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The Cost of Substance Abuse: The Use of Administrative Data to Investigate Treatment Benefits in a Rural Mountain State

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Abstract: *Findings from cost-benefit evaluations have suggested that the cost of substance abuse treatment is covered by the economic benefits to society. In this research we measure the economic impact of substance abuse treatment in a rural mountain state. Using a novel approach, cost data were gathered from four disparate state administrative databases, which were selected and matched to form one complete data set. A cost-benefit analysis was used to examine the aggregate economic impact of substance abuse treatment. The conservative post treatment outcome of the combined costs revealed a range or $4.12 to $3.98 million dollar overall offset, a difference that resulted in 20 to 16 percent savings above the fixed treatment cost. Policy implications are discussed.*

Keywords: cost-benefit analysis, treatment, substance abuse, administrative data

INTRODUCTION

There are many issues state policy makers must take into consideration when deciding how to allocate scarce economic resources to social service institutions and programs. In order to allocate resources most effectively, state policy makers and practitioners at all levels rely on several sources of information, including empirical research. The need for empirical research is at a premium in regard to substance abuse treatment specifically, where yearly expenditures for such treatment cost states in the hundreds of thousands, if not millions, of dollars annually (SAMHSA 2008b). Citizens and policy makers alike want to know that money is being spent effectively. Subsequently, an important branch within this body of

substance abuse treatment research centers on economic analyses (Aos, Miller, and Drake 2006; Belenko, Patapis, and French 2005; Dismuke et al. 2008; French, Roebuck, and McLellan 2004; Koenig et al. 2005; Swaray, Bowles, and Pradiptyo 2005; Welsh, Farrington, and Sherman 2001).

Some research on drug and alcohol treatment has focused on efficiency, as measured primarily by recidivism (Welsh et al. 2001). In the current study, we take a different, but related, approach that centers on whether substance abuse treatment renders cost savings as measured by decreases in correctional and medical spending and increased client earnings. We investigate the economic impact of substance abuse treatment on these relatively unexplored social support realms in a rural mountain state (hereafter referred to as Rural State). Analyses are made possible through the combined examination of four administrative databases, which originate from state Health and Welfare, Medicaid, Department of Corrections, and Department of Labor and Commerce agencies. Specifically, we begin to address the question of whether treatment has meaningful and positive effects on social phenomena, such as post-treatment earnings of participants, and whether treatment renders any cost offsets, which may indicate monetary savings at the state level. In regard to the above statement, readers should note that the research design utilized within this study is not strong enough to claim absolute certainty when speaking about causality. This issue is further discussed in the methods and discussion sections below.

This research is guided by Cullen's (1994) contention that social support, in the form of private or public programs, buffers an individual from otherwise criminogenic correlates. Cullen suggested that the more support a person receives the more likely they are to resist and overcome a criminogenic environment. Importantly, Cullen argued that whereas a social support paradigm can retard crime, coercion, another paradigm popular in policy, increases crime (Colvin, Cullen, and Vander Ven 2002). There is empirical support for this contention (Chamlin and Cochran 1997; DeFronzo 1983, 1996; Hannon and DeFronzo 1998; Pratt and Godsey 2003) and implications for the current study, because substance abuse treatment can be seen as a form of social support, and the cost-benefit a positive collateral consequence. Likewise, several researchers have discovered the positive impact (in terms of cost-benefits) and importance of institutional, after-care, and reentry programs for correctional clients and length of and completion of treatment (Belenko et al. 2005; Griffith et al. 1999; McCollister et al. 2003a, 2003b). The current study is unique in that there has been little previous research of this kind conducted in a rural state, and it can therefore set a baseline for future cost-benefit analyses within analogous states. Further, our methodology is novel insofar as we use an amalgam of secondary state-run data sources.

RURAL DRUG USE

Correctly considered, drug use as a general phenomenon is neither a rural nor an urban issue. Rather, different patterns exist according to the type of drug and the ruralness/urbanicity of the area (Warner and Leukefeld 2001). For example, methamphetamine has historically been a rural phenomenon (Haight et al. 2005; Hunt, Kuck, and Truitt 2006), with use and production generally higher in rural areas than urban (Herz 2000). Although methamphetamine use and production appears to be increasing in urban and suburban areas (Hansell 2006), it still remains mostly a rural concern, concentrated especially in the West and Southwest (Pennell et al. 1999; Kyle and Hansell 2005; Hansell 2006).

Nevertheless, most drug use research has focused on urban areas (Schoeneberger et al. 2006). However, in 2007, although both large metropolitan and small metropolitan residents ages 12 and older reported using illicit drugs twice as much as nonmetropolitan completely rural residents of the same age group, the difference was one of only about four percent (8.3 percent and 8.2 percent versus 4.1 percent, respectively; SAMHSA 2008a). Further, the dynamics associated with drug use in rural areas are often different than those associated with urban areas. For example, given the low populations of rural areas, concomitant with relatively high levels of poverty, rural areas often have low tax bases. This results in less funding and training for police agencies and public drug treatment programs. Also, cultural barriers, illiteracy, and other socio-demographic characteristics of rural residents may preclude them from seeking out treatment (Leukefeld et al. 2002).

Rural and urban drug users are at once similar and different in their use patterns. For example, although substance using arrestees from a rural area were less likely to have used cocaine than their urban counterparts, most other differences in drug use patterns were marginal (Leukefeld et al. 2002). Similarly, although there were some racial differences in drug use patterns among this sample, "statistical control may not reflect reality or characterize possible differences between rural areas, which for this study are generally more White and different culturally than are urban areas" (Leukefeld et al. 2002:723). Other research, however, has found that there are significant and meaningful differences between rural and urban drug users (Warren and Leukefeld 2001). Specifically, rural drug users had both higher rates of life-time drug use and drug use in the last 30 days. Importantly, these same rural drug users were *less* likely than their urban counterparts to have received treatment. Further, research suggests that between rural and very rural areas there are differences in patterns of drug use, with earlier levels of first drug use and more life-time drug use among rural residents than among very rural residents (Schoeneberger et al. 2006).

It is important, therefore, to consider drug use and treatment in a rural context. Although good research into the differences and similarities of urban versus rural drug use have been done, it is a literature that remains to be expanded on. The research suggests that rural residents do not take advantage of treatment for a host of reasons; this has direct implications for the cost-saving potential of rural treatment programs. The costs of substance use are considered in the next section.

MEASURING THE COST OF SUBSTANCE ABUSE

In 2002, illicit drug users incurred more than $180 billion of cost in the United States. Of that amount, 71.2 percent was due to loss of employment productivity, and 8.7 percent was due to healthcare costs (Necochea 2006). Such costs are not unique to the United States: Rehm and colleagues (2006) report that the totality of substance abuse in Canada in 2002 was almost CA$40 billion. Similar to the United States, the bulk of this amount was loss of employment productivity (61%) (see ONDCP 2004). Healthcare costs comprised 22 percent of the amount, and law enforcement expenses comprised 14 percent. Per capita, alcohol abuse cost Canadian citizens CA$463 while illegal drug abuse cost CA$262. It is no wonder, given these costs, that policy makers and program administrators are particularly interested in how economically effective substance abuse treatment programs are (Dismuke et al. 2004).

