Increased net benefits for the average enquirer into Pathways by £935

Net benefits to society = Gross earnings + fringe benefits – Expenditures on childcare, TRANSPORTATION + reduction in operating costs of transfer programs – employment program operating costs

1. **Net benefits to government** = Increased tax payments + reduced benefit payments + reduced operating costs of transfer programs – employment program operating costs – any reimbursements provided to participants
2. **Net benefits to individual** = Gross earnings + fringe benefits – Tax payments – Expenditures on childcare, transportation – reduction in benefit payments + any reimbursements provided by program

*There is considerable variation between the service providers in their operational costs. Therefore, actual costs per registrant vary depending on their service provider.

A.2 United States

Table 4: Benefit Cost Analysis & Cost Effectiveness Analysis of 3 US Programs: Structured Training and Employment Transitional Services (STETS), Transitional Employment Training Demonstration (TETD), & Project NetWork: Program Characteristics and Findings

	STETS **Sav (1989)**	**TETD** **Decker and Thornton (1995)**	**Project NetWork** **Kornfeld and Rupp (2000)**
PROGRAM CHARACTERISTICS			
Intervention	Provides transitional employment services – work exposure, on-the-job training, job placement, post-employment follow up and job support	Outreach, benefit protections, job placement, training, job retention services	Four models of intensive employment-focused case management – rehabilitation, developed and individual employment plan and direct employment counseling services
Mandatory/Voluntary	Voluntary	Voluntary	Voluntary
Target Population	Person with an intellectual disability between the ages of 18 to 24	SSI Claimants aged 18 to 40 with intellectual disability	SSDI and SSI claimants between 15 and 65
METHODOLOGY			
1. Control Group 2. Matching Basis	1. Randomly selected 2. Not matched	1. Randomly selected 2. Not matched	1. Randomly selected 2. Not matched
Timeframe for measuring the benefits	22 Months	6 Years	2 Years
Discount Rate	5%		5%
Data Type	Administrative	Administrative	Administrative
METHODOLOGY			
Costs	Program costs	Program costs	Program costs
FINDINGS			
Actual Cost per Individual	$6,657 (1982 dollars) per participant	$5,600 (1996 dollars) per participant	$3,986 (1994 dollars) per participant
Cost Effectiveness	Not presented	Not presented	Not presented

	STETS Sav (1989)	TETD Decker and Thornton (1995)	Project NetWork Kornfeld and Rupp (2000)
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Benefit Cost Ratios: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Society Net Societal Economic Output	$1,039(1982 dollars) per average participant BC Ratio: 0.83	Not presented	Not presented
Government: Net Government Budget Savings	Increased the budget by $3,149 (1982 dollars) per average participant	Increased the budget by $4,730 (1996 dollars) per average participant	Increased the budget by $2,019 (1994 dollars) per average participant
FINDINGS			
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Benefit Cost Ratios: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Individual Individual Economic Status	Increased net benefits for the average participant in STETS by $2,110 (1982 dollars)	Increased net benefits for the average participant in TETD by $3,400 (1996 dollars)	Increased net benefits for the average participant in NetWork by $399 (1994 dollars)

Table 5: Benefit Cost Analysis of Vocational Rehabilitation Programs: Program Characteristics and Findings

	Vocational Rehabilitation Conley (1969)	**Vocational Rehabilitation Worrall (1978)**
PROGRAM CHARACTERISTICS		
Intervention	Federal-state program that provides medical, therapeutic, counseling, education training, and work-related placement assistance	Federal-state program that provides medical, therapeutic, counseling, education training, and work-related placement assistance
Mandatory/Voluntary	Voluntary	Voluntary
Target Population	Any disabled person who has a work limitation and is accepted to the VR program, and had their cases closed, between fiscal year 1958 and 1967	Randomly selected from any disabled person who has a work limitation and is accepted to the VR program and had their cases closed, in the 1970 fiscal year
METHODOLOGY		
1. Control Group 2. Matching Basis	No control group	No control group
Timeframe for measuring the benefits	Lifetime	Lifetime
Discount Rate	Calculated with no discount rate; 4% and 8%	Calculated with no discount rate; 4% and 8%
Data Type	Administrative	Administrative
Costs	Program costs	Program costs
FINDINGS		
Actual Cost per Individual	Not presented	Not presented
Cost Effectiveness	Not presented	Not presented
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Society Net Societal Economic Output	Range from fiscal year 1958 to fiscal year 1967 by discount rate BC Ratio 7.90 (1967) to 10.90 (1960) at 0% BC Ratio 4.80 (1967) to 6.70 (1960) at 4% BC Ratio 3.30 (1967) to 4.70 (1960) at 8%	Total of 180 BC ratios, across all categories estimates of BC ratios range from -0.9* to 11.8**

