



ECONOMIC BENEFITS OF DRUG TREATMENT:

A CRITICAL REVIEW OF THE EVIDENCE FOR POLICY MAKERS

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EXECUTIVE SUMMARY AND KEY FINDINGS

- **Nearly two decades of treatment research, represented by hundreds of studies, finds that substance abuse treatment, especially when it incorporates evidence-based practice, results in clinically significant reductions in alcohol and drug use, crime and improvement in health and social function for many clients.**
- **Economic studies across settings, populations, methods, and time periods consistently find positive net economic benefits of alcohol and other drug treatment that are relatively robust. The primary economic benefits occur from reduced crime (including incarceration and victimization costs) and post-treatment reduction in health care costs.**
- **In general, outpatient programs achieve reductions in substance use at a lower cost than residential programs, although the latter services may be more effective for higher risk populations.**
- **Enhanced outpatient programs tend to be more cost effective than standard outpatient programs.**
- **However, studies of brief interventions for alcohol-involved clients suggest that less intensive interventions may be more cost effective in certain settings.**
- **Residential prison treatment is cost effective but only in conjunction with post-release aftercare services. In addition, cost effectiveness is greater for high-risk inmates who receive prison treatment plus aftercare, compared with low-risk inmates.**
- **Better controlled and designed studies are needed to determine the long-term economic impact of treatment, and the specific components of treatment that are cost-effective or produce positive economic benefits.**

Substance abuse and dependence and their consequences are associated with substantial health and social costs in the United States. Large numbers of Americans continue to suffer from the effects of substance abuse, and it remains one of our most serious health and social problems (ONDCP, 2001). As a result, federal, state, and local governments have invested substantial amounts of money for prevention and treatment programs aimed at reducing the impact of alcohol and illegal drug use.

Nearly two decades of research finds that substance abuse treatment, especially when it incorporates evidence-based practice, achieves clinically significant reductions in substance use and crime, and improvements in health and social function for many patients (Gerstein & Harwood, 1990; McLellan et al., 1996; Prendergast et al., 2000). However, treatment providers, funders, and regulators face growing challenges to sustaining treatment funding, improving the targeting of resources, making decisions about alternative treatment models, and maximizing the effectiveness of services. The current climate is defined by declining state and federal government resources, soaring

health care costs and prison budgets, and competing constituencies for limited government dollars. As states increasingly move toward performance-based contracting for treatment programs, such contracting is likely not only to require that programs demonstrate their success in treating drug and alcohol problems, but also their cost efficiency (Garnick et al., 2002; McCorry et al., 2000). Findings from economic analyses can help policy makers to make more rational and informed decisions about allocating resources to different types of treatment and target populations in a more cost-effective way.

The current review is designed to synthesize for policy makers, regulators, and treatment professionals the research findings on the economic impact of treatment, including treatment costs, cost effectiveness analysis, and cost benefit analysis. We also critically review the conclusions that can be drawn from that literature, and summarize the key research gaps that need to be addressed.

Methods

A systematic and extensive search was conducted to identify recent published and unpublished articles, books, and government reports on the economic costs and benefits of substance abuse treatment. We focused on newer studies issued since the CSAT-sponsored literature review conducted by Harwood et al. (2002); however, we also searched archives back to 1990 to identify studies that were excluded from Harwood et al. (2002). Our search of the peer-reviewed medical and economics literature identified 109 economic evaluations of substance abuse treatment published between 1990 and November 2004. Of these, 51 new articles were identified, including five published prior to 2002 that had not been included in Harwood et al. (2002). In addition, we identified 17 unpublished reports and studies (mainly state-sponsored studies) that examined treatment costs or economic benefits, either for specific types of treatment programs or across multiple treatment programs.

Findings: Treatment Costs

For several reasons, it is important to obtain accurate estimates of the costs of substance abuse treatment. First, there is pressure to contain behavioral health care costs. Second, to make informed decisions about allocating scarce treatment dollars, policy makers need a better understanding of the

relative costs of providing treatment in different settings and for different clients. Finally, treatment costs are one important determinant of outcomes in economic analyses; other things equal, the lower the treatment cost, the more cost effective a program or intervention will be, or the higher the net economic benefits. In reviewing findings from studies of treatment costs, we have standardized treatment cost findings across studies by recalculating to cost per week of treatment, and inflating all treatment costs to 2004 dollars.

Methadone Maintenance

- Weekly methadone program costs consistently ranged from \$80 to \$100/week per client. Because clients tend to stay in methadone programs for a relatively long time, however, the costs per treatment episode tend to be much higher than for outpatient treatment. Fifty-five percent of program costs are from labor (similar to intensive outpatient programs but lower than other modalities) (Roebuck et al., 2003).

Outpatient

- Estimated outpatient program costs, using different methods and economic perspectives, ranged from \$72 to \$166/week for standard outpatient services. Two studies that estimated costs for intensive outpatient programs found very different results: Harwood et al. (2001) estimated costs at \$272/week across nine programs, and Roebuck et al. (2003) estimated the costs at \$493/week across six programs. The variation in costs probably reflects the size of the programs, the costing methods used, geographic differences in cost of living, and the frequency and types of services.

Residential

- Treatment cost estimates included short-term and long-term residential programs, as well as therapeutic communities (TCs). One study comparing short- and long-term programs found a higher weekly cost for short-term residential (\$642 per week per client versus \$491; Koenig et al., 1999). One study that calculated treatment costs for TCs found an average weekly cost of \$626 across five programs (Roebuck et al., 2003).
- As with outpatient programs, estimated costs for residential treatment varied considerably, ranging from \$544 to \$747/week.

Treatment for Criminal Justice Populations

- Compared with community-based treatment, treatment in prisons is relatively inexpensive, ranging from \$41 to \$77/week per inmate across four states. These costs are in addition to the costs of incarceration.
- Studies of drug courts have found a wide range of costs. Roebuck et al. (2003) found that weekly costs were somewhat lower than for other outpatient programs (averaging \$87/week across nine programs). Other studies have estimated the total cost of drug court treatment, finding a wide range of costs from \$3,603 to \$11,978 per treatment episode. These large differences reflect variations in program length, geographic location, program size, client population, and costing methodology.

Treatment for Other Special Populations

- The few economic studies of adolescent outpatient treatment indicate that it is somewhat more expensive than adult treatment. Costs in one adolescent standard outpatient program were \$235/week, and averaged \$395/week in two intensive

outpatient programs (French et al., 2004). Treatment costs for programs in CSAT's Cannabis Youth Treatment project ranged from \$119 to \$275/week depending on the type of intervention (French, Roebuck, Dennis, et al., 2002).

- Modified TC treatment costs for clients with co-occurring mental health and substance use disorders were relatively high (\$707/week), perhaps reflecting more intensive services for co-occurring clients (French, McCollister, Sacks, et al., 2002).

Other Findings

- Most prior research on treatment costs has focused on program costs, ignoring costs to the client. However, in one study of five residential programs, client costs (such as lost wages) added another 35% to the program costs (French, Salomé & Carney, 2002). In another study of 50 residential and 27 outpatient programs, the average client cost was \$213.47 per day in treatment for residential clients, and \$54.60 per visit for outpatient clients (Salomé et al., 2003).
- A few studies have examined the unit costs of specific treatment services or cost components. Intake assessment costs are a relatively large "up-front" treatment cost. A relatively low percentage of costs are for counseling services (54% in intensive outpatient programs, but only 28% in standard outpatient and 20% in residential programs). The remaining costs are for administrative expenses and overhead, housing, record keeping, and other costs.

Findings: Cost Effectiveness Analyses (CEA)

CEA compares the relative costs of interventions for achieving specific health outcomes, by dividing the incremental cost by the incremental outcome, and comparing this ratio for two or more interventions. The intervention with lower cost per unit outcome would be preferred. This ratio is interpreted as the additional treatment cost that is needed to achieve a one-unit improvement in a specific outcome. CEA is generally only appropriate where there is a single outcome of interest.

- Across 99 programs, the costs per abstinent case (\$6,300) and per reduced drug use case (\$2,400) were lowest for outpatient clients, and highest for residential (\$14,900 and \$6,700) and inpatient (\$15,600 and \$6,100) clients (Mojtabai & Zivin, 2003).
- Enhanced outpatient services were more cost effective than standard services. In other words, the extra cost of enhanced services yielded a lower cost per unit improvement in outcomes (Jofre-Bonet & Sindelar, 2004; Sindelar et al., 2004; Zarkin et al., 2001a).
- In a randomized trial, the incremental cost effectiveness of methadone maintenance versus 180-day methadone detoxification was \$15,967 per life-year gained (Masson et al., 2004), well within the standard accepted threshold of \$50,000 per life-year gained.
- For alcohol-involved clients, studies suggest that less intensive brief interventions may be more cost effective in certain settings.
- Several CEA studies of correctional treatment concluded that residential prison treatment was cost effective only if aftercare services were completed (Griffith et al., 1999; McCollister et al., 2003a, b; 2004). Griffith et al. (1999) found that cost effectiveness was greater for high-risk inmates who receive prison treatment plus aftercare.

Findings: Cost Benefit Analyses (CBA)

CBA compares the economic cost of a program to its economic benefits. All the outcomes (attributable to the program) are valued in dollars, added, and then compared to total program costs. The results are expressed as either net economic benefits (total program benefits minus total program costs) or as a *benefit cost ratio* (BCR; total benefits divided by total costs). Programs that achieve a positive net benefit, or have a BCR of greater than one, are considered economically beneficial. The higher the BCR, the greater the return on treatment investment.

Our findings are consistent with previous reviews: substance abuse treatment yields positive net economic benefits, although the BCRs varied widely (as low as 1.33 and as high as 39.0). The largest proportion of the economic benefits accrues from reduced crime, including incarceration and victimization costs. Other economic benefits reflect improved health and increased employment.

- A large study of treatment clients in Chicago found a BCR of 1.49 at six months post-treatment admission (Salomé et al., 2003).
- Five residential programs in Washington State had an average net economic benefit of \$21,329 per client, and a BCR of 4.34 (French, Salomé, & Carney, 2002).
- A modified TC program for patients with co-occurring mental health and substance use disorders yielded substantial net benefits of \$85,527 per client, and a BCR of 5.19 (French McCollister, Sacks, et al., 2002).
- Three CBAs of drug courts found net economic benefits: the BCR across six drug courts in Washington was 1.74 (Barnoski & Aos, 2003), 2.71 across three drug courts in Kentucky (Logan et al., 2004), and 2.8 in the St. Louis drug court (Loman, 2004).
- Although several types of prison treatment in Connecticut yielded net economic benefits, the largest return on investment was for less intensive outpatient treatment. The BCRs were 1.79 for the six-month residential TC program, 3.16 for an intensive four-month day treatment program, and 5.74 for a 10-week low-intensity outpatient program (Daley et al., 2004).
- Several studies in different populations found substantial cost reductions in health care costs post-treatment.

Conclusions

In general, this review and previous reviews are consistent in finding that most substance abuse treatment interventions yield net economic benefits to society. Substantial variations in study designs and measures, client populations, time periods sampled, and treatment settings yielded a wide range of

BCRs, so there is no “average” or “typical” BCR or cost effectiveness ratio for treatment programs. Nonetheless, the consistent findings of positive economic benefits suggest that the economic effects of treatment may be relatively robust. Studies of brief interventions, and CEAs of outpatient versus inpatient treatment, suggest that less intensive interventions may be more cost effective for certain clients. On the other hand, high-need populations such as those with co-occurring mental illness or criminal offenders may need long-term, intensive treatment to achieve positive outcomes. Other studies suggest that enhanced treatment services in outpatient programs (which provide additional services or counseling hours and are more expensive) are more cost effective than standard care. However, more research is needed as to which populations can do well in lower intensity treatment.

Some caution is warranted, however. Better designed, randomized controlled trials are needed to isolate the causal effects of treatment, as are studies with longer follow-up periods and research on specific client populations. Other, non-economic, perspectives should be considered in making treatment funding decisions and drawing conclusions about treatment effectiveness.

Within a climate of pressure to implement evidence-based treatment practices, performance standards, and performance-based contracting, the substance abuse treatment system faces the considerable challenges of maintaining current funding levels and generating positive outcomes for clients. In this context, well-designed economic evaluations can help to convince funders to increase investments in treatment, to inform the allocation of scarce treatment resources, and to identify the factors that can increase the cost effectiveness and net economic benefits of treatment. Given the large percentage of substance-involved persons not in treatment, our findings suggest that increasing the relatively modest current investments in substance abuse treatment can generate substantial economic benefits for society. It is clear from research on the economic impact of substance abuse and addiction on health, crime, social stability, and community well-being, that the cost to society of *not* treating persons with substance abuse problems is quite substantial.

THE ECONOMIC BENEFITS OF DRUG TREATMENT: A CRITICAL REVIEW OF THE EVIDENCE FOR POLICY MAKERS

INTRODUCTION AND BACKGROUND

Substance abuse and dependence and their consequences are associated with substantial health and social costs in the United States. Large numbers of Americans and their families suffer from the effects of substance abuse and dependence, and it remains one of our most serious health and social problems (ONDCP, 2001). As a result, federal, state, and local governments have invested substantial amounts of money over the past 35 years for prevention and treatment programs. However, substance abuse treatment programs are now facing increasing budget and regulatory pressures, skepticism about the efficacy of treatment, and concerns about the viability and sustainability of the treatment infrastructure (McLellan & Meyers, 2004). Treatment services also have been substantially impacted by pressures from behavioral managed care companies to deliver more efficient services, and reimbursement for treatment services is often capped at a level many believe to be inadequate.

Accordingly, treatment providers, funders, and regulators face increasing challenges to sustaining substance abuse treatment funding, improving the targeting of resources, making decisions about alternative treatment models, and maximizing the effectiveness and salience of existing services (Lave & Joshi, 1996). States are increasingly moving toward performance-based contracting for treatment programs; such contracting is likely not only to require that programs demonstrate their effectiveness in treating drug and alcohol problems, but also their cost efficiency (Garnick et al., 2002; McCorry et al., 2000).¹ In this climate, economic analyses of treatment interventions may resonate most readily with funders and legislators. If substance abuse treatment can be demonstrated to provide net economic benefits, then the treatment field will have a better opportunity to maintain or expand funding levels. Economic analyses can inform a number of important questions: Should treatment

¹ For example, Delaware recently implemented a treatment funding system in which providers can earn additional funds by achieving certain performance benchmarks (based on client outcomes). Conversely, their funds can be reduced if they do not achieve these performance standards.

programs be expanded generally? Which types of substance abusers are most in need and for which types of treatment? Which components of treatment generate the greatest economic benefits? On the other hand, it is important to note that addiction deserves and is entitled to treatment on the same humanitarian basis as all other diseases and health conditions.

In 2003, a Blue Ribbon Task Force (BRTF) of the National Institutes of Health made recommendations for improving health services research at the National Institute on Drug Abuse (NIDA) (NIH, 2004). The BRTF noted that financing and economic studies are central issues in treatment research. One of its core recommendations was that NIDA integrate economic research into its portfolio of health services research, emphasizing the use of cost-effectiveness analysis (CEA) and cost-benefit analysis (CBA) in the context of treatment outcomes research.

The current review is designed to synthesize for policy makers, regulators, and treatment professionals the research findings on the economic impact of treatment, including the recent scientific literature on treatment costs, cost effectiveness analysis, and cost benefit analysis. We also critically review the conclusions that can be extracted from that literature, and summarize the key research gaps.

Scope of the Problem

In 2003, an estimated 110 million Americans had used illegal drugs in their lifetime, and 35 million had used in the past year; some 7 million abused or were dependent on drugs (Office of Applied Studies, 2004). An estimated 17 million Americans suffer from alcohol abuse or dependence (Office of Applied Studies, 2004). The health and social costs of illegal drug and alcohol use in this country are substantial, reflecting the effects of substance abuse on crime, productivity, health problems, premature death, underemployment, and family stability. The Office of National Drug Control Policy (ONDCP, 2001) estimated the total societal costs of illegal drug use in 1998 at \$143.4 billion (\$168 billion in 2004 dollars). Nearly two-thirds of these costs (62%) are related to the enforcement of drug laws and the effects of illegal drug use on criminal behavior, including \$31.1 billion in public criminal justice costs (1998 \$), \$30.1 billion in lost productivity due to incarceration,

\$24.6 billion in lost productivity due to crime careers, and \$2.9 billion in other costs including property damage and victimization. Other large costs are due to drug-related illness (\$23.1 billion), premature mortality (\$16.6 billion), drug abuse treatment and prevention (\$7.1 billion), HIV/AIDS (\$3.4 billion), and other medical consequences or hospitalization (\$4.1 billion).