Generally, cost-benefit evaluations have suggested that the cost of substance abuse treatment is covered by the economic benefits to society (see Aos et al. 2006; Zavala et al. 2005; Holder 1998). Importantly, studies that have utilized lengthy follow-ups have found little to no diminution of savings or increase of costs over time (Koening et al. 2005; Necochea 2006; Holder 1998; Franey and Ashton 2002; Dismuke et al. 2004). Although cost-benefit analyses are generally employed on unspecified populations of substance abusers, several studies have investigated specific substance abuse populations (along with issues surrounding cost estimation), with results similar to the general conclusion that society saves money by investing in substance abuse treatment. For example, Daley and colleagues (2000) explored the cost-benefit of substance abuse treatment for pregnant women and found that regardless of the type of treatment employed (e.g. detoxification, methadone, residential, out-patient, or a combination of residential and outpatient), the benefits outweighed the costs.

Similarly, Holder (1998) examined numerous cost-benefit studies and differentiated between groups treated by the substance being abused (alcohol or illicit drugs) and found that drug abusers and alcoholics who did not receive treatment utilized the healthcare system twice as much as those who had received treatment. His research also suggested that the costs of healthcare post-treatment remained below the costs of healthcare pre-treatment for drug and alcohol abusers, well into four-year evaluations. Finally, in regard to alcohol abuse specifically, Holder (1998) suggests that treatment for younger abusers netted greater benefits than for adult abusers, implying the importance of early intervention (see also Koenig et al. 2005). Franey and Ashton (2002) also found similar results in a cost-benefit evaluation of cocaine treatment. As they point out, longer treatment is better, not only clinically, but also economically (Franey and Ashton 2002; see also Taxman and Bouffard 2000). This suggestion is corroborated by Koenig and colleagues (2005), who found that, although the largest general cost-benefit ratio was found within the first six months post-treatment, productivity earnings continued to increase well into the 30-month follow-up period. Similar results have been found for cocaine treatment in terms of the cost of crime to society (Flynn et al. 1999; Hubbard, Craddock, and Anderson 2003).

Other examples of economic analyses have focused on the difficulty surrounding the estimation of costs and targeting multiple outcomes associated with substance abuse treatment, such as reductions in recidivism, arrests, and increases in employment or earnings (French 2000; Sindelar et al. 2004; Zavala et al. 2005). Additional studies have provided comparisons of evaluative cost studies in the community and in the prison setting (Warren et al. 2006), as well as programs aimed at increasing production levels of employees (Jordan et al. 2008), while other studies differentiate between treatment populations such as pregnant women, the mentally ill, and sex offenders (Daley et al. 2000; French et al. 2000; Shanahan and Donato 2001). Generally, what most of these studies have in common is the finding that treatment is more cost effective than no treatment or incarceration.

There are numerous economic studies of treatment related programs at various levels, from individual program evaluations to groups and aggregate level analyses. Some economic studies focus on cost-effectiveness or cost-benefit and cost-offset analyses and are an extension of a general evaluation done at the program level (Swaray et al. 2005). Well-designed (experimental or quasi-experimental) studies at the program level build in a counterfactual, or evaluate programs and/or program components in order to discover what particular treatments or interventions produce the best results (e.g. Patton 1997). As Swaray, Bowles, and Pradiptyo (2005:159) dutifully note in their literature review on economic analysis, there is a “dearth of experimentally rigorous evaluation of criminal justice policies.” Given all of the ethical considerations surrounding the denial of treatment to people in need, this is of no surprise to those researchers attempting to unearth and clarify best practices in substance abuse treatment.

However, there are answers to many of the economic questions surrounding treatment, and there are many examples of studies that direct our attention to what really works (see Welsh et al. 2001). One approach, taken here, focuses on the state-level treatment system as a whole in order to clarify or enumerate aggregate level impacts, in the form of economic savings, associated with substance abuse treatment (Alterman, Langenbucher, and Morrison 2001; Cartwright 2000; Godfrey and Parrott 2000).

RESEARCH DESIGN

The general design of this research is framed by four main databases. Rural State's Department of Health and Welfare (DHW) manages the database that identified the population of substance abuse clients to be analyzed here. This database is called the Substance Abuse (SA) database.[1] The SA data include many different elements consisting of demographic information, treatment unit frequency and cost (which were deflated/ converted into real terms (2009 dollars) by using monthly urban (or medical) CPI (the Consumer Price Index is "an index of prices used to measure the change in the cost of basic goods and services in comparison with a fixed base period" American Heritage Dictionary 1992:188) figures from U.S. Department of Labor, funding source, primary substance of abuse, referral source, employment, treatment setting, and county of residence. The three branching databases are managed by the Rural State's Department of Labor and Commerce (DLC), Medicaid, and the Department of Correction (DOC), and were linked together using the identified SA study group population. Of the 2,996 substance abuse clients, 1,315 were, at some point within the total and approximate five-year study period, incarcerated or supervised by the DOC; all 2,996 clients had DLC records; and 250[2] matched within the Medicaid database.

Sample Selection

Only clients who were eighteen years or older within the treatment range time period were included. In order to fulfill the selection criterion, each client had to first enter treatment (community based, publicly funded) between 7/1/02 and 6/30/03 (2003 State Fiscal Year or SFY). Only those clients who reported an episode for the first time (SFY 03 range only) within the SA database were included. This means that if client A received benefits from the DHW in 2000 and again in our study year 02-03, then client A would be disqualified from this study. First, this was done in order to obtain an unambiguous and arguably sound population of individuals who received services from the DHW for the first time during the treatment period, therefore creating a solid benchmark and resource for future analysis, and creating continuity for the present study. To clarify, first-time here means the first time each included client received treatment benefits through the DHW system. It does not necessarily mean that each client did not have a single or multiple treatment episodes prior to receiving benefits within the unique treatment episode range studied here. Additionally, at the time this research was conducted, the ability to obtain and measure multiple treatment episodes for each individual client was hampered by data availability and quality, expense, and time. Moreover, the analyses presented here represent a necessary first step for this state system; to get a good idea of the nature of the data and the effects of treatment on clients who receive DHW services for the first time.

Each client's episode range is unique. Therefore, the episode is tracked by a treatment service date, which is defined within the SA system as the date identifying when the service was entered on the system, and a service end date, which is defined as the date the service treatment ended or for ongoing treatment, the last day it was billed for. The follow-up or post interval for this study was set at the point of treatment discharge. Therefore, treatment benefits and costs data associated with corrections, earnings, and medical treatment were not gathered during each unique treatment episode. However, the cost of treatment is included in the final cost-benefit calculation. Treatment costs were calculated by units (hours and days) of treatment that were billed out to the state and were deflated and converted to real values (2009 dollars) using monthly urban CPI figures from U.S. Department of Labor.[3] Unfortunately, the DHW data employed here do not provide information on type of treatment, only real cost per unit/hour of service.

Table 1 (below) provides a brief descriptive overview of the entire SA population. Over half of the SA study population were unemployed, lacked insurance, and were treated in the community. A little under half were under DOC supervision or incarcerated, and one-third did not finish high school. For half of the SA study population, alcohol was the primary substance of abuse, while methamphetamine was proportionately the second, representing the primary drug of use for about one-third of the population. About one-third of the population was female, a small number of whom were pregnant or had a dependent child, which are primary target populations in Rural State. Finally, the majority of clients are classified as White, which is consistent with the general racial composition of Rural State.

