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NATIONAL EVALUATION DATA SERVICES

DO THE BENEFITS OF MORE INTENSIVE SUBSTANCE ABUSE TREATMENT OFFSET THE COSTS?

September 2000

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CSAT
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FOREWORD

The Center for Substance Abuse Treatment (CSAT) works to improve the lives of those affected by alcohol and other substance abuse, and, through treatment, to reduce the ill effects of substance abuse on individuals, families, communities, and society at large. Thus, one important mission of CSAT is to expand the knowledge about, and the availability of, effective substance abuse treatment and recovery services. To aid in accomplishing that mission, CSAT has invested significant resources in the development and acquisition of high quality data about substance abuse treatment services, clients, and outcomes. Sound scientific analysis of this data provides evidence upon which to base answers to questions about what kinds of treatment are most effective for what groups of clients, and about which treatment approaches are cost-effective methods for curbing addiction and addiction-related behaviors.

In support of these efforts, the Program Evaluation Branch (PEB) of CSAT established the National Evaluation Data Services (NEDS) contract to provide a wide array of data management and scientific support services across various programmatic and evaluation activities and to mine existing data whose potential has not been fully explored. Essentially, NEDS is a pioneering effort for CSAT in that the Center previously had no mechanism established to pull together databases for broad analytic purposes or to house databases produced under a wide array of activities. One of the specific objectives of the NEDS project is to provide CSAT with a flexible analytic capability to use existing data to address policy-relevant questions about substance abuse treatment. This report has been produced in pursuit of that objective.

This analytic report examines the value to society that is associated with increased intensity of substance abuse treatment (e.g., additional days in treatment or additional hours of counseling) received by clients. The findings suggest that the incremental benefits to society from an additional day of outpatient care exceed the additional costs, while an additional day of care in residential treatment provides tangible but insufficient benefits to offset the additional costs of care. Implications of the findings are discussed in relation to research, policy, and practice.

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National Evaluation Data Services

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EXECUTIVE SUMMARY

1. INTRODUCTION

As a result of efforts by third-party payers to control health care costs, substance abuse treatment providers have been increasingly challenged to deliver the same quality of care with smaller budgets. Providers faced with such financial pressures may have few options other than providing less costly treatment, which may translate into shorter lengths of stay and fewer treatment services. While the field generally believes that providing less intensive treatment will yield poorer client outcomes, little is known about the economic costs to society.

In this analysis, we estimated the relationship between treatment intensity and post-treatment societal costs associated with substance abuse treatment clients. We focused on the impact of length of stay and individual and group counseling sessions on crime-related costs (including criminal justice), health care costs, welfare payments, and client earnings. For purposes of this paper, we refer to an increase in length of stay or an increase in the frequency of counseling as an increase in treatment intensity. We used regression analysis to control for client addiction severity, motivation, and other relevant factors. Societal benefits were measured by the estimated reductions in post-treatment costs and welfare payments or estimated increases in earnings and taxes with each additional day of treatment or hour of counseling. We then compared the additional benefits from increasing length of stay or counseling with the additional cost of providing such care.

The purpose of the analysis was to identify the value to society of varying the length of stay or hours of counseling for clients who received substance abuse treatment. While other studies and analyses have shown treatment to be cost beneficial, we did not examine the issue of whether providing treatment yields benefits to society which exceed the cost of treatment. Recognizing this distinction is important. Our study is able to address issues such as the value of extending the treatment episode of a client by one day. In this respect, we did not need to estimate what client outcomes would have been if they had not received treatment and then compare these to actual outcomes to estimate the overall value of treatment. Instead, we used regression analysis to examine variation in post-treatment outcomes of clients with different lengths of stay and hours of counseling to identify the “marginal” benefits of increasing treatment intensity, while controlling for important differences in clients.