The costs to society of alcohol abuse and its consequences are even greater (Rice et al., 1990). The most recent estimate of the overall economic cost of alcohol abuse was \$185 billion for 1998 (Harwood, 2000). More than 70 percent of the estimated costs of alcohol abuse for 1998 were attributed to lost productivity (\$134.2 billion), including losses from alcohol-related illness (\$87.6 billion), premature death (\$36.5 billion), and crime (\$10.1 billion). The remaining costs include health care expenditures (\$26.3 billion, or 14.3 percent of the total), such as the cost of treating alcohol abuse and dependence (\$7.5 billion); the costs of treating the adverse medical consequences of alcohol consumption (\$18.9 billion); property and administrative costs of alcohol-related motor vehicle crashes (\$15.7 billion, or 8.5 percent); and criminal justice system costs of alcohol-related crime (\$6.3 billion, or 3.4 percent).

Importantly, the above cost estimates do not include the consequences of the abuse of legal prescription drugs, which is an emerging and growing problem (Forman, 2003; National Institute on Drug Abuse, 2001).

The Treatment Infrastructure

In response to the substance abuse problem, federal and state governments have invested in prevention and treatment programs over the past 35 years; expenditures increased an average of 9.6% per year between 1987 and 1997 (APA, 2001). In FY2005, the federal government allocated \$1.78 billion to states and territories in its Substance Abuse Prevention and Treatment Block Grant program, compared with \$1.08 billion in FY1993.² Including state and local funding, and other federal funding,

² <http://www.tie.samhsa.gov/documents/pdf/SAPTBG-05%20final.pdf>

total alcohol and drug treatment expenditures were an estimated \$4.46 billion in FY1999.³ This included \$1.25 billion from the Single State Agencies, \$384 million from other state agencies, \$367 million from county and local government, \$318 million from other federal sources, and \$778 million from other sources. In addition to publicly funded programs, an estimated 25% of substance abuse treatment facilities operate as private for-profit entities (SAMHSA, 2004). Overall, there were an estimated 15,124 substance abuse treatment facilities in the United States in 2003, of which 67% received government funding (SAMHSA, 2004). Most treatment programs provide outpatient services (81%), with 28% providing residential treatment, and 8% hospital inpatient (SAMHSA, 2004; some facilities provide more than one modality).

Yet such a large investment does not begin to meet the treatment needs of those with substance abuse problems: in 2002, it was estimated that of the 7.7 million Americans meeting diagnostic criteria for drug abuse treatment, only 18% received treatment in the past year (Office of Applied Studies, 2003a). In 2002, almost 18.6 million persons aged 12 or older were classified as needing treatment for an alcohol problem, of which only 1.5 million (about 8%) received any alcohol treatment in the past year. A scarcity of treatment beds, especially for residential treatment and for special populations such as women, adolescents, or those with co-occurring mental health and alcohol or drug abuse disorders, is common in many communities. Only 10-15% of prison inmates receive treatment, compared with the estimated 75-80% of state inmates needing treatment (Belenko & Peugh, 2005; Mumola, 1998).

These low rates of treatment utilization reflect in part that treatment expenditures remain relatively modest. In a national study of state budgets, only 4% of 1998 state budget expenses for the consequences of substance abuse and addiction were spent on prevention and treatment (CASA, 2001). Two recent state reports found even lower percentages devoted to prevention and treatment: 3% in Maine (Baird et al., 2004) and 2.6% in Texas (Liu, 2002). Although 36% of treatment admission

³ <http://www.nasada.org/Departments/Research/SADAP98&99/sadap99/99tble1.htm>

referrals are from the criminal justice system, a relatively small proportion of state corrections budgets are for substance abuse treatment (Belenko & Peugh, 1998). Mumola (1998) estimates that only 5% of state corrections budgets are allocated to substance abuse treatment services.

Finally, the treatment system in this country faces many challenges that impact the effectiveness and viability of interventions. High staff turnover, siting issues, credentialing of staff, inconsistent training, poor monitoring, outdated techniques, and inadequate physical resources are all issues that can negatively impact the quality of services, and in turn the attractiveness of treatment to those who might benefit from it (McLellan et al., 2003). Most people entering addiction treatment are forced to do so by pressures from the courts, an employer, or family members. Research indicates that coerced treatment is as effective as “voluntary” treatment (Brecht et al., 1993; Hiller et al. 1998; Marlowe, 2001; Young & Belenko, 2002).

The Effectiveness of Treatment

Nearly two decades of research on substance abuse treatment, including more than 1,000 randomly controlled trials of various types of addiction treatments and large-scale field studies, has indicated clinically significant reductions in substance use and improvements in personal health and social function for many treated patients (Gerstein & Harwood, 1990; McLellan et al., 1996; Prendergast et al., 2000). These treatment effects include significant gains to both the patients and to society (Gerstein & Harwood, 1990; Hubbard et al., 1989; McLellan et al., 1996; Simpson & Savage, 1980). Patients with substance use disorders who comply with the recommended regimen of education, counseling and medication have favorable outcomes during, and for at least six to twelve months following treatment. However, similar to other chronic diseases, lack of patient compliance with the pharmacological and behavioral components of the treatment, as well as multiple co-morbid medical and social conditions, mean that only about 40% of treated alcohol, opioid or cocaine dependent patients are continuously abstinent for one year; although an additional 15% do not resume dependent use (McLellan et al., 1996; McLellan et al., 2000).

The widespread societal costs resulting from substance abuse described above illustrate that substance abuse affects many aspects of health and social functioning. Substance abusers, especially those served by publicly funded programs, present with high rates of mental and physical health problems, employment and education deficits, and family problems that complicate the delivery of effective treatment. Criminal justice populations have high rates of alcohol and other drug involvement that is often linked to their criminal behaviors, yet relatively few offenders receive treatment services while under criminal justice supervision (Belenko & Peugh, 1998; Marlowe, 2003; Mumola, 1998). Evidence from evaluations of prison-based treatment with aftercare, drug courts, and diversion programs indicates that criminal justice-based treatment can significantly reduce drug use and recidivism, as well as health and social problems (Belenko, 2000; Belenko et al., 2004a; Martin et al., 1999; Mauser et al., 1994).

Accordingly, reducing or eliminating substance abuse and dependence is likely to have more general positive impacts on public health and safety. Unlike traditional health care interventions that focus on one specific outcome (e.g. reduction in blood pressure, maintenance of insulin levels), substance abuse treatment can achieve effects on a number of outcome measures, including health status, criminal behavior, family functioning, mental health, and employment (Cartwright, 2000; French & Martin, 1996; Sindelar et al., 2004).

Previous Reviews of the Economic Impacts of Treatment

Compared with other health care interventions (Drummond et al., 1997; Gold et al., 1996), economic evaluations of substance abuse treatment programs or systems have been relatively uncommon (French, Salomé, Sindelar et al., 2002). Yet, there have been a number of studies of the economic impacts of substance abuse treatment over the past two decades, two of which are frequently cited by treatment proponents as demonstrating the net economic value of treatment: the “CALDATA” study (Gerstein et al., 1994) and the RAND study of the projected economic impacts of different policies for controlling heavy cocaine use (Rydell et al., 1996). Several literature reviews of the

economic impacts of substance abuse treatment have also been published in academic journals (e.g., Cartwright, 1998, 2000; French 1995; Holder, 1998; McCollister & French, 2003). We now summarize the findings and conclusions from several of the more recent major reviews.

In June 2002, CSAT's National Evaluation Data Services (NEDS) published The Lewin Group's review of the empirical and technical issues related to economic analyses of treatment, which summarized findings from 58 CEA and CBA studies published between 1980 and 2001 (Harwood et al., 2002). This review drew several conclusions: (1) treatment generally pays for itself in economic benefits; (2) specific treatment approaches are more cost effective than others (for example, outpatient vs. inpatient treatment); and (3) more rigorous research designs and economic analysis methods are needed to advance the field. Harwood et al. (2002) considered four main questions: (1) is any treatment preferred to no treatment? (2) are some types of treatment more economical than other types? (3) are some components of treatment more cost effective or cost beneficial than other components? and (4) do economic outcomes differ for different client populations?

In terms of the first question (is any treatment preferred to no treatment?), Harwood et al. (2002) concluded in the affirmative: the available cost benefit studies consistently found that economic benefits exceed treatment program costs. Most of these benefits were a result of reduced criminal behavior and increased employment. In addition, the research was fairly consistent in finding reductions in health care costs following treatment. However, Harwood et al. (2002) also cautioned that weak research designs and lack of control groups make these conclusions more tentative. In addition, net economic benefits do not necessarily mean that cost savings are directly realized by government agencies. On the other hand, Harwood et al. (2002) note that treatment studies generally have only examined outcomes up to one year post-treatment, so that long-term economic benefits have probably been underestimated.

With respect to the relative economic benefits of different types of treatment, Harwood et al. (2002) concluded that research findings are difficult to generalize across program types or populations.

However, studies that have compared inpatient to outpatient detoxification or treatment (including some with rigorous research designs), have found no differences in outcomes, but because outpatient programs are much less costly they can be considered more cost effective (McLellan & McKay, 2002). Harwood et al. (2002) also noted that there has been relatively little research on the effectiveness or economic impacts of specific treatment components. However, they found no evidence that increasing the intensity of treatment (e.g. lower staff-to-client ratios, more counseling hours, more money spent per client) improves treatment outcomes. One study found that increasing the length of stay (LOS) does increase economic benefits in some settings but not others. In general, treatment research finds that longer retention is associated with improved outcomes (Carroll, 1997; Hubbard et al., 1989; Simpson et al., 1997).

Finally, Harwood et al. (2002) found very limited research on the economic impact of treatment on specific client populations. However, there is some evidence that the economic benefits of treatment for females may be lower because of their lower rates of criminal behavior, that clients with co-occurring mental health disorders tend to generate higher health care costs, and that treatment for incarcerated offenders and those in drug courts produces net economic benefits from reduced incarceration.

Holder (1998) reviewed studies that compared monthly health care costs prior to and after treatment. However, such comparisons are not able to determine whether treatment *caused* reductions in health care costs; as with most of the economics of treatment research literature, none of the reviewed studies included untreated control groups. In general, Holder (1998) found that health care costs increased during the two-year period just prior to treatment admission, then decreased after treatment to a level lower than pre-treatment costs, and similar to health care costs for healthy persons.

McCollister and French (2003) reviewed 11 studies published between 1986 and 2002 that analyzed the economic benefits of substance abuse treatment.⁴ Studies were identified that involved an addiction-related intervention, were published in peer-reviewed journals, and that included the estimation of economic benefits as well as costs. The primary outcome domains were crime, health service utilization, employment, and substance use. The average net benefit per client across these studies (2001 \$) was \$42,905, of which \$42,151 (98%) was derived from reduced crime. The 10 studies that calculated a benefit cost ratio (BCR) found ratios of greater than one, with a wide range from 1.33 to 23.33, meaning each dollar invested yielded more than one dollar in economic benefits. McCollister and French (2003) point out the difficulty of placing economic values on reductions in drug use, but note that doing so might lead to “double counting” of benefits because the valuation of reduced drug use may include factors related to reduced crime, improved health, or higher productivity.

Cartwright (2000) reviewed 18 CBA studies, published between 1970 and 1999. The studies covered different treatment modalities and settings, as well as methodologies and outcome measures. Although some of the studies had weak research designs or methodological problems that suggested caution in evaluating their results, all the studies found BCRs that were greater than 1 (ranging from 1.3 to 23), indicating that treatment investments yield net economic benefits to society. Although identifying a number of methodological concerns and need for more research, Cartwright (2000) indicated that the robustness of the CBA findings across different evaluation designs, programs, and economic methods suggests that future analyses using improved designs are also likely to yield favorable BCRs.

The Context of Economic Analyses

The task of determining the optimal way to allocate scarce health-related resources underlies the economic analyses of many health care programs. However, substance abuse treatment presents

⁴ All these studies were included in the Harwood et al. (2002) review or the current review.

particular challenges because of the complex dynamics and etiologies of substance abuse and dependence, multiple treatment outcomes, the methodological difficulties in conducting rigorous treatment outcome and economic studies, and the lack of consensus over the optimal techniques for delivering treatment services.

As the pressure grows to implement evidence-based treatment and performance based contracting (Elliott & Mihalic, 2004; Garnick et al., 2002), economic evaluations become increasingly important. The goal of providing low-cost yet effective services is likely to grow over time, placing increasing importance on studying economic impacts of new interventions or the dissemination of existing interventions. The economic impact of treatment programs is closely and directly related to the efficacy and effectiveness of such programs. As noted above, although treatment programs have been shown to be effective, weak research designs and problems in implementing evidence-based practice has tempered the strength of those conclusions and raised concerns about their generalizability (Prendergast & Podus, 2000).

Another issue is that achieving cost effectiveness or net economic benefits is dependent on a number of factors that are not necessarily related to the “quality” of treatment. Net economic benefits are related to both costs and outcomes, moderated and mediated by treatment program, client, and community factors. Some of these factors may be beyond the control of the treatment program or funding agencies, but need to be considered when interpreting findings from economic evaluations. These factors include the severity of the target population, the stability and adequacy of the treatment infrastructure, treatment access, availability of other community health care and social services resources, measurement issues, data availability, and the types of outcomes included and/or valued. Thus, economic evaluation should be viewed as only one important tool among a set of factors to be used in making funding decisions. In addition, the treatment modality, client populations, outcomes, cost measures, time frames, and methodologies can affect economic evaluation findings, and complicate the synthesis of results.

Many treatment programs are under-funded, and do not use empirically tested techniques. Thus the economics literature reviewed in this report should be considered in the context of a treatment field that is not operating under ideal conditions. In an ideal world, where treatment programs are stable, well-funded, and use evidence-based practice to provide services to appropriate client populations, the net economic benefits may be even greater. Finally, we note that any synthesis of research literature is affected by “publication bias” (Rehm, 1999). Negative findings about the impacts of treatment or its economic benefits are less likely to be published than positive findings. Thus it is possible to get a skewed picture of the state of research findings, although we are not specifically aware of unpublished studies that found no economic benefits.

TYPES OF ECONOMIC ANALYSES

Before presenting the results of our review, we present some basic information on the different types of economic analyses represented in the literature. For each type of economic analysis, we briefly summarize the goals of the technique, the methodological challenges, and the strengths and weaknesses of the approach.⁵

Cost Analysis

The analysis of treatment costs is an important component of any economic analysis. Other things equal, the goal of treatment services should be to provide the most effective treatment at the least cost. Because both CEA and CBA are dependent upon treatment costs, obtaining an accurate estimate of these costs is important. To the extent that treatment programs can reduce costs while

⁵ Many publications provide guidance for conducting economic evaluations of health care interventions (e.g. Drummond et al., 1997, 2005; Gold et al., 1996). Methodological issues in conducting economic evaluations of substance abuse programs have also been discussed in a number of papers (see, e.g., Bukoski & Evans, 1998; Cartwright, 2000; French, Salomé et al., 2002; Lillie-Blanton et al., 1998; Zarkin et al., 1994). Researchers interested in conducting such evaluations, and policy makers and treatment practitioners seeking guidance on understanding economic evaluations, should consult these publications.

providing effective interventions, their net economic benefits and cost-effectiveness are likely to be increased.

Treatment costs will vary depending upon the economic perspective used. In the literature, many different perspectives have been used, making it somewhat difficult to determine an accurate “standard” cost of different types of treatment. Among the economic perspectives found in the literature are the treatment provider, the State reimbursement system, the taxpayer (i.e. society), and the client. In general, cost analyses that use the societal perspective and include all economic (i.e. opportunity) costs, not just accounting costs, will show higher treatment costs; but are likely to be more accurate estimates (French, Salomé, Sindelar et al., 2002; Lave & Joshi, 1996). Studies that underestimate treatment costs will, of course, tend to inflate the net economic benefits. Of course, cost minimization can be an important goal of funders, but to the extent that reduced treatment costs negatively affect outcomes, such an approach can be “penny wise and pound foolish.” Nevertheless, to the extent that treatment programs can reduce costs while providing effective interventions, their net economic benefits and cost-effectiveness are likely to increase.

In addition to the economic perspective used, treatment costs are affected by a number of factors: length of stay (clearly the longer the LOS, the more expensive the treatment costs per client, but in general the better the outcomes, especially in outpatient treatment, [see Koenig et al., 2000]), client characteristics including addiction severity, number and type of services, staff-to-client ratio, educational and certification levels of staff, and geographic location.