Briefly, the matched Medicaid data captured a total of 250 substance abuse client records. We found that generally the Medicaid population, though smaller, at face value closely resembled the larger samples on a number of important indicators. For example, 96.8 percent of the total matched Medicaid clients received their substance abuse treatment from a freestanding or community based

Table 1. *Population Characteristics: Selected Descriptive Highlights (SA N= 2,966)*

Heading	Category	Mean	Frequency	%
Age		33		
Education	Graduated High School		1,913	64.5
	Did Not Graduate		1,053	35.5
DOC Involvement	Yes		1,315	44.3
	No		1,651	55.7
Client Type	Dual Diagnosis		277	9.3
	Pregnant		21	0.7
	Woman and Dependent		207	7.0
Employment	Unemployed		1,628	54.9
	Full Time		737	24.8
	Part Time		389	13.1
Living Arrangement	Homeless		195	6.6
	Dependent		792	26.7
	Independent		1,979	66.7
Insurance	Yes		306	10.3
	No		2,591	87.4
	Unknown		69	2.3
Tx Setting	Free Standing Community Based		2,883	97.2
Primary Substance	Alcohol		1,509	50.9
	Methamphetamine		798	26.9
	Marijuana		519	17.5
Gender	Female		1,007	34.0
	Male		1,950	65.7
Race	White		2,651	89.4
	Non-White		315	10.6
Marital Status	Divorced		696	23.5
	Married		540	18.2
	Single		1,401	47.2

*Some percentages do not add up to 100% due to a small number of missing data and rounding and some variable categories are not included here.

treatment setting/facility. Furthermore, 57.6 percent of the Medicaid clients were categorized as unemployed prior to treatment. Additionally, 59.2 percent reported not having insurance prior to treatment, and the primary substance of abuse was alcohol (43.2%).

Medicaid Database

For the purposes of this current examination, which partly represents a functional construction of a quality baseline study group or benchmark, the analysis was focused on Medicaid cost of service (COS) groups (which are made up of CPT codes[4]). These COS groups are coded most importantly as inpatient and outpatient and were collected at 18, 15, 12, 9, 6, and 3 month intervals pre and post treatment episode (each client also had continuous eligibility[5] during the study timeline; see Alterman et al. 2001; Reutzel, Becker, and Sanders 1987). Briefly, both inpatient and outpatient COS groups include those costs associated with mental health diagnosis, labs, and surgery services (CPT codes), which are provided by Medicaid. COS data are data that reflect the nominal costs of billed services attached to each individual client and are not estimations. The matching process identified a total of 250 client records within the Medicaid database. Medicaid cost outcomes were deflated and converted to real values (2009 dollars) using monthly medical CPI figures from U.S. Department of Labor.

Department of Labor and Commerce

The Rural State's Department of Labor and Commerce (DLC) database holds valuable information centering on client earnings. This matched information has

produced an economic observation of post-treatment set against the backdrop of pre-treatment episode/service. The matching procedure resembled that of the Medicaid process except results were reported in quarters (due to the availability of complete data). Earnings data are accessed five quarters pre, and five quarters post, treatment episode/service. DLC data does not capture daily, weekly, or monthly breakdowns of hours or earnings. Additionally, these data only reflect taxable earnings that were reported to the Rural State DLC and do not reflect client earnings that were a result of illicit activities or valid work-related earnings that were not accounted for.

These data, in addition to a dollar amount differential, have proven to be a crucial element in the understanding of substance abuse in Rural State and are addressed within the analysis section of this paper. The matching process identified a total of 2,966 clients within the DLC database; all of the available indicators were positively matched with the SA data. Earnings data were initially reported as nominal (actual) values. However, pre and post treatment episodes were marked by a specific date, which enabled the nominal earnings to be deflated into real terms (2009 dollars) by using monthly urban CPI figures from U.S. Department of Labor.

Department of Corrections

The matching process identified 1,315 client records within the DOC database. Information was gathered on rates of incarceration and supervision (measured in days). The DOC provided information on the average cost per day, per client for incarceration and supervision. For SFY 03' the *average* cost per day, per client is $3.50 for supervision and $50.23 for incarceration or prison. Thus, costs were estimated by multiplying the average costs for supervision and incarceration with the number of days pre and post treatment for each client. These cost estimations were also deflated using the urban CPI figures from the U.S. Department of Labor.

ANALYSIS

Previous research clearly indicates that some treatment is positively associated with reductions in criminal offending and substance abuse (e.g., Andrews et al. 2001; Henning and Frueh 1996; Knight, Simpson, and Hiller 1999; Lipton 1998; Martin et al. 1999; Pearson and Lipton 1999; Wexler et al. 1999). There are also indications that the longer treatment is continued, the greater the social benefits achieved (Hiller, Knight, and Simpson 1999; Knight et al. 1999; Martin et al. 1999; Wexler et al. 1999). Our focus here is on the cost benefit of treatment on prisons and community corrections and Medicaid spending and client earnings. Therefore, we expect that the overall cost benefit of treatment will be positive. In this context, we expect that spending (correctional and medical) will decrease and that client earnings will increase after treatment.

In order to measure the economic cost of substance abuse treatment, researchers generally employ one of three evaluation techniques. They may simply calculate the costs of treatment and compare those costs to non-monetary outcomes, such as number of days of substance abuse pre- and post-treatment; this process is generally referred to as a cost-effectiveness analysis. Another method, generally called cost-offset analysis, focuses on the difference post intervention of a cost trajectory compared to an outcome. The third, and possibly the most rigorous, of the three methods researchers attempt to employ is referred to as cost-benefit evaluation or analysis (e.g. see Aos et al. 2006). Cost-benefit evaluations compare the actual monetary cost of treatment to several economic based outcomes pre- and post-treatment (Zavala et al. 2005). Outcomes generally include the cost of healthcare, loss of employment productivity (absence from workforce due to incarceration for example), and the costs associated with criminal activity. This latter category includes costs connected to victimization and those related to the criminal justice system, including law enforcement, legal, and incarceration/correctional costs (Daley et al. 2000; Koenig et al. 2005; Zavala et al. 2005). Costs associated with welfare and Medicaid benefits have also been employed in cost-benefit evaluations (Necochea 2006). As is illustrated by the research, all are valid benefit targets that some authors choose to differentiate, while others combine all the accrued benefits into one aggregate outcome measure (French 2000; see also Koenig et al. 2005 for a discussion on this issue).

Cost is conceptualized in the current study as the net cost (estimated and/or measured as a dollar amount and net benefit as captured by the earnings data) incurred through four social service realms: (1) earnings, (2) medical care costs, (3) corrections, and (4) substance abuse treatment. A cost-benefit ratio is calculated by taking the pre-treatment estimated net costs in the four service areas and comparing those costs to those incurred during the post-treatment period. The pre-treatment costs minus the post-treatment costs reveal the dollar amount offset or net benefit. The information used to estimate these costs include a combination of accounting or claims data, employment history/socioeconomic status, criminal justice system involvement, alcohol and drug use, and medical care (see Walker et al. 2004; Alterman et al. 2001). Some cost measurements are directly applicable to a dollar amount (Reutzel et al. 1987), while non-monetary cost measures, such as social costs, quality of life, or criminal victimization, are more difficult to enumerate (French et al. 2000; Belenko et al. 2005) and often center on effectiveness of service and treatment as an outcome measure of substance abuse treatment (National Evaluation Data Services (NEDS) 2002).

The cost measures employed in this research focus on data from administrative sources regarding client employment (earnings), Medicaid, criminal justice involvement (correctional costs), and treatment costs. These four areas are related insofar as a substance abuse problem may affect each of these areas in tandem. Thus, substance abuse has a compounding effect on costs. However, the main concern while collecting and matching data from each agency was data quality on the *post side* – meaning that after a certain point in time, post-treatment, the data were deteriorating because of agency reporting practices and/or timelines. For example, for a medical claim to move from service for a client to payment then to be recorded may take up to a year. Additionally, there are no solid numbers on the average time it takes employers to report employee earnings to DLC. Given these issues and in consultation with data managers at these agencies, we chose to capture the most reliable data, which resulted in different time coverage by agency within the approximate five year study period.[6] In order to address the concern that the cost benefit ratio, which utilizes all available and time-varying cost data, produces a biased estimate, we present two separate cost benefit outcomes; the first includes all data that were provided by each agency, and in the more conservative second, the DOC data were cut from 24 months to 18 months pre and post in order to provide a cleaner time match with Medicaid (18 months pre and post) and DLC (15 months pre and post). These outcomes are presented and discussed below (see also endnote 6 for a more detailed discussion on "time to return on investment").