	Vocational Rehabilitation Conley (1969)	**Vocational Rehabilitation Worrall (1978)**
Government: Net Government Budget Savings	"Increased taxes paid by rehabilitants and the reduction in tax-supported payments for their maintenance and care amounted to perhaps as much as 25 percent of the total increase in earnings."	Not presented
Individual Individual Economic Status		Not presented

* Over 54, White, 0-7 years education, with mental disability

** Under 25, Nonwhite, 9-11 years education, with mental retardation

Table 6: Benefit Cost Analysis of Supported Employment (SE) Programs

	Supported Employment (SE) Cimera (2010)
PROGRAM CHARACTERISTICS	
Intervention	Emphasizes job placement in socially integrated work settings and time limited or ongoing support. Includes vocational assessment, career planning, job development, job site training, assistive technology, accommodations, case management, and employee supports.
Mandatory/Voluntary	Voluntary
Target Population	All VR funded disabled persons receiving SE who had their cases closed between 2002 and 2007 Range of disability groups
METHODOLOGY	
1. Control Group 2. Matching Basis	No control group
Timeframe for measuring the benefits	5 years
Discount Rate	Not presented
Data Type	Administrative
Costs	Program costs
FINDINGS	
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Actual Cost per Individual	$544.31 per participant (monthly)
Cost Effectiveness	Not presented
Society Net Societal Economic Output	Not presented
Government: Net Government Budget Savings	Reduced Budget by over $251.34 per average participant Reduced the Budget by $446.30* to $111.62** per participant by type of disability BC ratio range from 2.20* to 1.17** by type of disability
Individual Individual Economic Status	Not presented

^ Employers that hire supported employers are eligible for a tax credit equal to 40 percent of the $6,000 earned by the supported employee – this tax credit is an additional cost of the program. *"Other Learning Disabilities" provided the highest level of net benefits and BC ratios. **"TBI – Traumatic Brain Injuries" resulted in the lowest level of net benefits and BC ratios.

Table 7: Benefit Cost Analysis of the Americans with Disabilities Act (ADA) for Employees who are Eligible for Accommodation in their Work Environment: ADA Characteristics and Findings

	Americans with Disabilities Act Schartz, Hendricks, and Blanck (2006)
PROGRAM CHARACTERISTICS	
Intervention	The ADA prohibits discrimination against qualified workers with disabilities – one form of discrimination is failure to make reasonable accommodations in the work environment for a qualified job applicant or employee's physical or mental limitation
Mandatory/Voluntary	Mandatory
Target Population	Disabled individual who requires workplace accommodation
METHODOLOGY	
1. Control Group 2. Matching Basis	Employees in the same position, of the same company who do not have a disability Not matched
Timeframe for measuring the benefits	1 year
Discount Rate	Not presented
Data Type	Interviews with employers: Employers that contacted Job Accommodation Network (JAN)
Costs	Program Costs
FINDINGS	
Actual Cost per Individual	$388 per employee requiring an accommodation
Cost Effectiveness	Not presented
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Society Net Societal Economic Output	Not presented
Government: Net Government Budget Savings	Not presented
Individual Individual Economic Status	Not presented
Employer Net Employer Budget Savings	$11,335 per employee requiring an accommodation