Although some research has relied on fairly broad or rough estimates of treatment costs (e.g. treatment provider budgets, estimates based on interviews with program directors), several standardized and more rigorous techniques have been developed to estimate treatment costs.

The Substance Abuse Treatment Cost Allocation and Analysis Template (SATCAAT) was developed under CSAT funding by the Capital Consulting Corporation. The SATCAAT requires professional cost accountants to estimate provider expenses, which are then allocated to each of 16

different units of service (Harwood et al., 2001). In addition, the SATCAAT includes the cost of donated and volunteer resources including facilities and staff, using their market values.

The Drug Abuse Treatment Cost Analysis Program (DATCAP) is a structured data collection instrument and interview guide designed to be used in a variety of medical treatment and social service settings (French et al., 1997; Roebuck et al., 2003; www.DATCAP.com). The instrument is intended to collect and organize detailed information on resources used in service delivery and their associated dollar cost, and uses the perspective of “economic” or “opportunity” cost.⁶ The DATCAP includes cost categories of personnel, supplies and materials, contracted services, buildings and facilities, equipment, and miscellaneous items.

Zarkin et al. (2004) recently developed an approach based on the DATCAP, called the Substance Abuse Services Cost Analysis Program (SASCAP). SASCAP requires data collection from the treatment program director and financial officer only, and include labor, non-labor, and overhead costs broken down into eight primary service areas. Allocation of indirect and nonlabor costs to specific services is based on the percentage of clinic time spent on each activity. The result is a summary of overall program costs as well as service unit costs.

The Client DATCAP was recently developed and pilot tested to provide a different perspective on treatment costs: estimates of the costs of treatment participation incurred by the client (Salomé et al., 2003). Given differences in the types of services offered and client time in treatment, two different modules were developed, one for inpatient treatment and one for outpatient treatment (see www.DATCAP.com). The Client DATCAP organizes the costs that clients incur when attending treatment, such as transportation (for outpatients), childcare, lost work time, lost leisure time, and out-of-pocket expenses such as treatment payments. Costs can be aggregated as unit costs (per day or per clinic visit) or for the full treatment episode.

⁶ Opportunity costs pertain to the value of resources in their most productive capacity. For example, the opportunity cost of volunteer labor is the rate of pay these individuals could have earned in a competitive labor market.

Cost Effectiveness Analysis

CEA is a method of economic evaluation commonly used in the health care field. Its general purpose is to compare the relative costs of different interventions in achieving specific health outcomes (French, Salomé, Sindelar et al., 2002; Gold et al., 1996). Other things equal, the less costly intervention per unit outcome is preferred. This analysis can be done in two ways. One method divides the incremental program or intervention cost by the incremental outcome, and compares this ratio for two or more interventions. The intervention with lower cost per unit outcome would be preferred. Alternatively, an incremental cost effectiveness analysis calculates a ratio (ICER), with the numerator the difference in cost between two interventions (“incremental cost”), and the denominator the difference in outcome measure (“incremental outcome”). This ratio is interpreted as the additional treatment cost needed to achieve a one-unit improvement in a specific treatment outcome. A cost effectiveness ratio would not be calculated if one intervention is both less costly and also achieves better outcomes than an alternative intervention; in this case the first intervention is said to “dominate,” and the appropriate policy decision would naturally be to adopt the less expensive and more effective program (Gold et al., 1996). CEA becomes useful where an alternative intervention strategy (e.g. enhanced treatment services) is more expensive but achieves better outcomes. Decisions can be made based on which strategy has greater cost effectiveness. For example, several studies comparing inpatient to outpatient services have found that the former are more costly, but do not generate better outcomes (Alterman et al., 1994; Weisner et al., 2000). Thus, the outpatient option would be a preferred policy choice, other things equal.

CEA is generally appropriate only where there is a single outcome of interest. Thus using CEA for the economic analysis of substance abuse treatment can be problematic because drug and alcohol abuse and dependence have numerous social and health consequences, and substance abuse treatment is designed to achieve other outcomes in addition to reduction in drug or alcohol use. Recently, Sindelar et al. (2004) showed that different results are obtained in CEA depending upon the outcome

measure considered. Accordingly, policy makers might make inappropriate funding decisions based on a CEA, if multiple outcomes were not analyzed. In settings where one outcome of primary interest (for example, treatment programs for inmates designed to reduce recidivism), CEA may be a very useful analytic strategy for determining whether different types of inmate treatment should be implemented (see findings from McCollister et al., 2003a, described below).

A related type of analysis, increasingly common in the health economics field for multidimensional health outcomes, is an outcome index called the Quality Adjusted Life Year (QALY; alternatively, a Quality Adjusted Life Day is used) (Drummond et al., 1997; Gold et al., 1996). Based on interviews with general populations, QALYs are determined for each time period that corresponds to the quality of life during that period, with a 1 representing perfect health and 0 representing death. The weight for each state of health is multiplied by the time in that state, and then these are summed to yield the total number of QALYs. The QALY measure then corresponds to the number of health years of life valued the same as the actual health outcome (Garber et al., 1996). Alternative programs are then compared as to the cost per QALY, and the program or intervention with the lower cost per QALY is generally preferred. One important benefit of using QALY is that it allows the comparisons of different programs across multiple or different outcomes. Only a few studies have used this type of analysis in the substance abuse treatment field (e.g., Barnett, 1999; Barnett et al., 2001; Zaric et al., 2000). CEA that uses QALY measures are sometimes known as *cost-utility analyses*.

Cost Benefit Analysis

CBA is usually considered the “gold standard” of economic evaluation. This method compares the economic cost of a program to its economic benefits. The latter generally include multiple outcome domains that are all valued in a common metric of dollars. Thus CBA allows the analyst to incorporate multiple outcome measures to gain a more comprehensive picture of a program’s total economic impacts. Once all the outcomes (attributable to the program) are valued in monetary terms, they are added and then compared to the total program costs. The results are expressed either in terms

of net economic benefits (total program benefits minus total program costs) or as a *benefit cost ratio* (BCR; total benefits divided by total costs). Programs that achieve a positive net benefit, or have a BCR of greater than one, can be considered economically beneficial. Comparing different interventions, the higher the BCR, the greater the return on treatment investment.

Some CBAs, such as the CALDATA (Gerstein et al., 1994) and RAND (Rydell et al., 1996) studies, have received wide dissemination because of their conclusion that drug treatment programs can generate substantial economic returns on each dollar invested. As will be discussed later, CBA's in substance abuse treatment generally do find net economic benefits, although the value of these benefits varies considerably across studies.

Because substance abuse treatment generally seeks to achieve multiple outcomes, CBA has intuitive appeal because of its use of common dollar values across multiple outcomes. However, there are several disadvantages. CBA is relatively expensive to conduct, requiring multiple data sources (Lave & Joshi, 1996). Also, it can be methodologically difficult to attribute dollar value to some important outcomes, and there is some controversy in the health economics literature in terms of which valuation methods are preferable (e.g. whether to include and how to assign a dollar value to crime victimization costs, how to value reductions in substance use). Other important potential treatment outcomes, such as improved family functioning, or better mental health, can also be difficult to value, and are termed "intangible benefits" by economists (Lillie-Blanton et al., 1998). Yet ignoring such outcomes may result in an incomplete assessment of the economic benefits, resulting in artificially low BCRs. In addition, economic benefits may accrue over time, so using typical outcome data from one-year post-treatment may also underestimate program benefits.

The BCR will be influenced by how outcomes are valued, and how treatment costs are assessed. If all treatment costs are not included (e.g. economic or opportunity costs), the BCR will be artificially inflated. The economic perspective used (e.g. taxpayer vs. state reimbursement costs vs. criminal justice system) will also greatly influence the values of both the costs and the benefits. In

general, the economic (or opportunity) cost perspective is preferred for estimating program costs (French, Salomé, Sindelar et al., 2002), as is the societal perspective for benefits (Cartwright, 2000; Holder, 1998; Lave & Joshi, 1996).⁷

REVIEW METHODS

A systematic and extensive search was conducted to identify English language published and unpublished articles, books and government-published research studies related to the economic costs and benefits of substance abuse treatment. We focused on studies issued since the literature review conducted by Harwood et al. (2002); however, we also searched archives back to 1990 to identify relatively recent studies that might have been excluded from Harwood et al. (2002). We identified peer-reviewed publications identified from major online medical and economics databases, book chapters, and reports solicited directly from key state and federal agencies. In addition, we sent lists of publications to leading researchers on the economics of treatment, and asked them to identify published or unpublished work that was not included in our bibliography. Finally, reference lists and bibliographies of published and unpublished reports were reviewed to glean additional search terms as well as additional studies.

For published articles, the search terms used in our online literature searches were dependent on the database being searched. Within the major medical and psychology literature databases (PubMed, Medline, PsycINFO), search terms were used to identify the universe of economic evaluations (see Table 1). The abstracts of all of the economic evaluations that were identified were then reviewed to identify those studies that met our criteria for inclusion in this project. To be consistent with previous research reviews, we used the same definitions of “cost effectiveness”, “cost benefit”, and “cost offset” as those used by Harwood et al. (2002). Articles that only assessed the costs

⁷ Cost offset analyses are sometimes found in the economics of treatment literature. This refers to a comparison of the costs of a program with the value of a single outcome, such as avoided costs of future crime). For that reason, it can be considered as a partial CBA (French et al., 2002). Results from several such studies are summarized in the Cost Benefit Studies section below.

of providing treatment, and did not include other economic measures, were categorized as “treatment cost” studies and included in our review.

Table 1
Search Terms for Medical Databases

Cost benefit	Economic costs
Cost offset	Economic benefits
Cost estimates	Economic outcomes
Cost outcomes	Economic impact
Cost outcomes analysis	Effectiveness + cost
Cost analysis	Health care costs
Cost savings	Health care savings
Cost effectiveness	Service level costing
Cost effective	Treatment cost
Cost of treatment	Treatment effectiveness + cost
Economic analysis	Utilization costs
Economic evaluation	

Within the major economics literature databases (e.g., Econ-lit), search terms were used to identify the universe of articles that addressed substance abuse treatment (Table 2). These articles were then reviewed to identify those studies that conducted cost-benefit, cost-effectiveness, treatment cost, or cost-offset analysis of substance abuse treatment programs.

Table 2
Search Terms for Economics Databases

Substance abuse	Drug abuse
Substance dependence	Drug dependence
Alcohol abuse	Drug Treatment
Alcohol dependence	Addiction Treatment
Alcoholism	Alcohol Treatment
Addiction	

Our search of the peer-reviewed medical and economics literature identified a total of 109 economic evaluations of substance abuse treatment published between 1990 and November 2004. We then sorted the studies based on their inclusion in Harwood et al., (2002). This yielded 51 new articles that represent a broad range of economic evaluations, substance abuse treatments, and design qualities.

Included among these were five articles published prior to 2002 that had not been included in Harwood et al. (2002). With the exception of three studies (one each in Australia, Great Britain, and Canada), all of these articles represent research conducted in the United States.

In addition, evaluation reports and unpublished studies were solicited through letters sent to each state's Single State Agency (SSA) director; additional reports were located through searches of federal, state and local government internet-based archives (e.g. National Clearinghouse for Alcohol and Drug Information, National Institute on Drug Abuse, government agency websites). Similar to Harwood et al. (2002), we excluded non-empirical or non-"data-driven" documents such as letters to editors, commentaries and advocacy pieces. We also reviewed publications focusing on economic methodology to assist us in making recommendations for an economics research agenda.

Our search for unpublished reports and studies yielded 17 reports (mainly state-sponsored studies) that examined treatment costs or economic benefits, either for specific types of treatment programs or across multiple treatment programs. Through the comprehensive literature search process described above, we are confident that we have identified and obtained the vast majority of recent published and unpublished research on the economic impact of substance abuse treatment. Appendices A and B list the published and unpublished studies that were reviewed for this project.

Reviewing and Coding Peer-Reviewed Articles

Each article was initially categorized by the economic evaluation method used and by treatment modality (e.g., outpatient drug, methadone maintenance), and then independently reviewed by the Principal Investigator and at least one other TRI investigator. We rated each article on a five-point scale of design quality (based on quality of research design [e.g. use of randomization, comparison sample], control variables, appropriateness or quality of economic measures, outcome measures, etc.) and a 3-point scale of relevance (based on generalizability, sample size, recency, etc.). Where discrepancies existed in the scoring, they were discussed by the investigators and resolved through consensus. These procedures were similar to and based on those used in or recommended for previous

systematic literature reviews or syntheses, or meta-analyses (see e.g., Bero et al., 1998; Oxman, 1994; Prendergast et al., 2000; Sherman et al., 1997). Appendix C summarizes the coding used for the different study categories.

We then added the Design Quality and Relevance scores together to get an overall score. As noted in previous reviews (Cartwright, 2000; Harwood et al., 2002), there were relatively few studies with high design quality. Of 47 rated published studies⁸, only four (9%) achieved a score of 2 (highest quality design and relevance), and four (9%) had scores of 3. Only 15 studies (32%) were rated as having high or high medium quality for design or measurement rigor. In summarizing findings from specific studies in this report, we have given emphasis to those studies that were scored as medium to high on design quality and relevance (exceptions were made where there are only a small number of studies in a particular area; in these cases limitations of the study findings are noted).

FINDINGS: TREATMENT PROGRAM COSTS

Obtaining accurate estimates of the costs of providing different types of substance abuse treatment in different settings and populations is important for a number of reasons. First, the pressures to control behavioral health care costs (whether financed under private or public reimbursement systems) mean that treatment providers and their funders need to be increasingly aware of the costs of providing different types of services. Second, to make informed decisions about allocating scarce treatment dollars, policy makers need a better understanding of the relative costs of providing treatment in different settings. Finally, other things equal, the lower the treatment cost, the more cost effective a program or intervention will be, and the higher the BCR.

Treatment costs are expressed in several different ways in the literature: cost per unit of service (sometimes broken down by specific service within a program); daily, weekly, or annual cost; or cost per treatment episode. Each measure has its purposes and utility in economic analyses. Cost per

⁸ Review articles or economic simulation studies were not coded.

treatment episode is useful for summarizing total treatment costs and comparing to total economic benefits, but this measure is difficult to compare across studies or modalities: it is largely dependent on length of stay, which varies widely across programs and client populations. For example, the weekly cost of methadone maintenance (MM) is relatively low, but because length of stay tends to be long, overall treatment episode costs can be much higher than other modalities, especially outpatient drug-free treatment. For outpatient programs, where clients may only be at the program one or two days a week, daily cost may not be a meaningful statistic. We have therefore standardized the treatment cost findings across studies by recalculating the results (where the allowed) to weekly cost. The exception is detoxification programs, which typically last less than one week; for those programs we present daily or treatment episode costs. Also, because the cost estimates in the reviewed studies were published from the early 1990s to the early 2000s, we have standardized all treatment costs by adjusting the study findings to 2004 dollars, based on the Consumer Price Index, to facilitate comparisons across studies.

Treatment Costs by Modality/Setting:

Detoxification. No recent studies were found that examined treatment costs for detoxification services. However, several earlier studies had a range of cost estimates, largely dependent on whether detoxification was conducted on an inpatient or outpatient basis. A review by Harwood et al. (2001) estimated an average episode cost of \$1,231 across six non-hospital residential detoxification programs, or \$228/day per client based on an average length of stay of 5.4 days. About one-third of this cost was for housing, 25% for medical services, 19% for intake assessment, and 12% for counseling. In an earlier study included in the Harwood et al. (2002) review, Hayashida et al. (1989) estimated that detoxification costs ranged from \$5,056-5,583 for inpatient and \$267-591 for outpatient detoxification. The former costs much higher than those found by Harwood et al. (2001) for residential detoxification, perhaps reflecting longer length of stay, or the differences between hospital and non-hospital costs.

Methadone maintenance. It should be noted that unlike all other forms of treatment for addiction, MM is a continuing care form of treatment. This is relevant in two ways. First, the costs of care are likely to continue over a fairly long time period, albeit in reduced intensity (usually counseling and other services are reduced over time). Second, because the majority of patients remain in care for at least a year, the effects of methadone (i.e. treatment outcomes) are often measured while the patient is in treatment - unlike the post-treatment outcome measures used in the evaluation of all other forms of care.