In order to lend a bit more support to the cost benefit outcomes (due to the study design limitations), a simple OLS regression was performed on post treatment client earnings. To begin, both pre and post earnings variables were skewed (Pre = 5.48, Post = 4.42) and therefore were adjusted using a natural log transformation. All other variables were within the limits of normality. The variables included within the model included: age, gender (M, F), race (White = 0, Minority = 1), employment status (pre treatment: part time, full time and unemployed), educational attainment (pre treatment: no high school diploma, high school grad, and some college and above), living status (homeless, dependent, or independent), and primary drug of choice (self reported alcohol, meth, and marijuana). The model notes in Table 4 (at the end of the results section) indicate dummy reference categories as well as some other coding considerations.

RESULTS

The study hypothesis was supported in that the reported earnings post-treatment increased by approximately 10 percent in the aggregate, and DOC and inpatient and outpatient Medicaid spending decreased post episode. Earnings trends[7] (average, mean earnings per quarter) for pre and post per quarter indicate that regardless of inflation, the reported earnings trend pre-treatment, leading up to the episode, is negative, and the reported trend post-treatment is positive (see Figure 1).

Figure 1. *Pre and Post Treatment Episode Earnings Trends (N=2,966)*

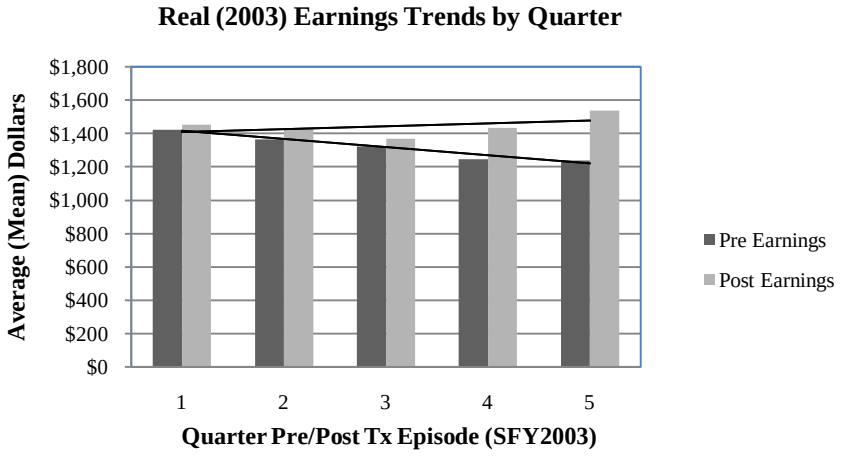

Table 2 highlights the total combined cost offset for the study group population (N= 2,966). The analysis for the combined groups reflected positive outcomes: the result of the combined costs, representing the three major areas of interest (earnings, health and corrections), revealed a $4.12 million overall offset, and when combined with the DHW cost of treatment, the difference resulted in 20 percent savings above the fixed treatment cost. This may be interpreted as: for every $1.00 invested in substance abuse treatment there is a $1.20 in general savings.

Table 2*. Combined Cost Offset and Benefit Ratio Post Treatment Episode (N=2,966)*

	Time Period (pre/post)	Pre	Post	Offset
Inpatient[1] (Medicaid)	18 months	$453,915	$293,793	$160,122
Outpatient[1] (Medicaid)	18 months	$262,393	$183,052	$79,342
Recorded Earnings[2]	15 months	$22,719,884	$24,885,559	$2,165,675
Days Incarcerated[3]	24 months	$5,472,748	$4,099,599	$1,373,149
Days Supervised[3]	24 months	$794,899	$449,195	$345,704
			Total Offset/Benefit	$4,123,992
Cost of Treatment[2]	Total Benefit	Outcome	Percent Savings	Ratio
$3,448,658	$4,123,992	$675,334	19.58 (^20%)	$1.20/$1.00

1. Deflated using monthly medical CPI figures from U.S. Department of Labor.
2. Deflated using monthly urban CPI figures from U.S. Department of Labor.
3. Average cost per day of incarceration and supervision used from figures provided by Rural State DOC. These figures were also deflated using monthly urban CPI figures from U.S. Department of Labor.

The analysis for the combined and time-adjusted groups still reflected positive outcomes. The adjusted outcome of the combined costs, revealed a $3.98 million overall offset, and when combined with the DHW cost of treatment, the difference resulted in 16 percent savings above the fixed treatment cost. This may be interpreted as: for every $1.00 invested in substance abuse treatment there is a $1.16 in general savings.

Table 3*. Time-Frame Adjusted Combined Cost Offset and Benefit Ratio Post Treatment Episode (N=2,966)*

	Time Period (pre/post)	Pre	Post	Offset
Inpatient[1] (Medicaid)	18 months	$453,915	$293,793	$160,122
Outpatient[1] (Medicaid)	18 months	$262,393	$183,052	$79,342
Recorded Earnings[2]	15 months	$22,719,884	$24,885,559	$2,165,675
Days Incarcerated[3]	18 months	$4,386,619	$3,152,120	$1,234,499
Days Supervised[3]	18 months	$703,409	$357,512	$345,897
			Total Offset/Benefit	$3,985,535
Cost of Treatment[2]	Total Benefit	Outcome	Percent Savings	Ratio
$3,448,658	$3,985,535	$536,877	15.56% (^16%)	$1.16/$1.00

1. Deflated using monthly medical CPI figures from U.S. Department of Labor.
2. Deflated using monthly urban CPI figures from U.S. Department of Labor.
3. Average price per day of incarceration and supervision used from figures provided by Rural State DOC. These figures were also deflated using monthly urban CPI figures from U.S. Department of Labor.

The OLS regression results (see Table 4) lend some further support to the findings presented here and provide additional insight to the nature of these data. Number of days in treatment was significantly ($p < .05$) related to post treatment earnings. This variable is interpreted as for every one unit increase in treatment days there is a 0.2 percent increase in post treatment earnings. The age variable is significant ($p < .001$) although negatively related to post treatment earnings. This is interpreted as those clients who are younger have an increased chance of making more money post treatment, or for every one year of age post treatment earnings decrease by 4.7 percent.

Table 4. *OLS Regression for Post-Treatment Client Earnings*

Variables	B	Beta	Std. Error	t
Gender	0.182	0.020	0.155	1.176
Tx Days	0.002*	0.039	0.001	2.294
Race[3]	0.271	0.020	0.229	1.186
Age	-0.047***	-0.117	0.007	-6.440
Ed High School[1]	0.191	0.023	0.157	1.219
Ed College[1]	0.292	0.025	0.225	1.299
Employment FT [1]	0.694***	0.071	0.176	3.945
Employment PT[1]	0.758***	0.061	0.217	3.429
Pre Tx Earnings[2]	0.486***	0.464	0.018	26.932
Homeless[1]	-0.417	-0.024	0.300	-1.389
Dependent Living[1]	-0.083	-0.009	0.170	-0.486
Meth[1]	0.452*	0.045	0.184	2.450
Marij.[1]	-0.104	-0.010	0.193	-0.542
Constant[2]	3.768***	--	0.349	10.809
N	2633			
F	76.528***			
R^2	.275			

Note: *p < .05, ** p < .01, ***p < .001
1. Education dummy reference category = did not graduate high school; employment dummy reference category = unemployed; living arrangement dummy reference category = independent living; substance of abuse dummy reference category = alcohol.
2. In order to adjust for skewness, both pre and post client earnings were transformed via natural log.
3. Race coded White (0), Minority (1).