A.3 Canada

Table 8: Benefit Cost Analysis of the Experimental Treatment of Back Pain

	Treatment of Back Pain **Loisel, Lemaire, Poitras, Durand, Champagne, Stock, Diallo, and C. Tremblay (2002)**
INTERVENTION CHARACTERISTICS	
Injury Being Treated	3 experimental treatments of back pain
Intervention	Experimental model, using clinical and occupational rehabilitation to treat back pain Three models 1. Experimental clinical rehabilitation 2. Experimental occupational intervention^ 3. Combination of both experimental treatments (Sherbrook)
Mandatory/Voluntary	Voluntary
Target Population	Workers who are absent for more than 4 weeks from their regular work for occupational back pain
METHODOLOGY	
1. Control Group 2. Matching Basis	Random assignment Not matched
METHODOLOGY	
Timeframe for measuring the benefits	1 year 6.4 years
Discount Rate	Not presented
Data Type	Survey data
Costs	Intervention costs
FINDINGS	
Actual Cost per Individual	One Year 1. $2,656 – per person in the control group 2. $5,580 – per person in the clinical intervention 3. $3,040 – per person in the occupational intervention 4. $5,622 – per person in the Sherbrook (2 + 3) intervention

	6.4 Years 1. $9,562– per person in the control group 2. $6,857 – per person in the clinical intervention 3. $3,432 – per person in the occupational intervention 4. $7,434 – per person in the Sherbrook (2 + 3) intervention
FINDINGS	
Cost Effectiveness	Not presented
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Society Net Societal Economic Output	Not presented
Government*: Net Government Budget Savings	**1 Year** 1. Increased Budget by $2,250 per clinical participant 2. Reduced Budget by $220 per occupational participant 3. Increased Budget by $2,348 per Sherbrooke (1 + 2) participant **6.4 Years** 1. Reduced Budget by $16,176 per clinical participant 2. Reduced Budget by $16,827 per occupational participant 3. Reduced Budget by $18,585 per Sherbrooke (1 + 2) participant
Individual Individual Economic Status	Not presented

*Government represents the Quebec Single Workers' Compensation Board (CSST) – Canadian work related disability board

^: Occupational intervention: Included visits to the occupational physician and an ergonomics intervention at the workplace

B. Other Interventions

Table 9: Benefit Cost Analysis of Programs Designed to Treat Mental Disorders: Program Characteristics and Findings

	Enhanced Depression Treatment Lo Sasso, Rost, and Beck (2006)	**NICE Guidelines – Cognitive Behavioral Therapy Layard, Clark, Knapp, and Mayraz (2007)**
PROGRAM CHARACTERISTICS		
Intervention	Depression interventions provided to a national sample of workers employed in a range of positions from surveyed companies	NICE guidelines state that all newly diagnosed mentally ill patients receive Cognitive Behavior Therapy (CBT)
Mandatory/ Voluntary	Not relevant	Mandatory (but rarely implemented due to lack of therapists within the NHS)
Target Population	Primary care patient presenting at Community practice diagnosed with depression	Mentally ill patients who receive CBT In the following categories: Depression, phobia, obsessive-compulsive disorder, panic disorder, general anxiety disorder, and post-traumatic stress disorder.
METHODOLOGY		
1. Control Group 2. Matching Basis	Random assignment of Patients presenting at Community primary care practices Socio-demographic (gender, marital status, insurance, occupation, salary) and clinical characteristics (depression symptoms)	Patients who would otherwise have no treatment "Representative sample" of the mentally ill categories stated above
Timeframe for measuring the benefits	1 year 2 years	2 years
METHODOLOGY		
Discount Rate	Not presented	Not presented
Data Type	Survey data	Survey data
Costs	Intervention costs	Intervention costs
FINDINGS		
Actual Cost per Individual	1 year: $735 per person 2 years: $353 per person	2 years: £750 per person

	Vocational Rehabilitation Conley (1969)	**Vocational Rehabilitation Worrall (1978)**
Cost Effectiveness	Not presented	Not presented
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Society Net Societal Economic Output	Not presented	£7,050 per person treated with CBT
Government: Net Government Budget Savings	Not presented	Reduced Budget by £450 per person treated with CBT
FINDINGS		
Benefit Cost Measures	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**	**Net Benefits: Benefits – Costs** **Ratio of Benefits to Costs: Benefits/Costs**
Individual Individual Economic Status	Not presented	Not presented
Employer Net Employer Budget Savings	1 year: Reduces budget by $30 per worker receiving enhanced depression treatment 2 years: Reduces budget by $257 per worker receiving enhanced depression treatment	Not presented