Data using the DATCAP in 11 MM programs found an average treatment cost of \$97/week per client, but a wide range of costs from \$45 to \$177/week (Roebuck et al., 2003). The wide range in part reflected the effects of program size, with smaller programs generally costing more per client than larger programs. In addition, geographic differences affected cost-of-living and facility costs, as did the quality and quantity of other services offered by the MM programs. About 55% of MM costs are from labor (equal to the percentage of labor costs found for intensive outpatient treatment but lower than other modalities), 13% are from supplies and materials, 13% from buildings and facilities, 13% from contracted services, and 6% from other items. The costs of methadone doses are relatively modest: Barnett et al. (2001) estimated that the actual costs of the methadone dose at only \$1; the balance of methadone program costs were for methadone distribution, physician evaluations, urinalyses, and psychosocial services.

Other studies found similar costs to those reported by Roebuck et al. (2003). Using the SASCAP instrument, Zarkin et al. (2004) estimated average methadone program costs at \$88/week across 170 clinics. Masson et al. (2004) found slightly higher costs, using a different cost methodology: \$105/week based on 310.7 days LOS (\$4,739 per treatment episode). Finally, earlier data from CSAT's NTIES study estimated methadone treatment cost at \$80/week per client (Koenig et al., 1999). Thus, despite a variety of economic perspectives, data collection tools, and clinic locations, all methadone cost estimates are in a similar range, roughly \$80-100 per week per client. These costs

parallel those found in SAMHSA's national Alcohol and Drug Services Cost Study (ADSS; Office of Applied Studies, 2003b), which estimated MM program costs from a representative sample of 44 programs to be \$92/week, or \$7,786 per treatment admission.

Outpatient Treatment. Outpatient program costs can vary depending on whether it is a standard or intensive (sometimes called enhanced) program. In general, intensive programs are more expensive because they provide more frequent services, case management, or more counseling hours, requiring more staff. Data from cost analyses using the DATCAP indicated that 68% of outpatient costs were for labor (Roebuck et al., 2003).

In their review of cost studies using the DATCAP, Roebuck et al. (2003) compared costs among 14 standard outpatient programs, and six intensive outpatient programs. Standard programs cost an average of \$129/week per client, and intensive programs were \$493/week. The latter costs are twice as high as those reported by Harwood et al. (2001) using the SATCAAP: an average of \$272/week across nine intensive outpatient programs. Standard outpatient program costs were similar to those reported by Roebuck et al. (2003): \$124/week across seven programs. Similarly, Koenig et al. (1999) estimated that NTIES outpatient programs cost \$125/week. Using the Brief DATAACP instrument, French et al. (2004) estimated economic costs of two outpatient treatment programs at an average of \$166/week, and \$2,125/episode. Machado (2001) estimated that outpatient alcohol treatment cost \$117/week on average across 38 programs in Maine.

Outpatient cost estimates were lower in a study by French, Salomé, Sindelar et al. (2002) based on three Philadelphia programs: \$77/week. This cost, however, was the same as the estimated weekly cost of outpatient treatment for cocaine abusers found for programs participating in the DATOS national treatment outcomes study (Flynn et al., 1999), and similar to the outpatient costs estimated by Weisner et al. (2000): \$72/week for an eight-week program. These outpatient program costs are generally in line with estimates obtained from the 1997 ADSS survey of 222 outpatient programs: \$83/week, or \$1,505 per admission (Office of Applied Studies, 2003b).

Residential Treatment. The costs of residential treatment are much higher than outpatient programs for obvious reasons: clients are at the program 24 hours per day, caseloads are generally lower, and there are higher facility and staffing costs. On the other hand, because length of stay may be shorter, overall treatment episode costs may not be proportionally higher than for outpatient treatment. In addition, short-term residential programs may have higher weekly costs than long-term programs, but lower overall treatment episode costs.

Harwood et al. (2001) reported an average residential treatment cost across 15 programs of \$544/week, similar to the costs found by Koenig et al. (1999) for the NTIES sample (\$642/week for short-term residential, \$491/week for long-term residential). Data from cocaine users in DATOS programs indicated that long-term residential costs were \$679/week (Flynn et al., 1999). Costs for a residential program for women in public housing were relatively high, at \$798/week (Alexandre et al., 2003).

Roebuck et al. (2003) found that residential treatment costs (based on the DATCAP) averaged \$747/week across 18 programs, and \$626/week across five therapeutic community (TC) programs. Costs varied widely among the residential programs, however, ranging from as low as \$199/week up to \$1,939/week. More than half (55%) of the residential program costs were for labor, 13% for buildings and facilities, and 10% for supplies and materials (Roebuck et al., 2003). By comparison, for TCs, only 48% of the costs were for labor, and 18% were for buildings and facilities. Estimated program costs across five residential programs in Washington State were \$650/week, ranging from \$525 to \$797 (French, Salomé, and Carney, 2002), in a similar range as in other studies. The ADSS survey results indicated that average residential program costs averaged \$560/week, or \$4,032 per admission (Office of Applied Studies, 2003b).

Finally, French, McCollister, Cacciola et al. (2002) found that standard residential treatment for pregnant or parenting women in Arkansas cost \$294/week; with an average length of stay of 30.2 days,

the full treatment cost averaged \$1,467 per client (state reimbursement costs only). This cost is lower than found in other estimates for short term residential programs.

Treatment Costs for Criminal Justice Populations

Offenders in the criminal justice system present particular challenges for integrating effective substance abuse treatment (Belenko, 2000; Marlowe, 2003). Recent interest in increasing access to substance abuse treatment for drug-involved offenders has been spurred by concerns over expanding prison and jail populations that generate huge costs for state and local government, high recidivism rates for drug-involved offenders, and the close link between illegal drug use and criminal activity (Belenko et al., 2004a; Blumstein & Beck, 1999; Taxman et al., 2004; Young et al., 2004). Chronic untreated drug and alcohol abuse is likely to result in high rates of repeated contacts with the criminal justice system and a greater likelihood of re-incarceration. Unless these offenders naturally desist from drug use, or are successfully engaged in treatment, recidivism is likely to remain high and the courts and correctional systems are likely to continue to face increasing cost burdens from substance-involved offenders. The high rates of other health and social problems among offenders (Belenko, 2002; Belenko et al., 2004b; Braithwaite & Arriola, 2003; Hammett et al., 2001) means that successful substance abuse treatment among offenders is likely to reduce other societal costs related to health care utilization (including mental health services) and underemployment.

Treatment in Correctional Settings. Several recently published studies have estimated the costs of providing residential treatment in prison settings, followed by aftercare treatment in the community after release from prison. Cost estimates indicate that the incremental costs of treatment in prison facilities can be quite modest. McCollister and French (2002) found that the prison treatment costs in four states ranged from \$1,120 to \$3,624/episode, or \$41 to \$77/week per client. It should be noted that prison-based treatment episodes are generally longer than those found in general population studies. McCollister et al. (2003a) reported that treatment costs were \$77/week per client in a residential prison program in CA. Aftercare costs were only \$21/week in Delaware (McCollister et al.,

2003b), but \$125/week in California. Griffith et al. (1999) estimated the average cost of a prison TC in Texas (from the perspective of the criminal justice system) at \$384/week, substantially higher than for California or Delaware. But the estimate for the Texas prison TC included incarceration costs for this stand-alone prison treatment facility (Griffith et al., 1999).

In the only economic study of nonresidential prison treatment⁹ that we found, Daley et al. (2004) estimated the average cost per inmate of a one-week in-prison drug education program in several Connecticut prison facilities to be \$199. The average cost per inmate participant for a 10-week outpatient prison program (three group counseling sessions per week) was \$791, and the cost for an intensive day treatment program (four group sessions per week for four months) was \$3,139. All these costs were in addition to the costs of incarceration.

Treatment in Drug Courts. Over the past 15 years, drug courts have emerged as a preferred mechanism for linking drug- or alcohol-involved offenders to community-based treatment (Belenko, 2002; Marlowe, 2003). As of May 2004, 1,160 drug courts were operating in the United States, and an additional 517 were being planned (American University, 2004). Emphasizing judicial supervision and behavioral contingencies, long-term treatment, clinical assessment, and referral to ancillary services, drug courts embody many principles of effective treatment (Gerstein & Harwood, 1990; National Institute on Drug Abuse, 1999). Although methodological problems are common (as they are with substance abuse treatment research in general), drug court evaluations generally find that these programs maintain offenders in long-term treatment, and reduce drug use and criminal behavior, at least in the short term (Belenko, 2001).

Because they provide more intensive monitoring and services, more frequent supervision and court appearances, and longer stays, drug courts tend to be more expensive to operate than standard court processing. Across nine drug court studies that used the DATCAP, the cost per treatment

⁹ In correctional treatment settings, residential substance abuse treatment refers to programs that require the inmate to live in a separate housing unit dedicated to treatment. The term “outpatient” treatment means that inmates live in their regular housing unit but attend counseling sessions at a program somewhere else in the prison facility.

episode was reported at \$3,694, or \$87/week (Roebuck et al., 2003). This was a much lower cost than reported by Carey and Finigan (2004) in Multnomah County, Oregon (where the cost per drug court client was \$6,625/client) and by Barnoski & Aos (2003) for six drug courts in Washington State (average of \$11,978/client), but somewhat higher than found across three programs in Kentucky, also using DATCAP (\$3,603/client, Logan et al., [2004]). However, the weekly costs were about the same in Kentucky, \$87/week, as reported by Roebuck et al. (2003). Drug court costs were also higher in St. Louis (\$8,183 per graduate; Loman, 2004) but this higher cost may have been because the latter study only included drug court graduates, who have longer lengths of stay than drug court dropouts.

Deschenes et al. (1996) calculated the costs of operating four Los Angeles County drug courts, including treatment and related services (e.g. housing assistance, food, and medical services), as well as court costs. The weekly cost per client ranged from \$102 to 151, and the average annual cost per client ranged from \$3,706 to \$8,924 for program graduates and from \$1,599 to \$3,290 for non-graduates. Harrell et al. (1999) estimated the program costs for the Washington, DC drug court to be \$147/week per client, comparable to the costs found for Los Angeles County.

Treatment Costs for Other Special Populations

As noted above, treatment costs can vary widely for different client populations. Other things equal, of course, clients who require longer treatment stays, more intensive services, lower staff-to-client ratios, or more expensive services (e.g. psychiatric treatment) will generate higher treatment costs. To the extent that it is more difficult to achieve positive treatment outcomes for more impaired clients, programs serving relatively large numbers of such clients may not generate as many economic benefits or be as cost effective as programs serving lower-risk clients. Other than criminal justice treatment, only a few economic studies have estimated treatment costs for special populations. In addition, there is little information about the differential treatment costs for different types of clients (e.g. gender, age, drug type, addiction severity).

In a study of a modified TC for mentally ill, chemically dependent (MICA) clients, treatment costs were \$25,951 per treatment episode, or \$707/week, based on an average length of stay of 257 days (French, McCollister, Sacks, et al., 2002). Reporting on the same program, McGeary et al. (2000) estimated that the use of other services was much higher for control (“treatment as usual”) clients similar to those served by the modified TC. Comparison subjects incurred a total of \$37,971/client in health care costs over a 12-month period (including \$17,768 in inpatient psychiatric services), compared to a total of \$2,531 for TC completers and \$28,105 for TC noncompleters. Total costs including TC treatment were similar for completers and comparison clients, and slightly higher for TC dropouts. Because TC clients had better outcomes than comparison clients (Sacks et al., 1998), the economic data suggest that modified TC treatment for MICA clients is likely to be cost-effective.

Adolescent Treatment. The economic evaluation of adolescent treatment has been largely ignored until relatively recently. Using the DATCAP instrument, French, Roebuck, Dennis et al. (2002) examined the costs of four different research-based interventions for youth receiving treatment for marijuana abuse as part of CSAT’s Cannabis Youth Treatment project. Five different combinations of these four interventions were implemented across four different sites. The cost per treatment episode and average weekly cost per client were highest for the Family Support Network intervention (\$3,730 and \$275 respectively), and relatively low for Motivational Enhancement Therapy/Cognitive Behavioral (MET/CBT) and Community Reinforcement models (averaging about \$1,474 per treatment episode and \$119 per week. However, weekly costs were higher (averaging about \$206/week across sites) for a shorter version of MET/CBT.

French et al. (2004) tested the Brief DATCAP in three adolescent outpatient programs in different cities. The economic costs per treatment episode and weekly costs were \$2,822 and \$235 respectively for a standard outpatient program with a median length of stay of 12 weeks. Costs in two intensive outpatient programs were higher, but varied substantially. In one intensive outpatient program, the average cost per treatment episode was \$12,180 (\$411 per week), and in a second

program, the episode and weekly costs were \$5,690 and \$379. The difference in episode costs between the two programs reflected a much longer median length of stay in the first program (30 versus 15 weeks).

Measurement of Client Costs

All the cost estimates summarized above are either from the perspective of the treatment program or society. However, another element of treatment costs has rarely been studied in addiction treatment research: the cost to the client. Because clients spend time at the program, or incur other opportunity or actual costs, it would be useful to also account for those costs. The Client DATCAP was recently tested in samples of 50 inpatient and 27 outpatient clients (Salomé et al., 2003; www.DATCAP.com). The results indicated that clients may incur substantial costs: the average cost for outpatient clients was \$54.60/visit, and for inpatient, \$213.47/day in treatment. Most of this cost reflected the opportunity costs of not working or lost leisure time during the period spent in treatment. These data suggest that client costs can be a significant component of total treatment costs: client costs were higher than the treatment program or societal cost estimates summarized above.

In another study that included the opportunity cost for residential treatment clients in five programs (based on lost wages valued at the minimum wage), French, Salomé, and Carney (2002) found that these costs added \$1,431 to the average program episode cost of \$4,139. Thus for residential programs, opportunity costs for clients may add as much as 35% on top of program costs. Client costs are worthy of further study, and should be considered and measured in future economic analyses of substance abuse treatment programs.

Costs of Different Services

Information about the separate costs of specific treatment components or services has potential importance for increasing our understanding about treatment costs, and the particular elements of treatment that contribute to net economic benefits. Previous reviews (e.g. Cartwright, 2000) have called for more research on the costs of the specific components of treatment.

Unfortunately, the research literature is still quite limited in this area, with only a handful of studies examining the unit costs of the different components or elements of treatment (Anderson et al., 1998). As Harwood et al. (2001) discuss, ignoring unit costs of different services can give a distorted picture of true treatment costs. For example, intake assessments have been found to be a relatively expensive component of treatment. Thus, average treatment episode (or weekly) costs for clients who leave treatment early will be artificially inflated because of these large “up-front” costs. As clients remain in treatment longer, average weekly costs drop as these intake assessment costs are amortized over time. Cost comparisons across programs or interventions thus should take these unit cost issues into account.

In their study using the SASCAP cost instrument, Zarkin et al. (2004) reported average service costs to be \$116.23 for initial assessment, \$39.11/client for each individual counseling session, \$9.42/client for each group counseling session, and \$11.21/client/week for case management. Masson et al. (2004) estimated the admission intake and assessment costs at \$325 per client for a methadone program, medical care costs at \$26.80/week, group counseling sessions at \$11.78/session, and relapse groups at \$13.01/session.

Using the SATCAAT, Harwood et al. (2001) presented estimates of the unit costs of different treatment components across 37 service delivery units in four modalities that received CSAT demonstration grants: detoxification, residential, intensive outpatient, and standard outpatient. The results showed some interesting patterns. First, a surprisingly small proportion of treatment costs were for counseling services: this percentage was highest in intensive outpatient treatment (54% of the treatment episode costs), but only 12% in detoxification programs. Counseling comprised only 20% of residential and 28% of standard outpatient treatment costs. In an earlier study, Anderson et al. (1998) also found that counseling costs were a relatively small proportion of the monthly costs in five residential and eight outpatient programs. Not including intake, 13% of monthly residential and 17% of monthly outpatient costs were for individual or group counseling, or case management; 62% of

residential and 47% of outpatient program costs were for non-treatment expenses (excluding intake). These findings are consistent with recent observational studies indicating that a relatively low percentage of clinical sessions are actually devoted to clinical treatment services (Taxman & Bouffard, 2002).

Not surprisingly, housing costs are a large percentage of residential treatment costs (43%; Harwood et al., 2001). A perhaps more interesting finding is that “other” costs (mainly record keeping, but also education and transportation for residential clients, and child care for outpatient programs) were a relatively large proportion of overall treatment costs: 17%, 9%, and 39% for residential, intensive outpatient, and standard outpatient respectively.