Marginal benefits are simply the additional benefits gained from increasing the intensity of treatment by one unit. For example, the marginal benefit of length of stay would be the added benefits from one additional day of care for clients who are receiving treatment. The concepts

of marginal benefit and marginal cost are fundamental to economic and policy analysis. If the marginal benefits from an additional day of care exceed the marginal costs (i.e., the added costs from treating an existing client for one more day), then increasing the length of treatment would increase total net benefits (net of the additional cost). On the contrary, if marginal costs exceed marginal benefits, reducing the length of treatment would increase total net benefits to society. In this study, we examined the value of varying the intensity of treatment by comparing the marginal benefits of increasing treatment intensity to the additional costs.

2. METHODOLOGY

The data used in this analysis came from the National Treatment Improvement Evaluation Study, a federally-funded study designed to evaluate the treatment process at a number of selected programs supported by the Center for Substance Abuse Treatment (CSAT). Data were collected on a purposive sample of clients from 72 treatment programs that received CSAT demonstration grant funding. The treatment programs covered the major modalities, including short-term and long-term hospital and residential facilities, outpatient drug-free programs, and outpatient methadone programs. Data collection for NTIES was mainly carried out through a series of client interviews. Questionnaires were administered at treatment intake, at treatment discharge, and approximately one year after stopping treatment (follow-up).

Our regression analysis related length of stay and hours of counseling to client outcomes, while controlling for client addiction severity, demographic characteristics, prior treatment, treatment readiness, and comorbid medical conditions, including mental health. To identify treatment benefits from an additional day of care or hour of counseling, we ran separate regression models for each modality using post-treatment societal costs and earnings as our dependent variables. Societal costs include health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments. For example, if our regression results revealed that an additional day of treatment reduced annual societal costs by two dollars and increased post-treatment annual earnings by \$10, we would conclude that an additional day of treatment would create a \$12 annual benefit.

3. FINDINGS AND DISCUSSION

Our results indicate that longer treatment duration is associated with reduced post-treatment costs and increased client earnings for clients in short-term and long-term residential and outpatient drug-free programs. The (annual) marginal benefits to society from an additional day of treatment were roughly \$15 for long-term residential care, \$27 for outpatient drug-free

care, and \$32 dollars for short-term residential care. Increased earnings accounted for roughly 46, 77, and 78 percent of the benefits to society for short-term residential, long-term residential, and outpatient modalities, respectively. The marginal benefits to society represent offsets to the average cost of an additional day of treatment (our proxy for marginal costs) of approximately 44 percent for short-term residential, 27 percent for long-term residential, and 196 percent for outpatient drug-free treatment. In addition, our results for methadone maintenance relative to detoxification indicate that methadone maintenance would benefit society by approximately \$2,900 a year per client continuing treatment (or \$7.90 per day) as compared to clients who discontinued methadone treatment. This average benefit per day of \$7.90 represents roughly 87 percent of the average cost of methadone treatment per day. The results for the marginal benefits to the non-treated population from an additional day of care were similar but smaller than the marginal benefits to society.

In addition, we found that an additional hour of counseling per month was associated with benefits to society for clients in short-term hospitals and residential facilities. These benefits exceeded the additional costs of the counseling for short-term hospital care and offset more than 50 percent of the additional cost of counseling provided in short-term residential facilities.

The comparison of average treatment costs to marginal treatment benefits likely understates the true value of the additional treatment, because average cost is a poor estimate of marginal cost. The true marginal cost of an additional day of care is likely less than the average cost of a day of care. Average cost of a day of care for a client is defined as the total cost of the treatment episode divided by the number of days in treatment. Total costs include several one-time, labor intensive items (e.g., intake), which likely cause the average cost of a day of care to exceed the marginal cost of an additional day of care. This effect is particularly noticeable for short-term programs that perform relatively more client intakes; however, treatment is likely to be more intensive during the beginning of care in all treatment settings. In addition, our measure of average cost for counseling, which is measured by the costs for an hour of clinical staff time (from National Opinion Research Center, 1997), includes costs for medical staff who typically do not provide individual or group counseling to clients. Because therapeutic staff earn less than medical staff, these estimates are too large for an accurate comparison of the marginal benefits of individual and group counseling to the marginal costs.