C. Illustration of a Non-Economic Benefit Measure

Table 10: Quality Adjusted Life Years to Society Associated with the Treatment of Ankylosing Spondylitis

	Treatment of Ankylosing Spondylitis (AS) Boonen (2006)
INTERVENTION CHARACTERISTICS	
Injury Being Treated	Review of 5 CE Studies in treating Ankylosing Spondylitis (AS)
Intervention	Five models – 1 Spa and 4 drugs 1. Spa (NL) 2. Drugs 1. Infliximab (UK) 2. Infliximab (Canada) 3. Infliximab (NL) 4. Etanercept (NL)
Mandatory/Voluntary	Voluntary
Target Population	Person with Ankylosing Spondylitis (AS)
METHODOLOGY	
1. Control Group 2. Matching Basis	Standard Treatment – Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and usual physical exercise Not matched
METHODOLOGY	
Timeframe for measuring the benefits	Five Models – 1 Spa and 4 Drugs 1. Spa (NL) – 1 Year 2. Drugs 1. Infliximab (UK) – 2 years 2. Infliximab (Canada) – 30 years 3. Infliximab (NL) – 5 years 4. Etanercept (NL) – 5 years

	Treatment of Ankylosing Spondylitis (AS) **Boonen (2006)**
Discount Rate	Not relevant
Data Type	Review of previous studies (check from the studies)
Costs	Treatment costs
FINDINGS	
Actual Cost per Individual	1. SPA (NL) - $1,327 per treated person – 1 year 2. Drugs 1. Infliximab (UK) - $9,755 per treated person – 2 years 2. Infliximab (Canada) - $89,323 per treated person – 30 years 3. Infliximab (NL) – $42,663 per treated person – 5 years 4. Etanercept (NL) - $32,297 per treated person – 5 years

FINDINGS	**Treatment of Ankylosing Spondylitis (AS)** **Boonen (2006)**
Cost Effectiveness:	**Cost per Quality Adjusted Life Year (QALY)**** 1. Spa (NL) - $7,809 per QALY 2. Drugs 1. Infliximab (UK) - $55,573 per QALY 2. Infliximab (Canada) - $30,218 per QALY 3. Infliximab (NL) – $198,289 per QALY 4. Etanercept (NL) - $123,454 per QALY

**QALY: A year of life lived in good health

D. Illustration of Lifetime Costs to Society of Autism

Table 11: Paper Illustrating the Measurement of Lifetime Costs to Society of the Incidence of Autism

	Lifetime Costs of Autism Ganz (2007)
DISEASE CHARACTERISTICS	
Disease Type	Autism
Mandatory/Voluntary	Not relevant
Target Population	Hypothetical incidence of autism on the cohort born in 2000 and diagnosed in 2003
METHODOLOGY	
1. Control Group 2. Matching Basis	Those born in 2000 and are not diagnosed with autism in 2003 Not matched
Discount Rate	3%
Timeframe	Lifetime
Costs	Direct Costs: Medical, special education, transportation, childcare, babysitting, respite care, out-of home placement, home & vehicle modifications Indirect Costs: Welfare benefits, household services, caregivers lost or impaired work time, missed time at work, reduced hours, lower paying but more flexible job or absence from the workforce
FINDINGS	
Actual Cost per Individual	Not presented
Cost Effectiveness	Not presented
Cost Measure	**Net Lifetime Costs**
Society Net costs to society due to the incidence of autism: Loss in productivity Medicare as an adult	Net lifetime cost of $3.2 million per person born in 2000 and diagnosed with Autism in 2003.
Government:	Not presented
Individual	Not presented

4. Summary of Key Points

In this chapter, we summarize the BCA and CEA framework, present the range of programs studied, highlight the overall study findings, and discuss some of the major methodological differences between the studies.