This type of unit cost breakdown allows more refined estimates of treatment costs that may be quite useful for treatment planners. Using this type of analysis, future research could include economic analyses in studies of the impacts of specific treatment services (e.g. case management, individual vs. group counseling, vocational training services). In addition, the above findings suggest a need to more closely examine administrative and non-treatment costs to determine whether and how such costs can be reduced so that a higher percentage of expenditures can be allocated to clinical services.

Summary of Findings

Table 3 summarizes the treatment cost estimates found in our review. Weekly *methadone* program cost estimates consistently ranged between \$80 and \$100/week per client, although the costs per treatment episode tend to be much higher than for outpatient treatment, because of longer time in treatment. A little over half of methadone program costs (55%) are from labor, similar to the percentage of labor costs in intensive outpatient programs, but lower than other modalities. Estimated costs ranged from a low of \$72 to \$166/week per client for *standard outpatient* services, and *intensive outpatient* program costs are higher: an average of \$272 per week across nine programs in one study, and \$493 per week across six programs in another study. Results from a small number of studies

indicate that *adolescent outpatient* treatment is somewhat more expensive than adult treatment.

Estimated costs for *residential* treatment also varied considerably, ranging from \$544 to \$747/week.

In addition to the costing methods used, the variation in costs probably reflects the size of the programs, geographic differences in cost of living, and the frequency and types of services.

Compared with community-based treatment, treatment in prisons is relatively inexpensive, ranging from \$41 to \$77/week per inmate (in addition to incarceration costs) across four states.

Studies of drug courts have found a wide range of costs: one study estimated the weekly costs at \$87 across 9 programs, slightly lower than for other outpatient programs. Other studies found a wide range of costs from \$3,603 to \$11,978/episode. These large differences reflect variations in program length, geographic location, program size, and costing methodology.

Recent studies of client costs suggest that total treatment costs might be substantially higher than indicated above. In one study of five residential programs, client costs (such as lost wages) added another 35% to the program costs. In another study of 50 residential and 27 outpatient programs, the average client cost was \$213.47/day in treatment for residential clients, and \$54.60/visit for outpatient clients.

Several studies of the unit costs of specific treatment services or cost components indicate that intake assessment costs are a relatively large “up-front” treatment cost. In addition, a relatively low percentage of costs are for counseling services (54% in intensive outpatient programs, but only 28% in standard outpatient and 20% in residential programs). The remaining costs are for administrative expenses and overhead, housing, record keeping, and other costs.

Table 3
Summary of Treatment Cost Findings
(All costs are per individual client, adjusted to 2004 \$)

Modality	Author	Treatment Costs	Notes
Detoxification	Harwood et al. (2001)	\$1,231/episode; \$228/day	Average of 6 residential programs; average LOS 4.4 days
	Hayashida et al. (1989)	\$5,056-5,583/episode inpatient \$267-591/episode outpatient	Average LOS 6.7 days
Methadone	Roebuck et al. (2001)	\$97/week; \$45-177 range	Average across 11 programs
	Zarkin et al. (2004)	\$88/week	Average across 170 programs
	Masson et al. (2004)	\$105/week; \$4,739/episode	Average LOS 310 days
	Koenig et al. (1999)	\$80/week	NTIES sample
	Office of Applied Studies (2003)	\$92/week; \$7,786/episode	Average across 44 programs
Outpatient	Roebuck et al. (2003)	\$129/week standard; \$493/week intensive	Average across 14 standard and 6 intensive programs
	Harwood et al. (2001)	\$124/week standard \$272/week intensive	Average across 7 standard and 9 intensive programs
	Koenig et al. (1999)	\$125/week	NTIES sample
	French et al. (2004)	\$166/week; \$2,150/episode	Average across 2 programs
	French, Salomé et al. (2002)	\$77/week	Average across 3 programs
	Weisner et al. (2000)	\$72/week; \$493/episode	Eight week program
	Office of Applied Studies (2003)	\$83/week, \$1,505/admission	Average across 22 programs
	Residential	Harwood et al. (2001)	\$544/week
	Koenig et al. (1999)	\$642/week STR; \$491/week LTR	NTIES Sample
	Alexandre et al. (2003)	\$798/week	Women in public housing
	Flynn et al. (1999)	\$679/week	DATOS Programs
	Roebuck et al. (2003)	\$747/week, \$626/week TCs	Average across 18 residential and 5 TC programs
	French, Salomé, & Carney (2002)	\$650/week	5 programs in Washington State
	Office Of Applied Studies (2003)	\$560/week, \$4,032/Admission	Average across 48 programs
Prison-based Treatment	McCollister & French (2002)	\$41-\$77/week; \$1,120-\$3,624/episode	Programs in 4 states
	McCollister et al. (2003a,b)	CA: \$77/week; \$125/week aftercare DE: \$21/week aftercare	Excludes incarceration costs
	Griffith et al. (1999)	\$384/week	Therapeutic Community in Texas, includes incarceration costs
	Daley et al. (2004)	\$169, 1 week drug education \$791, 10-week nonresidential \$3,139, intensive 4-month day treatment	Excludes incarceration costs
Drug Courts	Roebuck et al. (2003)	\$87/week; \$3,694/episode	Average across 9 courts
	Carey & Finigan (2004)	\$6,625/episode	Multnomah County, OR
	Barnoski & Aos (2003)	\$11,978/episode	Average across 6 courts in WA
	Logan et al. (2004)	\$87/week; \$3,603/episode	Average across 3 courts in KY
	Loman (2004)	\$8,183/episode	Costs for graduates only, St. Louis, MO

Special Populations	French, McCollister, Sacks, et al. (2002)	\$707/week, \$25,951/episode	Psychiatric population, average LOS 257 days
	French, Roebuck, Dennis, et al. (2002)	\$275/week, \$3,730/episode	Adolescents, Family Support Network
		\$119/week, \$1,474/episode	Adolescents, MET/CBT, CRA
		\$206/week	Adolescents, MET/CBT, shortened
	French et al. (2004)	\$235/week, \$2,822/episode	Adolescent outpatient 12-week program
		\$411/week, \$12,180/episode	Adolescent intensive outpatient, 30-week program
		\$379/week, \$5,690/episode	Adolescent intensive outpatient, 15-week program

FINDINGS: COST EFFECTIVENESS ANALYSES

As noted earlier, CEA is commonly used to help make decisions on alternative health care therapies or interventions (Gold et al., 1996), and is an important tool in the evaluation of health care outcomes. Because CEA is best suited for interventions that have a single or primary outcome (Gold et al., 1996; Sindelar et al., 2004), its appropriateness for evaluating the multiple outcomes for substance abuse treatment has been questioned (Cartwright, 2000; French, Salomé, Sindelar, et al., 2002; Kenkel, 1997). Several possible solutions to this problem have been suggested: creation of a summary index outcome that cuts across different domains (Jofre-Bonet & Sindelar, 2004), calculation of cost-effectiveness ratios for multiple outcomes, or use of general health outcome measures such as QALYs or QALDs saved (Barnett, 1999; Gold et al., 1996), or life-years gained (Masson et al., 2004). Despite these methodological and analytical challenges, though, CEA is likely to remain an important tool for conducting economic evaluations of substance abuse treatment programs, especially because alternatives such as CBA also present analytical and practical challenges.

One finding from recent studies consistent with the Harwood et al. (2002) review is that outpatient programs may generally be more cost effective than residential programs. Mojtabai and Zivin (2003) analyzed cost effectiveness by modality for 1,799 clients from 99 treatment programs selected as part of SAMHSA's Services Research Outcomes Study (SAMHSA, 1998), a large-scale

national study based on a stratified random sample selected from more than 10,000 drug treatment facilities. A unique aspect of this study is that it incorporated a five-year post-treatment follow-up period. Another strength of this study is that propensity score analysis was used to adjust for selection bias. Mojtabai & Zivin (2003) compared the cost per abstinent case, and the cost per reduced drug use case (including abstinence), for inpatient, residential, outpatient detoxification to methadone, and outpatient drug free programs.

Mojtabai and Zivin (2003) found that the cost per abstinent case was considerably lower for outpatient programs and highest for inpatient: \$6,300 for outpatient clients, \$12,400 for detoxification/methadone, \$14,900 for residential, and \$15,600 for inpatient (1990 \$). The cost per reduced drug use case was much lower across generally, but remained lowest for outpatient programs: \$2,400 for outpatient clients, \$4,600 for detoxification/methadone, \$6,100 for inpatient, and \$6,700 for residential. Results were similar across different subgroups of clients based on propensity scores, suggesting that outpatient treatment would be the preferred choice for achieving reductions in drug use at the lowest unit cost. However, it should be pointed out that a problem with many CEAs of addiction treatment programs is that it is not always clear whether the ratios of cost to unit outcome are independently cost effective. In other words, we do not have benchmark values for the cost per abstinent day upon which to judge CEA estimates.

Three studies have found that enhanced outpatient services, although more expensive than standard services, yield better outcomes and are more cost effective. Jofre-Bonet et al. (2004) compared enhanced and standard treatment in several Philadelphia outpatient programs and found lower costs per unit improvement for enhanced services, using an index of outcomes based on the number of days experiencing problems in each of the seven domains of the Addiction Severity Index. Similarly, Sindelar et al. (2004) analyzed the cost effectiveness ratios for enhanced versus standard treatment across multiple domains and outcome measures, and found that the incremental cost effective ratios (ICERs) generally favored enhanced treatment in terms of reduced drug and alcohol

use, fewer psychological problems, and improved social relations. However, standard treatment was more cost effective in reducing family problems, increasing employment earnings, and reducing the number of days engaged in illegal activities. These findings indicate that cost effectiveness determinations may be dependent on the outcome measure used; Sindelar et al. (2004) thus suggest that multiple outcome measures and multiple cost effectiveness ratios should be incorporated into CEAs of treatment programs to provide a broader picture of a program's cost effectiveness. Finally, Zarkin et al. (2001a) compared enhanced and standard HIV risk reduction interventions for out-of-treatment substance abusers at risk for HIV, and found that the ICER was about \$90 per day of reduced drug use (1997 \$), favoring the enhanced intervention.

In a comparison of the relative cost effectiveness of buprenorphine and MM therapy in a randomized trial in Australia, Doran et al. (2003) did not find a significant ICER for reduction in heroin-free days for methadone versus buprenorphine. They concluded, however, that if the dosage price and time to administer were reduced for buprenorphine, there would be no difference in cost effectiveness compared to methadone. In contrast, Barnett et al. (2001), in an economic simulation study using QALY gained as the outcome, concluded that at a lower dosage cost (\$5 per dose), buprenorphine would be more cost effective than methadone per QALY gained.

In another randomized trial, Masson et al. (2004) compared the cost effectiveness of MM to a 180-day methadone detoxification program. They found that MM, compared to detoxification, increased the number of life-years, at a cost \$15,967 per life-year gained. Given the general convention in health economics that a cost-effectiveness ratio of less than \$50,000 per life year gained is a threshold for adopting a health care intervention (Barnett, 1999; Owens, 1998), the Masson et al. (2004) findings suggest that MM is cost effective.

Finally, a CEA of a brief intervention for problem drinkers was conducted by Kunz et al. (2004). This pilot project tested a brief intervention consisting of a counseling session, together with an "action plan" assigned to the patient. Participants were low-income minority emergency

department patients screened for problem drinking, who were randomly assigned to the brief intervention (n=90) or to a control condition (n=104). Program cost data were based on the DATCAP, and there was a three-month follow-up. The results, although preliminary, suggested that brief interventions are relatively inexpensive (Zarkin et al., 2001b) but may be quite cost effective: the intervention cost only \$632 per patient (including \$497 in screening costs and \$135 for the brief intervention). All drinking behavior outcomes were better for the intervention group, although none of the differences were statistically significant. The ICERs indicated a high potential level of cost-effectiveness: \$258 for a one-unit reduction in the AUDIT score, \$219 for one less drink of alcohol, and \$51 per 1% decrease in the prevalence of heavy drinking.

Criminal Justice Treatment

Two recent studies by McCollister and her colleagues have examined the relative cost effectiveness of prison TC treatment, work release treatment, using number of days incarcerated during the follow-up as the outcome measure. In Delaware, which operates a work release TC as well as an aftercare program for released inmates, McCollister et al. (2003b) found that the ICER for all treatment clients (work release or aftercare) compared to the comparison group was \$65/incarceration day saved (2000 \$). Comparing clients who received aftercare to those who were only in the work release program, the ICER was \$19/incarceration day saved. Given the cost of incarceration in Delaware of \$57/day, McCollister et al. (2003b) concluded that it is more cost effective to add aftercare. However, because they only examined the costs of the program to the Department of Corrections, and the follow-up period was only 18 months (a number of offenders were still incarcerated at the end of the follow-up period), both their cost estimates and the number of incarceration days saved may be underestimated.

A second study of a California prison treatment and aftercare program, using a five-year follow-up, found similar results. McCollister et al. (2004) found that the ICER for any treatment versus controls was also \$65/incarceration day saved, but only \$45/incarceration day saved comparing

aftercare recipients to the control group (2000 \$). At a daily incarceration cost of \$72, McCollister et al. (2004) concluded that prison treatment was cost effective, and more cost effective if aftercare was received. In both these studies, however, clients self-selected into aftercare, so the results should be replicated in better-controlled studies in the future.

Griffith et al. (1999) conducted an economic evaluation of a Texas prison TC that included residential treatment in prison and outpatient aftercare programs following release from prison. Using an outcome measure of reincarceration, and an economic perspective of the criminal justice system, Griffith et al. (1999) found significant reductions in reincarceration only for those who completed the aftercare program, compared with a matched comparison sample of inmates who were eligible for the TC but did not enroll. Calculating the cost per 1% reduction in reincarceration, they found that the inmate treatment program was cost effective only when aftercare was completed. In addition, the program was more cost effective for high-risk inmates: the ICER was \$165 for aftercare completers versus comparisons, compared with \$494 per 1% reduction in reincarceration for low-risk inmates (1999 \$).

These findings support other studies that have consistently found that aftercare treatment is necessary to achieve post-release reductions in drug use and crime among inmates who received treatment in prison (e.g. Martin et al., 1999; Wexler et al., 1999).

Summary of findings

Table 4 summarizes the key findings from the CEA studies included in this review. Several studies in different types of outpatient programs concluded that enhanced services were more cost effective than standard services. In other words, the extra cost of enhanced serviced yielded a lower cost per unit improvement in various outcomes. Another study across 99 treatment programs found that the costs per abstinent case and per reduced drug use case were much lower for outpatient clients (\$6,300 and \$2,400 respectively), than for residential (\$14,900 and \$6,700) or inpatient (\$15,600 and \$6,100) clients.

In a randomized trial, the incremental cost effectiveness of MM versus 180-day methadone detoxification was \$15,967 per life-year gained, well within the accepted threshold in health economics of \$50,000 per life-year gained. Finally, several CEA studies of correctional treatment concluded that residential prison treatment was cost effective only if aftercare services were completed. These results are consistent with prison treatment outcome studies that find post-release treatment impacts only if inmates attend aftercare treatment following release. One of the reviewed studies also found that cost effectiveness was greater for high-risk inmates who receive prison treatment plus aftercare, compared with low-risk inmates.

Table 4
Summary of Cost Effectiveness Analysis Findings

Modality	Author	Findings	Notes
Inpatient	Mojtabai & Zivin (2003)	\$15,600 per abstinent case	22 programs, 5-year follow-up
		\$6,100 per reduced drug use case	
Methadone	Mojtabai & Zivin (2003)	\$12,400 per abstinent case	Included detoxification costs
		\$4,600 per reduced drug use case	
	Masson et al. (2004)	ICER of \$15,967 per life-year gained for methadone maintenance	Compared to 180-day methadone detoxification
Outpatient	Mojtabai & Zivin (2003)	\$6,300 per abstinent case	23 programs, 5-year follow-up
		\$2,400 per reduced drug use case	
	Jofre-Bonet et al. (2004)	CE higher for enhanced vs. standard services	
	Sindelar et al. (2004)	CE ratios varied depending on outcome variables, but generally favored enhanced treatments	Compared enhanced to standard services
	Zarkin et al. (2001a)	ICER of \$90 per day in favor of enhanced intervention	Compared enhanced and standard HIV risk reduction interventions
	Kunz et al. (2004)	ICER: \$258 per one-unit AUDIT score reduction \$219 per one drink reduction \$51 per 1% reduction in heavy drinking	Brief intervention with an action-plan, compared to no-treatment control
Residential	Mojtabai & Zivin (2003)	\$14,900 per abstinent case	26 programs, 5-year follow-up
		\$6,700 per reduced drug use case	
Corrections-based	McCollister et al. (2003b)	ICER of \$65 per incarceration day saved	Compared work-release treatment or aftercare, to no-treatment controls
		ICER of \$19 per incarceration day saved	Compared aftercare to work-release without aftercare
	McCollister et al. (2004)	ICER of \$65 per incarceration day saved	Any treatment compared to no-treatment controls
	Griffith et al. (1999)	ICER of \$165 per 1% reduction in recidivism rates, for high risk inmates (aftercare completers versus controls)	Aftercare more effective for high-risk inmates, compared to low-risk inmates

FINDINGS: COST BENEFIT ANALYSES

As noted earlier, previous reviews of the economics of treatment literature have generally concluded that cost benefit studies are consistent in finding positive net economic benefits (i.e. cost savings) as a result of treatment participation. In other words, studies have consistently found that each dollar invested in treatment yields more than one dollar in total economic benefits. The published literature since 2001 generally supports that conclusion for different treatment modalities and populations.