The interpretation of the pre-treatment (Tx) earnings variable ($p < .001$) in this model is a bit different because it too was adjusted using a natural log transformation. Accordingly, these data indicate that a one percent increase in average client earnings pre-treatment yields a 48.6 percent increase in client earnings post-treatment. Additionally, those significant independent variables ($p < .001$) that are dummy coded (Employment FT/PT & Meth) also must be interpreted differently.[8] Results show that for client full time employment (FT), there was 100 percent relative increase in E(Y) when dummy is turned on (unemployment is the reference category, see also endnote 8). Likewise, for client part time employment (PT), there was a 113 percent relative increase in E(Y) when the dummy variable is turned on. The results show that for client substance of abuse (Methamphetamine) there was a 57 percent relative increase in E(Y) when the dummy variable is turned on (reference category is alcohol). Regression diagnostics did not indicate any problems with this model.

DISCUSSION

Those who labor in the public sector are constantly being called upon to make do with less and in the current economic environment (latter part of the 2000 decade), to make cuts. Too often, these cuts are made of programming that is, ironically, central to reducing costs. There is now a body of research that indicates, for instance, that treatment programming that employs best practices can be successful in reducing the recidivism of inmates (Andrews et al. 2001; Henning and Frueh 1996; Knight et al. 1999; Lipton 1998; Martin et al. 1999; Zavala et al. 2005). Moreover, there are studies emanating out of a number of states that indicate related costs such as Medicaid, unemployment insurance, and welfare might be reduced when people with a substance abuse problem receive the appropriate

treatment (Necochea 2006; Swaray et al. 2005). Such cost benefit analyses, such as those presented here, provide researchers and policymakers with an alternate view of the "efficiencies" achieved when treatment for the poor gets cut. Our data indicate that doing so may result in higher costs in terms of other program provision rather than the expected, and hoped for, reductions in overall government expenses.

To reiterate, the first overall cost benefit analysis uncovered a $4.12 million overall offset, and when combined with the DHW cost of treatment, the difference resulted in 20 percent savings above the fixed treatment cost. Again, this may be interpreted as: for every $1.00 invested in substance abuse treatment there was a $1.20 in general savings. The second and more conservative analysis for the time-adjusted data still revealed a positive outcome. These combined costs, revealed a $3.98 million overall offset, and when combined with the DHW cost of treatment, resulted in a 16 percent savings above the fixed treatment cost. This may be interpreted as: for every $1.00 invested in substance abuse treatment there is a $1.16 in general savings. These conservative findings may indicate that, through the utilization of substance abuse treatment, Rural State saved money ($4.12 to $3.98 million, respectively) in the criminal justice and health fields and stimulated increases in client earnings. Furthermore, it is very important to understand that this analysis is limited by the lack of available data enumerating service and social costs derived from arrest records and victimization costs (among others) that may have rendered the identification of even greater savings.

The design of this research is limited by the time period covered, although secondary analysis of administrative data can be a methodologically sound approach which provides clear insight into the research questions (Alterman et al. 2001). Also, there was no comparison group to test whether the cost-offsets reported here are directly related to treatment or not. Therefore, statements regarding a direct relationship between treatment and outcomes cannot be made at this time. We also acknowledge that we only include those individuals who entered treatment for the first time and these findings may not apply to those who enter treatment multiple times. As with any research involving the analysis of secondary data, the original data collection techniques may promote biased conclusions in either direction. Because this research is derived from four disparate databases, the use of which focus on fiscal management, internal/external process evaluations, and client services, findings should be interpreted with caution. Additionally, we did not have access to information on the type of specific treatment that each client received. It is for this reason that we cannot assess whether a particular type of treatment is more cost-efficient with some clients over others. However, the final cost benefit number(s) lack the estimated positive impact of law enforcement data in the form of arrests pre- and post-treatment, victim associated costs, and societal costs. With the addition of these data, it is possible that the cost offset or complete cost-benefit ratio number could be much greater than the amounts found in this research.

Despite these limitations, the savings we did find are comparable (in terms of trends within the selected cost categories) to those found in a study by researchers at UCLA in a report submitted to the California Department of Alcohol and Drug Programs in 2006 (Longshore et al. 2006). The researchers examined the cost-offset/benefit of the California Substance Abuse and Crime Prevention Act of 2000 (SACPA). SACPA requires that non-violent drug offenders be offered probation and community based drug treatment as a sentence rather than incarceration. In examining the program, the researchers found that there was a general savings of $2.50 for every $1.00 invested per offender the first year and a similar savings of $2.30 for every $1.00 in the second year. Further, those offenders who completed treatment resulted in a cost-offset of $4.00 for every $1.00 invested. Although costs incurred through treatment, probation, and healthcare increased under SACPA, ultimately, savings were offset as a result of cost reductions relating to jail, prison, arrest, and conviction costs, as well as tax savings.

Similar to previous studies (McCollister et al. 2003a, 2003b; Griffith et al. 1999; Belenko et al. 2005), length of treatment was positively related to post treatment earnings. Although increases in earnings per added treatment day (0.2%) are small, they do add up (e.g. +30 days = a 6% increase, respectively). As stated previously, Holder (1998) suggests that treatment for younger abusers netted greater benefits than for adult abusers, implying the importance of early intervention (see also Koenig et al. 2005). The findings related to age here may also reflect this general pattern. The findings in regard to employment status and pre-treatment earnings are not surprising given the argument that those clients who have full and part time employment should naturally earn significantly more than those clients who are unemployed. Finally, the finding that clients who indicated that methamphetamine was their primary substance of abuse had a 57 percent relative increase in post treatment earnings may be explained by highlighting level of risk. Simply, those clients who reported alcohol (a "legal" substance) as their primary substance of abuse may be considered more stable and therefore patterns of relative change in earnings pre to post treatment may be stronger for the more risky meth-addicted clients. To reiterate, clients who received treatment for alcohol had higher levels of pre-treatment earnings than clients receiving services for meth addiction.

There have been few studies that have focused on the possible relationships and outcomes of some aspects of substance abuse and the resulting social, as well as, economic costs incurred (Carey and Finigan 2004; Domino et al. 2005; Godfrey, Stewart, and Gossop 2003). To date, these studies have strengthened quantitative and qualitative

methodological techniques for this kind of research. They have also produced important information on the efficiency, effectiveness, costs, and benefits of substance abuse treatment. Results from these studies have most likely produced policy updates (health, public policy and planning, and law enforcement) and changes within the infrastructure of the study population, whether it is local, state, or on a national level (Anderson et al. 1998).

In Rural State, research studies that address concerns centering on the economic costs of substance abuse treatment are scarce. A strong recommendation is to build a network of researchers and key stakeholders through the replication and integration of similar statewide studies. This group of researchers and practitioners would be responsible for continuing similar research, the development of a more in-depth understanding of the substance abuse treatment and rehabilitation system in Rural State, and as partners, work to break down data sharing walls that currently impede future research, while remaining sensitive to privacy requirements.