A. Benefit Cost and Cost Effectiveness Analysis

The broad purpose of BCA and CEA is to help with social decision-making. More specifically, the objective is to facilitate a more efficient allocation of society's resources. Thus, they are used to answer two questions. One is whether a particular social program is worthwhile. The second is, what is the most effective way of achieving a particular outcome among several alternatives? BCA and CEA are used in many different ways, which can be a source of confusion. Generally speaking, BCA is used in contexts in which it is possible to attach a monetary value to both the benefits and the costs. Whereas CEA is used more to relate a non-monetized benefit to its cost. As a result, BCA is particularly suited to addressing the question of whether a social program is worthwhile. Almost all of the studies reviewed use BCA, while only two of the studies reviewed perform CEA.

The first step in BCA is to systematically catalogue the benefits and costs of employment programs for the disabled and attach a monetary value to each. The comparison of the benefits and costs is then usually presented in terms of the net benefits (benefits minus costs) and in terms of the ratio of benefits to the costs. The standard framework examines the benefits and costs from three perspectives, Society (net societal economic output), government (net government budget savings) and the participant (individual economic status). All of BCA studies in this review use the standard measures. Thus, we see that there is a broad range of shared approaches to BCA. However, the perspectives presented vary a great deal and most of them do not present all three.

All of the BCA studies reviewed use either net benefits, benefit cost ratios, or a combination. The older studies we reviewed estimate BC ratios exclusively without mentioning net benefits. While the more recent studies present either just the net benefits or both.

CEA is a widely used alternative to BCA. Under CEA, programs are evaluated on the basis of their costs and a single quantified but not monetized effectiveness measure, such as the cost in dollars per job placement.

B. Program Range and Characteristics

This report reviews all the major papers in the literature as well as a number of additional papers in order to illustrate the range of analyzes conducted. The studies reviewed are divided into two broader categories. The first includes those studies that examine the impact of direct employment interventions. The second are those studies that examine the impact of other related rehabilitation programs.

The papers reviewed are all from the UK and North America. We were not able to find any relevant studies from other countries. The range of programs reviewed spans programs such as Pathways in the UK, a multiservice program in which participants are assigned a personal advisor, attend WFI's, and are provided with an individualized comprehensive package of activities and services.

To Supported Employment (SE) programs, which emphasize job placement in socially integrated work settings and time limited or ongoing support: Includes vocational assessment, career planning, job development, job site training, assistive technology, accommodations, case management, and employee supports.

To national laws such as the Americans with Disabilities Act (ADA) of 1990: The ADA in addition to prohibiting employer discrimination requires employers to provide "reasonable accommodation" in the work environment for their employees with disabilities.

Most of the programs are voluntary, except for Pathways and ADA, which are mandatory. Most programs are targeted to a wide range of disabilities, although, there are some programs that focus on a specific disability.

C. Methodological Issues

Beyond the broader conceptual commonalities, there are significant differences in the specific methodologies used in the studies. Two major ones are the use of a control group and the time span for measuring benefits.

About half of the direct employment intervention studies use a control group and half do not. All of the treatment intervention studies do utilize a control group. In every case where a control group is included, they employ random assignment. The control groups receive only standard care or, in one case, no treatment at all.

The second major methodological difference concerns the timespan used to estimate benefits. The earlier studies, took a lifetime approach to measuring the benefits of the intervention. That is income over predicted employment life cycle. This approach requires the authors to make numerous assumptions about mortality rates, expected employment and earnings in order to estimate the benefits, because none of the studies follows the participants over their full lifetimes. Moreover, the longer the period, the more sensitive are the findings to the chosen discount rate. For reasons such as this, we have observed a trend away from the lifetime approach to the use of much shorter time spans in estimating the benefits. For example in the existing studies that we have surveyed, the time span is generally 2-3 years and the longest was six years of actual follow-up.

In almost all cases, the researchers discount at a defined rate benefits received or costs incurred in future years. Therefore, they are calculating the present value of net benefits.

D. Findings

Almost all of the BCA studies report positive net benefits, or equivalent BC ratios of greater than one for every perspective and regardless of the methodology being used. This is despite the fact that the programs measure the subsequent impact on employment and income over a short time period.