However, some words of caution are needed. First, the quality of the research designs varied across studies; only one recent study used a randomized experimental design, and several were pre-post studies of treatment clients, which are relatively weak designs. Second, although all the studies found BCRs of greater than one, the ratios varied widely across studies (as low as 1.33 and as high as 39.0). Because of the wide range in findings, different methodologies used, different populations, and different benefits valued, it is not possible to generalize across studies and present an “average” BCR for particular types of treatment.

Our findings are consistent with previous analyses in that the largest proportion of the economic benefits accrues from reduced crime. The two primary cost components of crime reduction are incarceration costs and victimization costs; the latter costs have been estimated by various analysts (e.g. Miller et al., 1996; Rajkumar & French, 1997). Although treatment outcome studies (especially of criminal justice-based programs such as drug courts and prison treatment) generally find reductions in post-program crime rates, the economic benefits can vary substantially depending on whether victimization costs are included. For example, Miller et al., (1996) estimated the intangible costs (i.e. effects on quality of life) of a victim of robbery to be \$5,700 and for an assault victim \$7,800, and the total victimization costs at \$8,000 and \$9,400 per crime respectively (all estimates in 1993 \$). Rajkumar & French (1997) estimate the total social costs of victimization at \$23,122 for robbery and \$53,600 for assault (estimates in 1994 \$). Depending on the crime categories used, the cost

perspective, and the type of enumeration of victim costs chosen, the net economic benefits can vary widely.

Using a pre-post design, Flynn et al. (1999) compared the estimated economic benefits for cocaine-dependent clients of long term residential and outpatient programs in the DATOS national outcome study. Economic benefits were estimated based on the tangible costs of reductions in crime (including victim costs per Rajkumar & French [1997] as well as criminal justice system costs). For residential program clients, the crime cost reduction ranged from 75-79% from pre- to post-treatment (depending on the method used to impute missing values); for outpatient clients, the crime cost reduction ranged from 24-39%. Compared against treatment costs, Flynn et al. (1999) estimated BCRs that ranged from 1.68 to 2.73 for long term residential, and from 1.33 to 3.26 for outpatient treatment.

In another study using a pre-post treatment design, Salomé et al. (2003) calculated treatment costs and benefits for a sample of 2,862 clients receiving treatment as part of the Chicago Target Cities project. Costs were derived from reimbursement rates for Illinois, and were based on outcome measures of medical and psychiatric status, employment, and criminal activity for six months prior to admission and six months after treatment admission. The average net benefit per client at six months post-treatment was \$881 (1997 \$), and the BCR was 1.49. This result was adjusted to exclude extreme values for net benefits. The largest economic benefit was derived from a post-treatment reduction in the number of robberies committed.

French, Salomé, and Carney (2002) estimated the costs and benefits of residential treatment for five programs in Washington State (including both short-term and long-term residential programs), based on a sample of 222 clients who received both baseline and follow-up assessments at six months post-discharge. Outcomes used to calculate economic benefits included inpatient medical or psychiatric treatment, employment and income, days with medical problems, days engaged in illegal activities, and days experiencing psychological problems. The average net benefit was \$21,329 (1999 \$) and the BCR was 4.34. As with other studies, most of the economic benefits (\$17,705 or 83%)

resulted from reductions in criminal activity relative to baseline. Multivariate analyses indicated that benefits were greatest for clients with higher levels of drug or legal problems at treatment admission, and for male and white clients.

Fleming et al. (2002) conducted a CBA of a brief intervention for problem drinkers administered in physicians' offices. In a randomized trial, 774 patients at risk for alcohol problems received either the brief intervention (two physician visits and two follow-up calls with nurses, n=392), or standard care (n=382). Aside from the randomized design, another strength of this study was its 48-month follow-up period, with 83% of the patients retained in the study at 48 months. Outcome measures included alcohol use, motor vehicle and legal events, injuries, health care utilization, health status, and mortality, from both self reports and official records. The brief intervention group had significant reductions in # drinks/week, # binge drinking episodes, % having a binge drinking episode, days hospitalized, ER visits, motor vehicle events (not statistically significant), and legal events (significant only for controlled substances or liquor law violations). The intervention was relatively low-cost: \$166 from the clinic perspective, and \$39 from the patient perspective for a total of \$205 (1993 \$). Total economic benefits (1993 \$) were statistically significant in terms of medical costs (\$712) and motor vehicle events (\$7,171 per client), with total savings of \$7,985 per person over 48 months. From the perspective of the medical system, the BCR for this program was 4.3, and from the societal perspective, it was a substantial 39.0 (mainly reflecting the large economic benefits from reduced motor vehicle incidents).

Adolescent treatment and Other Special Populations

One recent study estimated net economic benefits for adolescents receiving treatment under CSAT's Cannabis Youth Treatment study. Comparing five structured interventions implemented in different settings, French, Roebuck, Dennis, Godley et al. (2003) examined their effects on health service utilization, days with medical and psychological problems, substance abuse treatment utilization, education and employment, and criminal activity. Two types of Motivational Enhancement

Therapy (MET), and MET plus the Family Support Network, generated statistically significant reductions in the costs of these drug abuse consequences from baseline to 12-month follow-up. Two treatment interventions (Community Reinforcement Approach and Multidimensional Family Therapy) did not yield cost reductions during the follow-up.

Two recent cost benefit studies were based on special client populations. French, McCollister, Cacciola, et al. (2002) compared the costs and benefits of specialized care for samples of pregnant or parenting women in Arkansas, to a comparison sample of women receiving care in a geographically proximate, standard residential program for the same target population. Program costs were based on State reimbursement rates, and economic benefits were calculated from a societal perspective. The net economic benefits (including medical and psychiatric problems, medical and psychiatric care, employment, and days engaged in illegal activities) were substantial: \$17,143 for specialty care and \$8,090 for standard care, yielding relatively high BCRs of 3.1 and 6.5 respectively.

French, McCollister, Sacks et al. (2002) conducted a CBA of a modified TC for MICA patients, using a waiting list control design that placed eligible clients into a “treatment as usual” control group if no TC beds were available. Outcomes were determined 12 months post-treatment for self-reported criminal activity, use of treatment and other health services, and employment earnings. The net benefits per client (corrected for extreme outliers in the data) were estimated at \$85,257 (1994 \$), yielding a BCR of 5.19 (adjusted). Most of the benefit accrued from reduced crime costs (including victimization costs).

Drug Courts

As noted earlier, drug courts have emerged as an important and popular treatment intervention for offenders involved with alcohol and other drugs. One important empirical question about drug courts is whether the costs of operating such programs are lower than the economic benefits or avoided costs that accrue because incarceration time is reduced, or because drug treatment reduces the likelihood of relapse and recidivism (Belenko, 2001; 2002). Several studies described in previous

reviews of drug court research (e.g., Belenko, 2001) concluded that drug courts generate criminal justice savings or lead to avoided future costs because of reduced crime (Anspach & Ferguson, 1999; Finigan, 1999; Harrell et al., 1999).

Four recent studies (two published and two unpublished) have estimated the net economic impacts of drug court programs: Carey & Finigan (2004) compared court processing and treatment costs, and recidivism outcomes over a 30-month follow-up, for 594 drug court clients and 573 matched offenders processed through regular criminal court in Multnomah County (Portland) OR. Total costs (including jail time incurred during processing of the case) were lower for drug court participants (\$5,928 per case; 2002 \$) than for other offenders (\$7,369). Much of this difference was accounted for by higher jail costs for non-drug court offenders. Because of their significantly lower rate of recidivism and reincarceration, drug court clients also had lower outcome costs (\$15,490 per client versus \$19,087 for the comparison offenders), including the estimated costs of victimization. Including program costs, the net economic savings per drug court client were \$3,521 excluding crime victimization costs, and \$4,789 including victimization costs. Thus, Carey and Finigan (2004) conclude that the Multnomah County drug court achieved lower recidivism outcomes at a lower cost than standard court processing.

Analyzing data from six drug courts in Washington State, Barnoski and Aos (2003) estimated reductions in recidivism ranging from 40% to 46% over eight years in five of the counties, but only a 4% reduction in one of the counties, relative to matched comparison samples of offenders. The average avoided costs from reduced rearrests was \$6,779 per client (including victim costs; 2001 \$), and the BCR was 1.74.

Logan et al. (2004) conducted one of the only published CBAs of a drug court, in three Kentucky drug courts. They compared graduates (n=222) and dropouts (n=371), and a comparison sample (n=151) of clients who were assessed for the drug court but did not enter (i.e. not eligible or refused). Statistical modeling was used to correct for selection bias (Heckman, 1979), based on the

probability of entering drug court, and the DATCAP was used to estimate drug court costs. Multiple outcomes were analyzed and valued including rearrests, reincarcerations, protective custody, mental health services, traffic accidents, child support payments, and earnings. Outcome data were from official records as well as interviews. Actual and predicted outcomes were converted to economic benefits based on reductions in post-program costs and controlling for selection bias. Logan et al. (2004) estimated the total benefits at \$8,624/client, resulting in a net savings of \$5,446/client (1999 \$) and a BCR of 2.71. Based just on accounting rather than economic costs, there was a net savings of \$6,535 and BCR of 4.13.

Finally, Loman (2004) conducted a CBA of the St. Louis adult felony drug court. Although this study did not use an experimental design, it did incorporate an extensive one-to-one subject matching design (matching on a number of factors including assessment for drug or alcohol problems) that resulted in a very closely matched comparison sample. Loman (2004) compared 219 graduates who completed the drug court prior to 2001, with a matched sample of offenders who completed probation during the same period, and were not offered drug court. Cost data (from official records, using the taxpayer perspective) included wages, welfare, Medicaid, treatment, health and mental health services, rearrests, reconvictions, incarceration, court processing, supervisions, and drug-exposed babies. Changes in costs were measured from 24 months prior to entering the drug court or probation, compared to 24 months after completing the drug court or probation. The results indicated higher costs for the drug court: \$7,793/graduate compared with \$6,344/probation completer, or \$1,449 more per graduate (2002 \$). However, 24-month post-program costs were \$4,064 lower per drug court graduate, and net benefits were \$2,615/graduate (2002 \$). This yielded a BCR of 2.8, very similar to the ratio found by Logan et al. (2004). The cost savings were driven largely by reductions in the costs of jail, Medicaid, victim costs from crime, and drug-exposed infants (six in the control group, one in the drug court group). In addition, Loman (2004) projected costs and benefits for an additional 24 month period based on third-year data, resulting in estimated net savings over four years at \$7,707 per

drug court participant, or a BCR of 6.32 over the four-year period. These results exemplify how economic benefit estimates for treatment interventions, when limited to one-year follow periods, may be conservative estimates of long-term benefits that may accrue over time.

Prison Treatment

One recently published study examined the costs and benefits of several types of voluntary prison treatment programs operated by the Connecticut Department of Correction (Daley et al., 2004). This study examined program costs and economic benefits from reduced rearrest for a sample of inmates released from prison during FY1996-97 (N=831). All inmates who received any level of treatment prior to release (n=358) were compared to a random sample of inmates who had been screened as having a substance abuse problem but did not receive any treatment (n=473). Program costs were based on accounting costs from agency budgets, and personnel time for delivering treatment services, and excluded the costs of incarceration. The four levels of treatment received were: Tier 1 – one week of drug education classes; Tier 2 – three outpatient group counseling sessions per week for 10 weeks; Tier 3 – intensive day treatment incorporating four group sessions per week for four months; Tier 4 – residential TC treatment for six months.

Using logistic regression to control for baseline differences between the samples, Daley et al. (2004) found significant reductions in rearrests one year after release for treatment participants overall (33% rearrested compared with 46% for the no-treatment comparison sample). There was no significant effect for inmates who received Tier 1 services, compared with those receiving no treatment. Assuming that each rearrest resulted in reincarceration for one year, Daley et al. (2004) calculated BCRs of 5.74 for Tier 2, 3.16 for Tier 3, and 1.79 for Tier 4. Thus, although all three prison treatment programs yielded net economic benefits, the largest BCR was for the least intensive treatment, reflecting its relative low cost. Because inmates were not randomly assigned into the different treatment levels, one should be cautious in interpreting these results to mean that low intensity outpatient treatment would generally be preferred to long-term residential treatment. It is possible that

inmates who went into the Tier 2 program were lower risk (although the analyses by Daley et al. [2004] controlled for baseline factors, including a Need for Drug Treatment score and an Overall Risk Score). However, these findings suggest the need for more research on the relative economic benefits and cost effectiveness of outpatient prison programs of shorter duration, compared with long-term residential treatment.

Cost Savings Studies

Dismuke et al. (2004) compared the costs of substance abuse-related consequences at treatment entry, and over a 48-month follow-up period, for 1,326 treatment clients in Chicago. Cost measures included medical status, psychiatric status, employment, and criminal activity (as measured by items on the Addiction Severity Index). Including treatment costs, the average total costs decreased from \$19,108 at baseline to an average of \$6,671 per client 48 months after treatment admission (2000 \$).

Maynard et al. (1999) compared Medicaid costs before and after treatment for patients with co-occurring disorders discharged from residential treatment programs in Washington State between 1994 and 1997 (about one-third completed treatment, and the remainder left before completion). The average Medicaid reimbursement costs decreased by 44% from the year prior to treatment admission, to the year after treatment exit, from \$10,121 to \$5,682 per client. Three years after treatment, average Medicaid costs were \$2,197, a 78% reduction from baseline. The largest cost reductions were found for emergency room visits, psychiatric hospitalization, and outpatient medical services. Using a similar method, Maynard et al. (2000) compared pre-and post-treatment health service costs for 735 patients released from residential treatment in Washington State from 1994-1997. Average costs were lower than for the co-occurring disorder patients (see above), but were similarly reduced following treatment: from \$7,065 per client in the year prior to treatment to \$2,459 three years post-treatment, a 65% reduction. The main cost reductions were for psychiatric hospitalizations, and outpatient medical services.

Several unpublished state studies have examined cost offsets from treatment services for clients receiving welfare or other entitlement payments, and all found post-treatment reductions in health care costs. For example, Estee & Nordlund (2003) collected comprehensive health care cost data for a large sample of clients with substance abuse disorders in Washington State who were receiving Supplemental Security Income payments, compared with those who were diagnosed with substance use disorders, but who did not receive treatment. Adjusting for age, gender, race, and prior health care costs, treatment reduced the monthly client cost for medical expenses, hospitalization, nursing homes. Post-treatment costs for substance abuse treatment increased, however. The net overall decrease in costs was \$252 per client per month overall, \$292 per client per month if the client spent more than 90 days in treatment, and \$363 per client per month for treatment completers (2001 \$).

Finally, Parthasarathy et al. (2003) randomized outpatients in a Health Maintenance Organization in Sacramento CA to an Integrated Medical Care model (substance abuse treatment plus medical care; n=318) or Standard Independent Care (medical services received independently at an HMO; n=336). They compared medical service utilization and costs 12 months prior to treatment to 12 months after treatment admission. No significant differences in outcomes were found between the groups, but overall medical costs decreased for both groups. However, patients with substance abuse-related medical conditions in the Integrated Care group had significant reductions in hospitalization, inpatient days, and emergency room use, and a significant decrease in medical costs. Similar patients in the Standard Care group did not have a significant reduction in medical costs.

Summary of findings

Table 5 summarizes the key findings from the CBA studies included in this review. Although there have been a limited number of recent studies, our findings are consistent with previous reviews in concluding that substance abuse treatment yields positive net economic benefits (i.e. cost savings). All the studies reviewed found BCRs of greater than one, although the ratios varied widely (as low as 1.33

and as high as 39.0). Consistent with previous analyses, the largest proportion of the economic benefits accrued from reduced crime, including incarceration and victimization costs.