4. IMPLICATIONS

Our findings suggest that the marginal benefits to society from an additional day of outpatient care exceed the additional costs, while an additional day of care in residential facilities provides notable but insufficient benefits to offset the additional cost of an extra day of care. From a policy perspective, the issue is where and how to devote Federal, State, and local resources in a way that maximizes societal welfare.

With respect to residential programs, the fact that marginal benefits do not exceed marginal costs does not suggest that treatment in these programs is not cost beneficial. In fact, a number of studies, including Koenig et al. (1999) which used NTIES data, have found that the total benefits of a treatment episode in residential facilities justify public expenditures for these treatments. Our findings do not address the issue of whether treatment is cost beneficial overall. Rather, they suggest that public support of these programs might be best devoted to ensuring that clients who need residential treatment receive it, but that efforts and resources used to extend the treatment of existing clients be devoted mainly to outpatient care. Our results also suggest that partially subsidized care may be appropriate for clients receiving residential care who face financial constraints that may force them to leave treatment prematurely. This approach recognizes that additional residential treatment yields marginal benefits to society, but that these marginal benefits are not entirely sufficient to cover the complete cost of the additional care.

There are a number of limitations to this study, some of which provide areas for future research. First, our measures of post-treatment costs and earnings only relate to the post-treatment reference period of approximately 12 months. If benefits from treatment last longer than this period, we have underestimated the marginal benefits of treatment duration and counseling. Caution also must be exercised in interpreting the results due to data limitations. The NTIES covered a purposive sample of clients at programs that received CSAT demonstration funding. Therefore, the results may not generalize to the entire treatment population. In addition, our ability to accurately measure the amount of counseling clients actually received is limited by the type of information collected in the NTIES discharge questionnaire. The questionnaire only asks clients to identify counseling received by a single provider who was identified by clients as being important to them. These limitations and others noted in the paper suggest that similar analyses need to be performed using different data sets to either support or refute our findings, and to enhance our understanding.

I. INTRODUCTION

As a result of efforts by third-party payers to control health care costs, substance abuse treatment providers have been increasingly challenged to maintain the same quality of care with smaller budgets. Providers faced with such financial constraints may have few options other than providing less costly treatment, which may translate into shorter lengths of stay and fewer treatment services or sessions. While the field generally believes that providing less intensive treatment will yield poorer client outcomes, little is known about the economic costs to society.

Significant evidence exists that substance abuse treatment is effective at reducing drug and alcohol dependence (Hubbard et al., 1989; Brochu et al., 1997; McCusker et al. 1996; Flynn et al., 1999; Gerstein and Johnson, 1999). Several studies have also demonstrated the indirect benefits of treatment, such as its ability to reduce the criminal activity of clients and its associated societal costs (Lessard et al., 1985; Harwood et al., 1988; Flynn et al., 1999; Koenig et al., 1999). Cost-benefit analyses, which attempt to quantify the economic benefits of treatment relative to its costs, have generally found that the benefits of treatment match or exceed its costs (Lessard et al., 1985; Harwood et al., 1988; National Opinion Research Center (NORC) and Lewin-VHI, 1994; Koenig et al., 1999; Flynn et al., 1999). Benefits are often measured in terms of reduced health care and crime-related costs, and increased client earnings and productivity. These benefits accrue to the client as well as to society and taxpayers and may offset the costs of publicly supported treatment.