Additionally, given the nature of the cost benefit research that utilizes administrative data, such as those employed here, we can make the following methodological recommendations for future research in particular: (1) in regard to the time to return on investment issue and post-data quality, data should cover at least two years out pre and post, if not longer. This is essential to gaining a valid cost benefit estimate, and given the problems associated with institutional reporting processes, one should add between one to two additional years to the targeted or selected years of study (situated pre and post around a treatment episode); (2) future research should seek an answer to both the "horizon" question (when or how much time does it generally take for a return to be seen on the investment) and the question around the flattening of benefits (for example: how long does it take before increases in earnings level out, or decreases in Medicaid spending or DOC spending level out?) in order to assess the stability of treatment outcomes over time within Rural State (see Yates 1999; Hubbard et al. 2003).

At the outset of this research, one driving force that helped in breaking down barriers (data sharing, communication, and shared goals, etc.) between disparate agencies was the notion that client(s) "claimed" by Health and Welfare, for example, were the same client(s) receiving services from the DOC, Medicaid, or both; these agencies are serving a large number of the same individuals. Therefore, inter and intra-agency communication seems to be one area that can be improved in order to better service clients and the community in general. Second, as stated in the introduction, making decisions on how to allocate scarce economic and social resources in regard to service recipients is difficult. Dually problematic for many state agencies is the allocation of internal agency resources. For that reason, state agencies and key community stakeholders should continue to build networks with university and other researchers, thereby increasing social capital and empirical output, which theoretically should increase agency effectiveness and efficiency.

It is important to note that the areas of focus within this analysis (earnings, health benefits, corrections, and treatment) are uniquely related. Therefore, the effects of substance abuse have a compounding effect on costs, and these costs are interconnected. Concomitantly, the effects of treatment, should they be positive, have the potential to also have compounding prosocial effects. For example, increases in earnings, changes in lifestyle, and decreases in health problems appear to be related to participation in treatment; therefore, movement in a positive direction in one category may well influence progress in another. For that reason, *the effort to improve substance abuse treatment services should be understood as a cooperative effort with collateral effects and should be analyzed as such.*

In his identification of a Social Support Paradigm, Cullen (1994) devised a method for understanding the collateral positive effects of support for distressed and criminogenic individuals in communities. His contention is that social support, in the form of programs, policies and practices that buffer the harsh realities of existence for those in need, are likely to reduce criminal involvement, no matter how that support is delivered (e.g. governmental or private programs). Substance abuse treatment, provided free of charge to those addicted and poor individuals included in this study, might be seen as the kind of social support that would reduce criminal involvement and increase employment and earnings. Of course, aggregate decreases or increases in cost or monetary earnings cannot be attributed to treatment alone. The pre-post changes illustrated here, however, may be correlated to substance abuse treatment.

There has been no similar research in Rural or many other states. It is hoped, therefore, that these findings might be replicated and expanded on (with the inclusion of arrest data, victim costs, and the expansion of health related data to non-Medicaid recipients) in both Rural and other states. If the finding holds true in future studies that treatment costs are more than offset by benefits (such as increased earnings and decreased correctional costs), treatment funding should be expanded in general. However, future research in Rural State should move from the aggregate findings presented here to empirical investigations regarding treatment targets, efficiency (as measured by recidivism), best practices, and specific treatment populations (who benefits most).

Endnotes

[1] The SA data are gathered at a few stages. When a client first contacts the contracted managing service provider, demographic information is collected along with

materials from a short pre-assessment. The client is then directed into a full assessment. Once this assessment is done, the client then contacts the managing service provider to receive authorization for treatment. The treatment facility then bills the managing service provider for services rendered to the client. Data are gathered at each of these stages for each client who receives benefits. Each client is assigned a unique identification number. This number follows each client continuously through the treatment episode. These numbers, along with client social security numbers, served as key identifiers in matching case to case within the branching databases. We provide an illustration of the matching method in appendix A.

[2] Because the treatment these clients received was publicly funded, one might question why only 250 records were matched from SA to Medicaid. To answer this question, the final number of matched records was influenced by our selection criterion. Previous research has discussed the problems associated with lack of continuous benefit eligibility throughout a study period (Reutzel et al. 1987). Therefore, our first and main matching and selection criterion was that each client had to have continuous eligibility throughout the entire study period (18 months pre and post treatment, including treatment episode length).

[3] Treatment units (hours and days) and actual billed costs data were provided by DHW per client during the 03' SFY. Unfortunately, these data did not contain any information on treatment modality so we are unable at this time to adjust for cost variation by treatment type.

[4] SA client identifiers were dispatched through the Rural State's Medicaid database and matched to services and benefits. The Medicaid database enlists and groups several levels or layers of data within the Medicaid database. The lowest level or most detailed field groups data by diagnostic codes. These codes are called ICD-9 codes. Each state collects and records their data slightly differently depending on the breadth of coverage of these codes and medical coverage. Therefore, comparison between states' Medicaid data by utilizing these ICD-9 codes may not produce reliable results. However, they may act as a guiding tool for reference purposes and as a target group (of codes). For the purposes of this research, instead of matching a substance abusing sub-population by ICD-9 codes (created by a mathematical algorithm), an already identified population (through utilizing DHW SA data) was sent through and matched within the Medicaid database.

The next level above the ICD-9 codes is grouped by procedure. These codes are called CPT codes or procedure codes. The CPT codes give less detail than the ICD-9 codes. A hypothetical example of the difference between the depth of these two codes may look like this:

CPT coded: Pregnant/Physical Exam

ICD-9 coded: Drug Dependence Complicating Pregnancy

The differences between the ways State Medicaid systems report medical information is a direct result of disparate use of CPT codes in concert with the scope of medical coverage and medical definitions. Other data consist of revenue codes and modality or treatment type codes.

[5] In their study, Reutzel et al. (1987) focused on a group of 176 Medicaid enrollees who were admitted to a program for alcohol treatment during the 82-83' state fiscal year. From this group they identified a sub-sample of 46 Medicaid clients, who were "[c]ontinuous enrollees for six months prior to, and six months after, the month in which they entered treatment for the first time" (Reutzel et al. 1987: 503). This issue of "continuous eligibility" comes about because of the movement of clients across benefit levels and systems, where client level data can be influenced by funding sources and changes in income (Alterman et al. 2001).

[6] Note: SFY 03' treatment period defined the time frame within which a client had a total of one treatment episode. Each client's treatment episode is unique (could be 1 day to 365 days, no costs were calculated during this period). Therefore, the main concern while collecting and matching data from each agency was data quality on the *post side*, meaning that after a certain point in time, post treatment, the data were deteriorating. Given these issues (reliability of data) and in consultation with data managers at these agencies, we chose to capture the most reliable data, which resulted in different coverage by agency after all was said and done. Due to the varying length of data provided by each agency, one might conclude that the findings (particularly Table 2): (1) may be an artifact of time, and (2) could be considered a type one error.

First, the fact that the treatment cost is both fixed and funded through a dedicated block grant (meaning Health and Welfare has a certain amount of money they must spend on drug treatment each fiscal year), we argue that: (1) by shortening the pre/post time periods, we run the risk of committing a type two error, not type one (i.e. the more we extend, the clearer the picture), and (2) defaulting to shorter time periods may be flawed because of differing institutional time periods (in terms of reporting processes). This unique issue is empirically supported and commonly referred to as "time to return on investment" (Yates 1999). According to the National Institute on Drug Abuse (http://www.drugabuse.gov/IMPCOST/IMPCOST10.html) "Net benefit is the result of subtracting costs from benefits. Present valuing benefits reduces the value of benefits. Using present-value benefits gives an appropriate advantage to programs that achieve their benefits sooner. Present-valuing benefits still, however, gives an advantage (appropriately) to programs that take longer but achieve

better benefits than programs that produce quick but small benefits." Cost benefit outcomes then, can be considered intrinsically related to or an artifact of time. Therefore, our first cost benefit outcome (Table 2) may be just as accurate as the second and more aesthetically pleasing pre/post time-adjusted cost benefit outcome (Table 3), given the many dynamics surrounding agency reporting practices and time to return on investment issues.