BCRs tended to be higher for community-based residential programs. For example, the average BCR was 4.34 across five programs in Washington State (with an average net benefit of \$21,329), and 5.19 for a modified TC for patients with co-occurring mental illness and substance use disorders (average net benefit of \$85,527 per client). By comparison, the BCR was 1.49 at six months post-treatment admission for a large sample of treatment clients in Chicago, and results from three CBA studies of multiple drug courts (which primarily use outpatient treatment) found BCRs of 1.74 (six drug courts in Washington), 2.71 (three drug courts in Kentucky), and 2.8 (a drug court in St. Louis). In contrast, the highest BCR in a study of different treatment tiers in Connecticut prisons was for the least intensive outpatient treatment: BCRs were 1.79 for a six-month residential TC program, 3.16 for an intensive four-month day treatment program, and 5.74 for a 10-week low-intensity outpatient program.

Table 5

Summary of Cost Benefit Analysis Findings

Modality	Author	BCR	Net Economic Benefits^a	Notes
Outpatient	Flynn et al. (1999)	1.33-3.26	Pre- to-post crime cost reductions 24-39%	DATOS sample
	Salomé et al. (2003)	1.49	\$881 at 6 months post treatment	Chicago Target Cities Project
	Fleming et al. (2002)	4.30	\$712 to healthcare system	Brief intervention for problem drinkers
		39.0	\$7,171 to society in reduced motor vehicle accidents	
	French, McCollister, Cacciola, et al. (2002)	3.10	\$17,143 Specialized care	Residential treatment for pregnant or parenting women
		6.50	\$8,090 Standardized care	
	Daley et al. (2004)	5.74	Not reported	3 sessions/week x 10 weeks, in prison
3.16		Not reported	Intensive day treatment for 4 months, in prison	
Residential	Daley et al. (2004)	1.79	Not reported	6 months residential TC, in prison
	French, Salomé, & Carney (2002)	4.34	\$21,329 (83% from reduced criminal activity)	5 programs in WA, short- and long-term residential
	Flynn et al. (1999)	1.68-2.73	Pre-to-post crime cost reductions of 75-79%	DATOS, long-term residential sample
	French, Roebuck, Dennis, Godley et al. (2003)	Not Reported	3 programs had net benefits at 12-month follow-up	5 structured adolescent treatments
	French, McCollister, Sacks, et al. (2002)	5.19	\$85,257 12 months post treatment	MICA patients, Modified TC
Drug Court	Carey & Finigan (2004)	Not Reported	\$4,789, including victim costs	Portland, OR
	Barnoski & Aos (2003)	1.74	\$6,779, including victim costs	Washington State, 6 courts
	Logan et al. (2004)	2.71	\$5,446	Kentucky, 3 courts
	Loman (2004)	2.80	\$2,615 per graduate, 24-month follow-up	St. Louis, MO
		6.32	\$7,707 per graduate, 48-month follow-up	

^a Per client

DISCUSSION AND CONCLUSIONS

Economic evaluations of substance abuse treatment can help to guide treatment funders and policy makers in making informed decisions about allocating scarce treatment resources, expanding treatment services, identifying those factors that can improve the cost effectiveness and net economic benefits of treatment. In general, this review and previous reviews, covering more than 100 studies, are consistent in finding that substance abuse treatment interventions yield net economic benefits to

society. Cost benefit studies of different treatment modalities and client populations continue to report significant cost savings and positive returns on treatment investments; a primary component of the economic benefit is the reduction in crime and victimization following treatment.

Some caution is warranted, however. Economic research on treatment is still in its relatively early stages, as evidenced by the relatively low quality ratings we assigned to many of the published studies. “Publication bias” means that studies may exist that did not find a treatment effect or positive economic impact, but were not published. As economic and research methodologies improve, more evidence-based treatment practice is implemented, and better-designed treatment outcome studies are conducted, our knowledge about the economic impacts of treatment is likely to expand considerably. The relatively recent emphasis on performance-based contracting at the state level, and on economic evaluations of treatment on the part of the National Institute on Drug Abuse, are also important trends that will increase the visibility and importance of economic evaluations of substance abuse treatment.

Some key methodological challenges need to be overcome to further expand our knowledge about the economic impact of treatment. Because of the lack of randomized controlled trials in which clients are randomly assigned to treatment or no treatment, it is possible that at least some of the treatment effects are due to factors other than the actual treatment. However, continued use of randomization to compare different types of services will be important for increasing our knowledge of the relative cost effectiveness of different treatment components. Although raising ethical issues (i.e. denying treatment to someone in need) and logistical difficulties, the use of randomized controlled trials is the ideal way to test the efficacy of treatment, and determine the economic benefits. Short of implementing full randomized trials, continued use of randomization to compare different types of services, or supplemental services, will be important for increasing our knowledge of the relative cost effectiveness of different treatment components. In addition, the emergence of new alternatives to random assignment (e.g. patient preference designs, multi-stage randomization; see TenHave et al., 2003) may allow expansion of stronger study designs and thus more confidence in research findings.

Another set of challenges relates to the importance, yet difficulty, of assigning monetary value to the multiple outcomes that result from substance abuse treatment. Drug abuse has multiple health and social consequences, so enumerating the full range of benefits of treatment is very difficult and costly. These benefits may be tangible as well as intangible. As we have seen, a large portion of the economic benefits from treatment are derived from reduced crime and victimization, yet there remains a lack of standardization about how to value crime reduction. Including high costs such as jury awards may inflate the economic benefits of crime reduction; ignoring victimization costs, on the other hand, may artificially lower the estimate of economic benefits. There is no consensus among researchers on how to quantify the economic benefits of the key treatment outcome measure of reduced drug or alcohol use. Valuing indirect or “qualitative” outcomes such as improved family functioning or self esteem can be quite challenging, and such outcomes have been largely ignored in the economics of treatment research literature. Some argue that as long as the tangible benefits of drug-related consequences are estimated, this may not be a large concern (French, Salomé, Sindelar et al., 2002), and placing a dollar value on reduced drug use or intangible or indirect benefits may result in “double-counting” of economic benefits.

Novel techniques such as “willingness to pay” are possible proxies for the value of reduced drug use (Zarkin et al., 2000). In the health care field, qualitative outcomes related to quality of life have been developed, and economic estimates of the value of Quality Adjusted Life Years or Life Days are commonly used (Gold et al., 1996). Although QALY measures have only been used infrequently in the substance abuse treatment literature, they deserve further study as a standardized outcome measure. Some economists, however, have recently questioned the utility of QALY measures for substance abuse treatment evaluations (Jofre-Bonet & Sindelar, 2004), in part because of the other important health, public safety, and social outcomes of interest.

Comprehensive analyses of treatment effects as well as economic costs and benefits require longer follow-up periods. Although treatment costs are “fixed” in the sense that clients participate in

discrete treatment episodes, benefits may accrue over time (e.g. from continued employment, long-term desistance from crime). Thus, studies that have a relatively short follow-up period are likely to underestimate benefits if clients do not relapse. From the perspectives of “treatment careers” (Hser et al., 1997), and the model of addiction as a chronic disease (McLellan et al., 2000), substance abusers are likely to engage in multiple episodes of treatment over the course of their lives. As more sophisticated economic modeling techniques develop, economists may be able to simulate more accurate models of lifetime economic costs and benefits of treatment.

A number of tools are now available to allow for more detailed assessment of treatment costs, including unit costs of service, as well as client costs. Methods will continue to be refined to allow a more complete calculation of treatment costs, but studies need to be clear about the sources and accuracy of cost data, the perspective used, and the time frames. The promulgation of “user-friendly” tools such as the Brief DATCAP may allow for the collection of more standardized treatment cost data. As French, Salomé, Sindelar et al. (2002) and others have argued, it is important to account for all program costs, including shared and hidden costs (Lillie-Blanton, 1998), if accurate conclusions are to be drawn about the net economic benefits or cost effectiveness of a program or intervention. Recent findings by Salomé et al. (2003) using the Client DATCAP, suggest that client opportunity costs can add substantially to the overall costs of treatment, especially for residential programs. French, Salomé, and Carney (2002) showed that lost wages alone could add up to 35% to the overall costs of residential treatment.

In addition, although a few studies have examined service unit costs, and a recently developed tool (SASCAP) has been used to estimate these costs, future studies should examine the costs of specific units of service. In conjunction with research on the effective *components* of treatment, such economic analyses will allow more refined estimates about how specific ingredients and services of treatment contribute to generating economic benefits.

This review indicates that there is a considerable gap in economic research on adolescent treatment. Given the stakes involved in reducing adolescent substance use, it will be important to expand outcomes and economic research on adolescent treatment interventions. Research on other important specific client populations is also needed: women, African Americans and Hispanics, and clients with co-occurring mental health and substance abuse disorders. In addition, it will be important to replicate existing economic evaluations in other settings and with different populations. For example, with most studies based on urban programs, more research is needed on rural treatment programs, which face different challenges related to geographical spread, staffing shortages, client transportation costs, and the impacts of recent surges in methamphetamine abuse in rural areas.

Given the high rates of substance involvement among criminal offenders, the fact that 36% of all treatment admissions come from the criminal justice system (including 48% of non-intensive outpatient admissions; Office of Applied Studies, 2002), and the high costs of drug- and alcohol-related crime, economic research on criminal justice-based treatment should be expanded. Although several economic evaluations of prison treatment programs and drug courts have been conducted, more CBAs of criminal justice treatment programs are needed (prison-based programs, jail-based treatment, drug courts, juvenile justice, probation, diversion programs). Only one study was found that examined the economic impacts of non-residential prison treatment (Daley et al., 2004), and the results of that study suggested that shorter term, less expensive prison treatment may yield substantial net economic benefits compared with longer-term residential prison treatment.

Finally, the development of more standardized treatment outcome measures will facilitate comparisons of findings across studies and populations. Benchmark values (i.e., incremental cost per unit outcome) need to be developed for assessing when treatment interventions are cost effective, as exist with health care interventions (Gold et al., 1996). Guidelines for selecting a dominant outcome for CEA of treatment are also needed, as are standards and techniques for using single vs. multiple

outcome measures in CEA and CBA (see Jofre-Bonet & Sindelar [2004] for an example of an aggregate outcome index in a CEA).

Although it might be of interest to policy makers, we do not believe it feasible at this point to establish an “average” or “typical” BCR or cost effectiveness ratio for treatment programs. Substantial variations in study designs and measures, client populations, time periods sampled, and treatment settings make it impossible to calculate a single average economic benefit. Nonetheless, the consistency of positive findings across settings, populations, methods, and time periods suggest that the economic effects of treatment may be relatively robust, and that future, better controlled and designed studies are likely to continue to find net economic benefits.

General conclusions about the relative cost effectiveness of different modalities or components of treatment cannot yet be made, but it is clear that the relative costs of different types of treatment vary considerably by program type, client population, and economic perspective. Outpatient and methadone maintenance programs have relatively low weekly and treatment episode costs. Studies of brief interventions, as well as several cost effectiveness studies of outpatient versus inpatient treatment, suggest that less intensive interventions may be more cost effective for certain clients. These findings are consistent with a number of earlier studies of alcoholism treatment that generally concluded both that shorter hospital-based treatment was more cost-effective than longer treatment, and that day clinic treatment is more cost effective than inpatient treatment (French, 1995). There is some evidence that high-need substance abuse populations such as those with co-occurring mental health disorders or pregnant and parenting women may need long-term, intensive treatment to achieve positive outcomes. Other studies suggest that enhanced treatment services in outpatient programs, although more expensive, are more cost effective than standard care.

Criminal justice clients are also likely to need more intensive treatment because of higher problem severity and other social and health problems. Aftercare treatment for released inmates is relatively inexpensive but appears to yield significant and long-term economic benefits, and to be

significantly more cost effective than prison treatment alone. On the other hand, one study with Connecticut inmates suggested that even low intensity, relatively short-term treatment in prison may yield net economic benefits. Economic evaluations of drug courts indicate that they produce net economic benefits, primarily because of reduced recidivism, but they tend to be costly programs and it is not yet known whether shorter or less intensive drug courts would be more cost effective.

The limited research on the costs of specific treatment components indicates that a substantial portion of treatment costs reflects non-clinical activities. Further research is needed to determine the implications of this finding for treatment effectiveness, but the findings are consistent with recent field studies indicating that a substantial proportion of group counseling sessions is spent on administrative or other non-clinical activities. Strategies for minimizing the non-clinical costs of treatment may be called for, as well as research on the implications of unit cost allocation on treatment outcomes.

Although this review has highlighted the importance of the economic perspective in making informed treatment policy decisions, there are other perspectives to be considered in making alternative funding decisions for substance abuse treatment. For example, the desire to reduce human suffering, concern about public health, or the pressures to reduce crime are all important factors for funding or encouraging implementation or expansion of treatment programs. Other factors include the feasibility of implementation, the ability of the program to serve an appropriate target population, political pressure, or the number of clients served (Lillie-Blanton et al., 1998). As Dismuke et al. (2004) suggest, clinical outcome measures should also be important determinants of the value of a treatment intervention: such outcomes are not necessarily highly correlated with economic outcomes.

Targeting issues are also important. Studies of the natural history of addiction find that some people can reduce their substance use, or achieve periods of abstinence, without treatment (Watson & Sher, 1998). Interventions with little or no expense to taxpayers (e.g. 12-step or faith-based programs) may also help many substance abusers maintain sobriety (Humphreys et al., 2004; McCrady et al.,

2004; Pandini et al., 2000). Pressure from employers or family members, or “aging out” may also reduce substance abuse. Accordingly, a challenge for public health systems is to expand assessment for substance abuse problems, and identify those substance abusers who may be able to reduce or eliminate their substance use without treatment (Harrell & Kleiman, 2002). For treatment providers, the challenge is to allocate their scarce resources to those clients who cannot reduce substance use on their own.

Within the current climate of pressure to implement evidence-based treatment practices, performance standards, and performance-based contracting, the substance abuse treatment system faces the considerable challenges of maintaining current funding levels and generating positive outcomes for clients. Governments desire to make informed decisions about allocating scarce dollars, and funding agencies should choose to allocate expenditures where they will achieve the most benefit. There are competing constituencies, and a greater number of worthy programs than there are funds to support them. These decision processes should ideally be driven by several concerns: (1) does the program serve a public good, (2) is the program effective in achieving its goals and objectives, (3) does the program spend its money efficiently, and (4) is the program more cost effective or yield net economic benefits compared with an alternative intervention or no intervention?

In this context, well-designed economic evaluations can play an important role in convincing funders to increase investments in treatment services. Funders and policy makers should encourage more economic evaluations of substance abuse interventions, including prevention programs, using scientifically accepted methods and standard measures. A research agenda is needed for advancing the literature on the economic impacts of substance abuse treatment. This should include developing new methodological advances and standards for estimating costs, valuing outcomes, follow-up and measurement techniques, and simulation models for long-term outcome projections. Promoting standardization and consistency in economic evaluation techniques, analysis perspectives, economic concepts, and methods is also important.

The evidence from recent and past research is that increasing the relatively modest current investments in substance abuse treatment can generate substantial economic benefits for society, especially given the large current treatment gap. Given these findings, and the financial and organizational struggles faced by many treatment providers, it appears likely that the growth of evidence-based treatment practice and better-designed economic evaluations will yield new additional evidence that investments in substance abuse and addiction treatment are feasible and justified. It is clear from research on the economic impacts of substance abuse and addiction on health, crime, social stability, and community well-being that the costs to society of *not* treating persons with substance abuse problems would be quite substantial.