One interesting exception is the study of three employment initiatives for SSDI and SSI beneficiaries in the US. From the government's perspective, the net benefits are negative for all three of these initiatives but from all other perspectives are positive.

The following quotes provide examples of how the authors relate to their BCA findings.

- The Pathways to Work Program in the UK: "The key conclusion is that the Pathways' measured benefits exceed the measured cost of the program for the individuals affected by the program, for the Government and for society as a whole" (Adam et al.).
- STETS one of the employment initiatives in the US "Taxpayers and society benefit from an increased output of goods and services and a reduced dependency of people with disabilities" (Sav).
- The Vocational Rehabilitation programs in the US: "The evidence indicates that the funds that have been expended on the vocational rehabilitation program are repaid, on the average, many times over in increased output" (Conley).
  And "We found that the rehabilitation program is generally returning more in productivity gains to society than the costs expended" (Worrall).
- The experimental treatment of back pain in Canada. "Appeared to be cost beneficial for the work disability compensation program (government)" (Loisel, et al.).
- The New Deal for Disabled People (NDDP) in the UK: "The conclusion that NDDP is cost-beneficial for both groups of customers from the government's perspective" (Greenberg and Davis).

The following quote provides an example of a more negative comment.

- Project NetWork, one of the employment initiatives for SSDI and SSI beneficiaries in the US: "Project NetWork produced modest net benefits to persons with disabilities and net costs to government (Kornfeld and Rupp).

Thus, the authors relate to the findings with two emphases. One is on whether the benefits exceed the costs and the other is to what extent they exceed the cost and how large is the benefit cost ratio.

Another way of looking at the results of BCA is illustrated by Greenberg and Davis in their study of the NDDP. What is unique in their study is that they ask how many hours would be required (at the median wage) for the benefits to exceed the cost. They then go on to conclude that most of the

program providers should be able to achieve this level of earnings for most of the participants and therefore, that achieving a positive BC ratio is realistic.

The CEA study of Boonen illustrates the manner of comparing between programs. It reviews the cost effectiveness of three different treatments for a specific type of disability, Ankylosing Spondylitis (AS).

Boonen compared the cost per quality adjusted life year (QALY) of the different methods and found considerable differences in their cost effectiveness. In addition, she notes that the treatment with the lowest cost per QALY is "a favorable cost-effectiveness ratio."

E. Benefits and Costs Omitted from BCA

There is recognition by many authors that ideally all costs and benefits should be taken into consideration as a basis for allocating resources. By not including these benefits and costs, the BC ratio may be over or underestimated and the relative CE ratio of the different programs distorted. In the methodological section of the paper, we provided a list of some of the commonly excluded benefits and costs.

There are various reason why a broader range of benefits and some types of costs are usually omitted:

- The data are less readily available and would be costly to gather.
- No standardized accepted measure or definition
- Cannot be monetized in BC calculations and CEA measures require a single measure of outcome to make unique comparisons across projects. There are few attempts to create an inclusive measure to capture excluded benefits, but they require many assumptions.

One of the major concerns in the literature is the absence of any measures of various aspects of quality of life such as improved health, social relations, or self-worth or overall happiness. The only BC or CE study in this review that made an effort to measure some such dimension was that of Boonen. This study used a measure that is very common in health related studies of effectiveness; the cost per quality adjusted life year, a year of life lived in good health.

The review includes one study that is not a BC or CE assessment of a particular program. It illustrates ways we could be measuring additional benefits. Ganz takes a lifetime approach to measuring the consequence of a disability to society. He measures the costs of all types of services that a disabled person requires to maintain his daily life: medical, special education, transportation, childcare, babysitting, respite care, out-of-home placement services, home and vehicle modifications, household services, welfare benefits. Very uniquely, he also measures the costs to the caregivers: lost or impaired work time, missed time at work, lower paying, but more flexible, jobs or absence from the workforce.

It would seem that efforts to broaden the measurement of the benefits of rehabilitation programs would provide a broader understanding of the true benefits and benefit cost ratios of investing in such programs.

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