[7] The earnings trend R-squared for pre-earnings is 0.958 and for post-earnings is 0.209.

[8] The expression that was used is:
[E[Y | dummy = 1] - E[Y | dummy = 0]]/ E[Y | dummy = 0] *or* exp(coefficient) = 2.00, 2-1 = 1, turn to percentage = %100.

References

Alterman, A.I., J. Langenbucher, and R.L. Morrison. 2001. "State-Level Treatment Outcome Studies Using Administrative Databases." *Evaluation Review* 25:162-183.

American Heritage Dictionary. 1992. The *American Heritage Dictionary, Third Edition*. New York: Houghton Mifflin Company.

Anderson, D.W., B.J. Bowland, W.S. Cartwright, and G. Bassin. 1998. "Service Level Costing of Drug Abuse Treatment." *Journal of Substance Abuse Treatment* 15:201-211.

Andrews, D.A., I. Zinger, R.D. Hoge, J. Bonta, P. Gendreau, and F.T. Cullen. 2001. "Does Correctional Treatment Work? A Clinically Relevant and Psychologically Informed Meta-Analysis." Pp. 291-310 in *Correctional Contexts: Contemporary and Classical Readings*, edited by E.J. Latessa, A. Holsinger, J.W. Marquart, and J.J. Sorensen. Los Angeles, CA: Roxbury Publishing.

Aos, S., M. Miller, and E. Drake. 2006. *Evidence-Based Public Policy Options to Reduce Future Prison Construction, Criminal Justice Costs, and Crime Rates*. Olympia, WA: Washington State Institute for Public Policy.

Belenko, S., N. Patapis, and M. French. 2005. "Economic Benefits of Drug Treatment: A Critical Review of the Evidence for Policy Makers." *Treatment Research Institute*, University of Pennsylvania.

Carey, S. and M. Finigan. 2004. "A Detailed Cost Analysis in a Mature Drug Court Setting." *Journal of Contemporary Criminal Justice* 20:315-338.

Cartwright, W. S. 2000. "Cost-Benefit Analysis of Drug Treatment Services: Review of the Literature. *The Journal of Mental Health Policy and Economics* 3:11-26.

Chamlin, M.B. and J.K. Cochran. 1997. "Social Altruism and Crime." *Criminology* 35: 203-228.

Colvin, M., F.T. Cullen, and T. Vander Ven. 2002. "Coercion, Social Support, and Crime: An Emerging Theoretical Consensus." *Criminology* 40:19-42.

Cullen, F.T. 1994. "Social Support as an Organizing Concept for Criminology: Presidential Address to the Academy of Criminal Justice Sciences." *Justice Quarterly* 11:527-559.

Daley, M., M. Argeriou, D. McCarty, J.J. Callahan, Jr., D.S. Shepard, and C.N. Williams. 2000. "The Costs of Crime and the Benefits of Substance Abuse Treatment for Pregnant Women." *Journal of Substance Abuse Treatment* 19:445-458.

DeFronzo, J. 1983. "Economic Assistance to Impoverished Americans: Relationships to Incidence of Crime." *Criminology* 21:119-136.

DeFronzo, J. 1996. "Welfare and Burglary." *Crime and Delinquency* 42:223-230.

Dismuke, C.E., M.T. French, H.J. Salome, M.A. Foss, C.K. Scott, and M.L. Dennis. 2004. "Out of Touch or On the Money: Do the Clinical Objectives of Addiction Treatment Coincide with Economic Evaluation Results?" *Journal of Substance Abuse Treatment* 27:253-263.

Domino, M., J. Morrissey, T. Nadlicki-Patterson, and S. Chung. 2005. "Service Costs for Women with Co-occurring Disorders and Trauma." *Journal of Substance Abuse Treatment*, 28:135-143.

Flynn, P.M., P.L. Kristiansen, J.V. Porto, and R.L. Hubbard. 1999. "Costs and Benefits of Treatment for Cocaine Addiction in DATOS." *Drug and Alcohol Dependence* 57:167-174.

Franey, C. and M. Ashton. 2002. "The Grand Design: Lessons from DATOS." *Drug and Alcohol Findings 7*:4-19.

French, M. 2000. "Economic Evaluation of Alcohol Treatment Services." *Evaluation and Program Planning* 23:27-39.

French, M., C. Roebuck, and T. McLellen. 2004. "Cost Estimation When Time Series Are Limited: The Brief DATCAP." *Journal of Substance Abuse Treatment* 27:187-193.

French, M., H. Selomé, A. Krupski, J. McKay, D. Donovan, A.T. McLellan, and J. Durell. 2000. "Benefit-Cost Analysis of Residential and Outpatient

Addiction Treatment in the State of Washington." *Evaluation Review* 24:609-634.

Godfrey, C., D. Stewart, and M. Gossop. 2003. "Economic Analysis of Costs and Consequences of the Treatment of Drug Misuse: 2-Year Outcome Data from the National Treatment Outcome Research Study (NTORS)." *Addiction* 99:697-707.

Godfrey, C. and S. Parrott. 2000. "How Can Policy Makers Use Available Evidence on the Cost Benefits of Drug Treatment?" *The Journal of Mental Health Policy and Economics* 3:55.

Griffith, J.D., M.L. Hiller, K. Knight, & D.D. Simpson. 1999. "A Cost-Effectiveness Analysis of In-prison Therapeutic Community Treatment and Risk Classification." *The Prison Journal* 79:352-368.

Haight, W., T. Jacobsen, J. Black, L. Kingery, K. Sheridan, and C. Mulder. 2005. "'In These Days': Parent Methamphetamine Abuse and Child Welfare in the Rural Midwest." *Children and Youth Services Review* 27:949-971.

Hannon, L. and J. DeFronzo. 1988. "Welfare and Property Crime." *Justice Quarterly* 15:273-288.

Hansell, B. 2006. "The Meth Epidemic in America: Two New Surveys of U.S. Counties: The Effect of Meth Abuse on Hospital Emergency Rooms, the Challenges of Treating Meth Abuse." Washington, D.C.: National Association of Counties.

Henning, K.R. and B.C. Frueh. 1996. "Cognitive-Behavioral Treatment of Incarcerated Offenders: An Evaluation of the Vermont Department of Correction' Cognitive Self-Change Program." *Criminal Justice and Behavior* 23:523-541.

Herz, D.C. 2000. "Drugs in the Heartland: Methamphetamine Use in Rural Nebraska." Washington, D.C.: National Institute of Justice.

Hiller, M.L., K. Knight, and D.D. Simpson. 1999. "Prison-Based Substance Abuse Treatment, Residential Aftercare, and Recidivism." *Addiction* 9:833-842.

Holder, H.D. 1998. "Cost Benefits of Substance Abuse Treatment: An Overview of Results from Alcohol and Drug Abuse. *The Journal of Mental Health Policy and Economics* 1:23-29.

Hubbard, R.L., S.G. Craddock, & J. Anderson. 2003. "Overview of 5-Year Follow-Up Outcomes in the Drug Abuse Treatment Outcome Studies (DATOS)." *Journal of Substance Abuse Treatment* 25:125-134.

Hunt, D., S. Kuck, and L. Truitt. 2006. "Methamphetamine Use: Lessons Learned." Cambridge, MA: Abt Associates Inc.

Jordan, N., G. Grissom, G. Alonzo, L. Dietzen, and S. Sangsland. 2008. "Economic Benefit of Chemical Dependency Treatment to Employers." *Journal of Substance Abuse Treatment* 34:311-319.