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APPENDIX A

PUBLISHED STUDIES INCLUDED IN REVIEW

Authors	Year	Title	Journal	Type
Alexandre, P.K., Roebuck, M.C., French, M.T., & Barry, M.	2003	The cost of residential addiction treatment in public housing.	Journal of Substance Abuse Treatment, 24, 285-290.	Treatment cost
Alexandre, P.K., Salomé, H.J., French, M.T., Rivers, J.E., & McCoy, C.B.	2002	Consequences and costs of closing a publicly funded methadone maintenance clinic.	Social Science Quarterly, 83, 519-536.	Cost offset
Berger, L.M.	2002	Estimating the benefits and costs of a universal substance abuse screening and treatment referral policy for pregnant women.	Journal of Social Service Research, 29, 57-84	Cost benefit
Borisova, N.N. & Goodman, A.C.	2004	The effects of time and money prices on treatment attendance for methadone maintenance clients.	Journal of Substance Abuse Treatment, 26, 43-50.	Treatment cost
Borisova, N.N. & Goodman, A.C.	2003	Measuring the value of time for MM clients: willingness to pay, willingness to accept, and wage rate.	Health Economics, 12, 323-334.	Treatment cost
Byrne, F., Schauflier, R. Lightman, L., Finigan, M., & Carey, S.	2004	California's drug courts: A methodology for determining costs and avoided costs.	Journal of Psychoactive Drugs, SARC Supplement 2, 147-156.	Cost savings
Carey, S.M. & Finigan, M.W.	2004	A detailed cost analysis in a mature drug court setting.	Journal of Contemporary Criminal Justice, 20, 315-338	Cost offset
Cowell, A.J., Broner, N., & Dupont, R.	2004	The cost-effectiveness of criminal justice diversion programs for people with serious mental illness co-occurring with substance abuse.	Journal of Contemporary Criminal Justice, 20, 292-315	Cost effectiveness
Daley, M, Love, C.T., Shepard, D.S., Petersen, C.B., White, K.L., & Hall, F.B.	2004	Cost effectiveness of Connecticut's in prison substance abuse treatment.	Journal of Offender Rehabilitation, 39, 69-92.	Cost benefit
Dismuke, C.E., French, M.T., Salomé, H.J., Foss, M.A., Scott, C.K., & Dennis, M.L.	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	Cost offset
Doran, C.M., Shanahan, M., Mattick, R.P., Ali, R., White, J., & Bell, J.	2003	Buprenorphine versus methadone maintenance: A cost-effectiveness analysis.	Drug and Alcohol Dependence, 71, 295-302.	Cost effectiveness
Fass, S.M. & Pi, C.R.	2002	Getting tough on juvenile crime: An analysis of costs and benefits.	Journal of Research in Crime and Delinquency, 39, 363-399.	Review
Fleming, M.F., Mundt, M.P., French, M.T., Manwell, L.B., Stauffacher, E.A., & Barry, K.L.	2002	Brief physician advice for problem drinkers: Long-term efficacy and benefit-cost analysis.	Alcoholism: Clinical and Experimental Research, 26, 36-43.	Cost benefit
French, M.T., Dunlap, L. J., Zarkin, G. A., McGeary, K. A., & McLellan, A. T.	1997	A structured instrument for estimating the economic cost of drug abuse treatment.	Journal of Substance Abuse Treatment, 14, 445-455.	Treatment cost

French, M.T. & Martin, R.F.	1996	The costs of drug abuse consequences: A summary of research findings.	Journal of Substance Abuse Treatment, 13, 453-466.	Review
French, M.T., McCollister, K.E., Cacciola, J., Durell, J., & Stephens, R.L.	2002	Benefit-cost analysis of addiction treatment in Arkansas: Specialty and standard residential programs for pregnant and parenting women.	Substance Abuse, 23, 31-51.	Cost benefit
French, M.T. , McCollister, K.E., Sacks, S., McKendrick, K. & DeLeon, G.	2002	Benefit cost analysis of a modified therapeutic community for mentally ill chemical abusers.	Evaluation and Program Planning, 25, 137-148.	Cost benefit
French, M.T., Roebuck, M.C., Dennis, M.L., Diamond, G., Godley, S. H., Tims, F., Webb, C., & Herrell, J.M.	2002	The economic cost of outpatient marijuana treatment for adolescents: Findings from a multi-site field experiment.	Addiction, 97 (Suppl 1), 84-97.	Treatment cost
French, M.T., Roebuck, C.M., Dennis, M.L., Godley, S.H., Liddle, H.A., & Tims, F.M.	2003	Outpatient marijuana treatment for adolescents: Economic evaluation of a multi-site field experiment.	Evaluation Review, 4, 421-459.	Cost offset
French, M.T., Roebuck, M.C., & McLellan, A.T.	2004	Cost estimation when time and resources are limited: The brief DATCAP.	Journal of Substance Abuse Treatment, 27, 187-193.	Treatment cost
French, M.T., Salomé, H.J., & Carney, M.	2002	Using the DATCAP and ASI to estimate the costs and benefits of residential addiction treatment in the State of Washington.	Social Science and Medicine, 55, 2267-2282.	Cost benefit
French, M.T., Salomé, H.J., Sindelar, J.L., & McLellan, A.T.	2002	Benefit-cost analysis of addiction treatment: Methodological guidelines and empirical application using DATCAP and ASI.	Health Services Research, 37, 433-455.	Cost benefit
Godfrey, C., Stewart, D., & Gossop, M.	2004	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.	Cost benefit
Griffith, J.D., Hiller, M.L., Knight, K., & Simpson, D.D.	1999	A cost-effectiveness analysis of in-prison therapeutic community treatment and risk classification.	The Prison Journal, 79, 352-368.	Cost effectiveness
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.	Cost benefit
Jofre-Bonet, M. & Sindelar, J.L.	2004	Creating an aggregate outcome index: cost-effectiveness analysis of substance abuse treatment.	Journal of Behavioral Health Services Research, 31, 229-241.	Cost effectiveness
Jofre-Bonet, M., Sindelar, J.L., Petrakis, I.L., Nich, C., Frankforter, T., Rounsaville, B.J., & Carroll, K.M.	2004	Cost effectiveness of disulfiram: Treating cocaine use in methadone-maintained patients.	Journal of Substance Abuse Treatment, 26, 225-232	Treatment cost
Kaskutas, L.A., Witbrodt, J., & French, M. J.	2004	Outcomes and costs of day hospital treatment and nonmedical day treatment for chemical dependency.	Journal of Studies on Alcohol, 65, 371-382.	Treatment cost
Kunz, F.M., French, M.T., & Bazargan-Hejazi, S.	2004	Cost-effectiveness analysis of a brief intervention delivered to problem drinkers presenting at an inner-city hospital emergency department.	Journal of Substance Abuse Treatment, 65, 363-370.	Cost effectiveness
Lave, L.B. & Joshi, S.V.	1996	Benefit-cost analysis in public health.	Annual Review of Public Health, 17, 203-219.	Cost benefit

Logan, TK, Hoyt, W.H., McCollister, K.E., French, M.T., Leukefeld, C., & Minton, L.	2004	Economic evaluation of drug court: Methodology, results, and policy implications.	Evaluation and Program Planning, 27, 381-396.	Cost benefit
Masson, C.L., Barnett, P.G., Sees, K.L., Delucchi, K.L., Rosen, A., Wong, W., & Hall, S.	2004	Cost and cost-effectiveness of standard methadone maintenance treatment compared to enriched 180-day methadone detoxification.	Addiction, 99, 718-726.	Cost effectiveness
Masson, C.L., Sorensen, J.L., Batki, S.L., Okin, R., Delucchi, K.L., & Perlman, D.C.	2002	Medical service use and financial charges among opioid users at a public hospital.	Drug and Alcohol Dependence, 66, 45-50.	Treatment cost
Maynard, C., Cox, G.B., Krupski, A., & Stark, K.	1999	Utilization of services for mentally ill chemically abusing patients discharged from residential treatment.	The Journal of Behavioral Health Services and Research, 26, 219-228.	Cost offset
Maynard, C., Cox, G.B., Krupski, A., & Stark, K.	2000	Utilization of services by persons discharged from involuntary chemical dependency treatment.	Journal of Addictive Diseases, 19, 83-93.	Cost offset
McCollister, K.E. & French M.T.	2003	The relative contribution of outcome domains in the total economic benefit of addiction interventions: A review of first findings.	Addiction, 89, 1647-1659.	Cost benefit
McCollister, K.E. & French M.T.	2002	The economic cost of substance-abuse treatment in criminal justice settings.	In C. Leukefeld, F. Tims, and D. Farabee (Eds.), <i>Treatment of drug offenders</i> . New York: Springer Publishing Co.	Treatment cost, cost effectiveness
McCollister, K.E., French, M.T., Inciardi, J.A., Butzin, C.A., Martin, S.S., & Hooper, R.M.	2003	Post-release substance abuse treatment for criminal offenders: A cost-effectiveness analysis.	Journal of Quantitative Criminology, 19, 389-407.	Cost effectiveness
McCollister, K.E., French, M.T., Prendergast, M.L., Hall, E. & Sacks, S.	2004	Long-term cost-effectiveness of addiction treatment for criminal offenders: Evaluating treatment history and reincarceration five years post-parole.	Justice Quarterly, 21, 659-679.	Cost effectiveness
McCollister, K.E., French M.T., Prendergast, M., Wexler, H., Sacks, S., & Hall, E.	2003	Is in prison treatment enough? A cost-effectiveness analysis of prison-based treatment and aftercare services for substance-abusing offenders.	Law & Policy, 25, 63-82.	Cost effectiveness
McGeary, K.A., French, M.T., Sacks, S., McKendrick, K., & DeLeon, G.	2000	Service use and cost by mentally ill chemical abusers: Differences by retention in a therapeutic community.	Journal of Substance Abuse, 11, 265-279.	Treatment cost
Mojtabai, R. & Zivin, J.G.	2003	Effectiveness and cost-effectiveness of four treatment modalities for substance disorders: A propensity score analysis.	Health Services Review, 38, 233-259	Cost effectiveness
Parthasarathy, S., Mertens, J., Moore, C., & Weisner, C.	2003	Utilization and cost impact of integrating substance abuse treatment and primary care.	Medical Care, 41, 357-367.	Cost offset
Roebuck, M.C., French, M.T., & McLellan, A.T.	2003	DATStats: Results from 85 studies using the Drug Abuse Treatment Cost Analysis Program.	Journal of Substance Abuse Treatment, 25, 51-57.	Treatment cost
Salomé, H.J., French, M.T., Miller, M., & McLellan, A.T.	2003	Estimating the client costs of addiction treatment: First findings from the client drug abuse treatment cost analysis program (Client DATCAP)	Drug and Alcohol Dependence, 71, 195-206	Treatment cost

Salomé, H. J., French, M.T., Scott, C., Foss, M., & Dennis, M.	2003	Investigating variation in the costs and benefits of addiction treatment: Econometric analysis of the Chicago Target Cities Project.	Evaluation and Program Planning, 26, 235-238.	Cost benefit
Sindelar, J.L., Jofre-Bonet, M., French, M.T., & McLellan, A.T.	2004	Cost-effectiveness analysis of addiction treatment: Paradoxes of multiple outcomes.	Drug and Alcohol Dependence, 73, 41-50.	Cost effectiveness
Single, E.	2003	Estimating the costs of substance abuse: Implications to the estimation of the costs and benefits of gambling.	Journal of Gambling Studies, 19, 215-233.	Cost of substance abuse
Tengs, T.O., Osgood, N.D., & Chen. L.L.	2001	The cost-effectiveness of intensive national school-based anti-tobacco education: Results from the Tobacco Policy Model.	Preventive Medicine, 33, 558-570.	Simulation
Zarkin, G.A., Dunlap, L.J., & Homsí, G.	2004	The substance abuse services cost analysis program (SASCAP): A new method for estimating drug treatment services costs.	Evaluation and Program Planning, 27, 35-43.	Treatment cost
Zarkin, G.A., Lindrooth, R. C., Demiralp, B., & Wechsberg, W.	2001	The cost and cost-effectiveness of an enhanced intervention for people with substance abuse problems at risk for HIV.	Health Services Research, 36, 335-355.	Cost effectiveness

APPENDIX B

UNPUBLISHED STUDIES INCLUDED IN REVIEW

State	Author(s)	Institution	Title	Year	Type
Illinois	Bruni, M., Jacob, B-A., & Robb, S.	Illinois Department of Human Services, Office of Alcoholism and Substance Abuse	The effectiveness of substance abuse treatment in Illinois: Results of the Illinois Statewide Treatment Outcomes Project	2001	Cost offset
Kentucky	Walker, R., Logan, TK, Bradshaw, G., Leukefeld, C., Goltz, M., & Stevenson, E.	University of Kentucky Center on Drug and Alcohol Research	Kentucky substance abuse treatment outcomes study: FY2002 follow-up findings.	2004	Cost benefit
Maine	Baird, D., Lancot, M., & Clough, J.	Maine Department of Health and Human Services, Office of Substance Abuse	The economic costs of alcohol and drug abuse in Maine, 2000.	2004	Cost of substance abuse
Minnesota	Luxenberg, M. G., Christenson, M., Betzner, A. E., & Rainey, J.	Professional Data Analysts	Chemical dependency treatment programs in Minnesota: Treatment effectiveness and cost offset analysis.	1996	Cost offset
Missouri	Loman, L.A.	Institute of Applied Research	A cost-benefit analysis of the St. Louis City Adult Felony Drug Court	2004	Cost benefit
New Hampshire	Merrow, K. & Minard, R.A.	New Hampshire Center for Public Policy	Under the influence: Part 2: Treating addictions, reducing corrections costs	2003	Cost offset
Oklahoma	Oklahoma Department of Mental Health and Substance Abuse Services.	Oklahoma Department of Mental Health and Substance Abuse Services	Programs of Assertive Community Treatment (PACT): Jail and psychiatric inpatient days among PACT recipients admitted in FY 2003.	2004	Cost offset
Oregon	Finigan, M.	NPC Research	Societal outcomes and cost savings of drug and alcohol treatment in the State of Oregon.	1996	Cost offset
Washington	Estee, S. & Nordlund, D.	Washington State Department of Social and Health Services	Washington State Supplemental Security Income (SSI) cost offset pilot project: 2002 progress report.	2003	Cost offset
	Barnoski, R. & Aos, S.	Washington State Institute for Public Policy	Washington State's drug courts for adult defendants: Outcome evaluation and cost-benefit analysis.	2003	Cost benefit
	Nordlund, D., Estee, S., & Yamashiro, G.	Washington State Department of Social and Health Services	Treatment of stimulant addiction including addiction to methamphetamine results in lower health care costs and reduced arrests and convictions: Washington State Supplemental Security Income recipients.	2003	Cost offset

	Nordlund, D., Mancuso, D., & Felver, B.	Washington State Department of Social and Health Services	Chemical dependency treatment reduces emergency room costs and visits: Washington State Supplemental Security Income recipients	2004	Cost offset
	Cawthon, L. & Schrager, L.	Office of Research and Data Analysis, Department of Social and Health Services	First Steps database: Substance abuse, treatment, and birth outcomes for pregnant and postpartum women in Washington State.	1995	Cost offset
	Wickizer, T. & Longhi, D.	University of Washington & Washington State Department of Social and Health Services	Economic benefits and costs associated with substance abuse treatment provided to indigent clients through the Washington State's Alcoholism and Drug Addiction Treatment and Support Act (ADATSA) Program	1997	Cost offset
Wisconsin		Department of Health and Family Services & Department of Workforce Development	Wisconsin women's AODA/TANF program: A partial cost-benefit analysis of criminal justice involvement, employment and earnings, TANF cash assistance, Medicaid claims.	2002	Cost offset
Other	Harwood, H.J., Kallinis, S., & Liu, C.	CSAT and The Lewin Group	The costs and components of substance abuse treatment.	2001	Treatment cost
	Koenig, L., Harwood, H.J., Sullivan, K., & Sen, N.	CSAT, The Lewin Group, and Caliber Associates	Do the benefits of more intensive substance abuse treatment offset the costs?	2000	Cost benefit

APPENDIX C

STUDY CODING CATEGORIES

Type of cost/economic study

Cost Benefit
Cost Effectiveness
Cost Offset
Treatment Cost

Study Setting:

[NOTE: Some studies included samples from more than one treatment modality].

Alcohol Detoxification
Alcohol Outpatient
Alcohol Residential
Drug Detoxification
Drug Outpatient
Drug Residential
Methadone Maintenance or Primary Pharmacological Intervention
12-Step
Other (e.g. Therapeutic Communities, prison treatment or other criminal justice-based interventions)

Design Quality:

1. High (randomized trial, use of control variables, excellent economic measures)
2. High medium (randomized or partially randomized, no or inappropriate/inadequate control variables, good economic measures)
3. Medium (Matched comparison sample with analyses of pre-treatment differences and adequate statistical controls, adequate economic measures)
4. Low medium (Matched comparison sample with limited pre-treatment equivalency analyses, inadequate economic measures, no comparison sample but good economic measures)
5. Low (No or inadequately matched comparison sample, poor cost measures)

Relevance [based on rater judgments about generalizability or importance of client population, multiple sites, large and diverse sample, common treatment setting, recency of study, etc.]:

1. High
2. Medium
3. Low