Knight, K., D.D. Simpson, and M.L. Hiller. 1999. "Three Year Reincarceration Outcomes for In-Prison Therapeutic Community Treatment in Texas." *The Prison Journal* 79:337-351.

Koenig, L., J.M. Siegal, H. Harwood, J. Gilani, Y. Chen, P. Leahy, and R. Stephens. 2005. "Economic Benefits of Substance Abuse Treatment: Findings from Cuyahoga County, Ohio." *Journal of Substance Abuse Treatment* 28:S41-S50.

Kyle, A.D., and B. Hansell. 2005. "The Meth Epidemic in America: Two Surveys of US Counties: The Criminal Effect of Meth on Communities, the Impact of Meth on Children." Washington, D.C.: National Association of Counties.

Leukefeld, C.G., E. Narevic, M.L. Hiller, M. Staton, T.K. Logan, W. Gillespie, J.M. Webster, T.F. Garrity, and R. Purvis. 2002. "Alcohol and Drug Use among Rural and Urban Incarcerated Substance Abusers." *International Journal of Offender Therapy and Comparative Criminology* 46:715-728.

Lipton, D.S. 1998. "Treatment for Drug Abusing Offenders during Correctional Supervision: A Nationwide Overview." *Journal of Offender Rehabilitation* 26:1-45.

Longshore, D., A. Hawken, D. Urada, and M. Anglin. 2006. *SACPA Cost Analysis Report (First and Second Years).* California Department of Alcohol and Drug Programs, March 2006.

Martin, S.S., C.A. Butzin, C.A. Saum, and J.A. Inciardi. 1999. "Three-Year Outcomes of Therapeutic Community Treatment for Drug-involved Offenders in Delaware: From Prison to Work Release to Aftercare." *The Prison Journal* 79:294-320.

McCollister, K.E., M.T. French, J.A. Inciardi, C.A. Butzin, S.S. Martin, & R.M. Hooper. 2003a. "Post-Release Substance Abuse Treatment for Criminal Offenders: A Cost-Effectiveness Analysis. *Journal of Quantitative Criminology* 19:389-407.

McCollister, K.E., M.T. French, M. Prendergast, H. Wexler, S. Sacks, & E. Hall. 2003b. "Is In-Prison Treatment Enough? A Cost-effectiveness Analysis of Prison-Based Treatment and Aftercare Services for Substance-Abusing Offenders. *Law and Policy* 25:63-82.

National Evaluation Data Services (NEDS). 2002. "Cost Effectiveness and Cost Benefit Analysis of Substance

Abuse Treatment: A Literature Review." Center for Substance Abuse Treatment (SAMHSA), June 2002.

Necochea, L. 2006. "Economic Benefits of Treating Substance Abuse Outweigh Costs." *Robert Wood Johnson Foundation Research Highlight 7*:1-2.

Office of National Drug Control Policy (ONDCP). 2004. *The Economic Costs of Drug Abuse in the United States, 1992-2002*. Washington, DC. Executive Office of the President (Publication No. 207303).

Patton, M.Q. 1997. *Utilization-Focused Evaluation: A New Century Text*. Thousand Oaks, CA: Sage Publications.

Pearson, F.S. and D.S. Lipton. 1999. "A Meta-Analytic Review of the Effectiveness of Correction-Based Treatments for Drug Abuse." *Prison Journal* 79:384-410.

Pennell, S., J. Ellett, C. Rienick, and J. Grimes. 1999. "Meth Matters: Report on Methamphetamine Users in Five Western Cities." Washington, D.C.: Office of National Drug Control Policy.

Pratt, T.C and T.W. Godsey. 2003. "Social Support, Inequality, and Homicide: A Cross-National Test of an Integrated Theoretical Model." *Criminology* 41:611-644.

Rehm, J., D. Ballunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. 2006. *The Costs of substance Abuse in Canada, 2002*. [Online] Available: http://www.ccsa.ca.

Reutzel, T., F. Becker, and B. Sanders. 1987. "Expenditure Effects of Changes in Medicaid Benefit Coverage: An Alcohol and Substance Abuse Example." *American Journal of Public Health* 77:503-504.

SAMHSA. 2008a. "Results from the 2007 National Survey on Drug Use and Health: National Findings" (NSDUH Series H-34, DHHS Publication No. SMA 08-4343). Rockville, MD.

SAMHSA. 2008b. "What You Need to Know About the Cost of Substance Abuse." Substance Abuse and Mental Health Services Administration, Issue Brief #7 for Employers, SMA 08-4350-2008.

Schoeneberger, M.L., C.G. Leukefeld, M.L. Hiller, & T. Godlaski. 2006. "Substance Abuse among Rural and Very Rural Drug Users at Treatment Entry." *The American Journal of Drug and Alcohol Abuse* 32:87-110.

Shanahan, M. and R. Donato. 2001. "Counting the Cost: Estimating the Economic Benefit of Pedophile Treatment Programs." *Child Abuse and Neglect* 25:541-555.

Sindelar, J., M. Jofre-Bonet, M. French, and T. McLellen. 2004. "Cost-Effectiveness Analysis of Addiction Treatment: Paradoxes of Multiple Outcomes." *Drug and Alcohol Dependence* 73:41-50.

Swaray, R., R. Bowels, and R. Pradiptyo. 2005. "The Application of Economic Analysis to Criminal Justice Interventions: A Review of the Literature. *Criminal Justice Policy Review* 16:141-163.

Taxman, F.S. and J.A. Bouffard. 2000. "Importance of Systems in Improving Offender Outcomes: New Frontiers in Treatment Integrity." *Justice Research and Policy* 2:37-58.

Walker, R., T. Logan, G. Bradshaw, C. Leukefeld, M. Goltz, and E. Stevenson. 2004. "Kentucky Substance Abuse Treatment Outcome Study: FY 2002 Follow-up Findings." Kentucky Department of Mental Health and Mental Retardation, Division of Mental Health and Substance Abuse, Frankfort, KY.

Warner, Barbara D. and Carl G. Leukefeld. 2001. "Rural Urban Differences in Substance Use and Treatment Utilization among Prisoners." *The American Journal of Drug and Alcohol Abuse* 27:265-280.

Warren, E., R. Viney, J. Shearer, M. Shanahan, A. Wodak, and K. Dolan. 2006. "Value for Money in Drug Treatment: Economic Evaluation of Prison Methadone." *Drug and Alcohol Dependence* 84:160-166.

Warren, B.D. & C.G. Leukefeld. 2001. "Rural-Urban Differences in Substance Use and Treatment Utilization Among Prisoners." *The American Journal of Drug and Alcohol Abuse* 27:265-280.

Welsh, B., D. Farrington, and L. Sherman. 2001. *Costs and Benefits of Preventing Crime.* Boulder, CO: Westview Press.

Wexler, H.K., G. Melnick, L. Lowe, and J. Peters. 1999. "Three-year Reincarceration Outcomes for Amity In-Prison Therapeutic Community and Aftercare in California." *The Prison Journal* 79:321-336.

Yates, B.T. 1999. "Measuring and Improving Cost, Cost-Effectiveness, and Cost-Benefit for Substance Abuse Treatment Programs." National Institute on Drug Abuse, NIH Publication Number 99–4518.

Zavala, S.K., M.T. French, C.E. Henderson, L. Alberga, C. Rowe, and H.A. Liddle. 2005. "Guidelines and Challenges for Estimating the Economic Costs and Benefits of Adolescent Substance Abuse Treatment. *Journal of Substance Abuse Treatment* 29:191-205.

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