While such studies suggest the economic value of publicly supported treatment, few studies have attempted to measure the impact of increasing the intensity of treatment. For instance, what are the additional economic benefits (or losses) of increasing (or decreasing) treatment duration, the amount of services provided, or the frequency of counseling sessions, and how do these benefits compare to the additional costs of treatment? Although economic studies of the relationship between increasing the intensity of treatment and treatment benefits are somewhat sparse, the effects of treatment intensity on therapeutic outcomes and readmission rates have been more widely researched. Several studies have established a positive relationship between length of stay and post-treatment outcomes (for example, see Moos et al. 1996, McCusker et al. 1996). However, the evidence on the impact of counseling sessions and other treatment services has been mixed (Etheridge et al., 1999).

In this paper, we used data from the National Treatment Improvement Evaluation Study (NTIES) to estimate the relationship between treatment intensity and post-treatment societal costs associated with substance abuse treatment clients. The analysis mainly focused on the impact of length of stay and frequency of individual and group counseling sessions on crime-

related (including criminal justice) and health care costs, welfare payments, earnings, and taxes. For purposes of this paper, we refer to an increase in length of stay or an increase in the frequency of counseling as an increase in treatment intensity. We used regression analysis to control for client addiction severity, motivation, and other relevant factors. The benefits from increasing treatment intensity were measured by the estimated reductions in post-treatment costs and welfare payments or increases in earnings and taxes with each additional day of treatment or hour of counseling. We then compared the benefits from an additional day of treatment or hour of counseling to the additional cost of providing such care.

The purpose of the analysis was to identify the value to society of varying the length of stay or hours of counseling for clients who received substance abuse treatment. While other studies and analyses have shown treatment to be cost beneficial, we did not examine the issue of whether providing treatment yields benefits to society which exceed the cost of treatment. Recognizing this distinction is important. Our study is able to address issues such as the value of extending the treatment episode of a client by one day. In this respect, we did not need to identify the difference between societal costs for substance abusers who do not receive treatment and those who do receive treatment, after controlling for demographic, drug-use, and other differences. Instead, we used regression analysis to examine variation in post-treatment outcomes of clients with different lengths of stay and hours of counseling to identify the “marginal” benefits of increasing treatment intensity, while controlling for important differences in clients.

Marginal benefits are simply the additional benefits gained from increasing the intensity of treatment by one unit. For example, the marginal benefit of length of stay would be the added benefits from one additional day of care for clients who are receiving treatment. The concepts of marginal benefit and marginal cost are fundamental to economic and policy analysis. If the marginal benefits from an additional day of care exceed the marginal costs (i.e., the added costs from treating an existing client for one more day), then the provision of an additional day of care would increase total net benefits (net of the additional cost). On the contrary, if marginal costs exceed marginal benefits, reducing the length of treatment would increase total net benefits to society. In this study, we examined the value of increasing the intensity of treatment by comparing the marginal benefits to the marginal costs.

II. LITERATURE REVIEW

1. COST-BENEFIT ANALYSIS

A number of studies have estimated the overall benefits of substance abuse treatment and then compared these benefits to the cost of treatment to derive benefit-to-cost ratios. While such studies are fundamentally different from this study as noted above, we believe a brief review of cost-benefit analyses for substance abuse treatment will provide some context for the analysis that follows.

Flynn et al. (1999) examined the costs and benefits of treatment for 502 cocaine-dependent clients who received care in either a long-term residential or outpatient drug-free treatment setting. Using data from the Drug Abuse Treatment Outcome Studies (DATOS), the study compared crime-related costs for each client in the 12 months before and after treatment and for the in-treatment period. The findings indicated that average treatment benefits per client, due to reductions in crime-related costs, were at least \$18,461 and \$1,891 for clients in long-term residential and outpatient treatment facilities, respectively. Based on these results, benefit-to-cost ratios of roughly 1:7 for residential treatment and 1:3 for outpatient treatment were calculated.¹

Koenig et al. (1999) examined the post-treatment benefits in terms of changes in clients' post-treatment health care costs, crime-related costs, and earnings. Using data from the National Treatment Improvement Evaluation Study (NTIES), the authors found that the average annual benefit to society per client was \$8,611 for crime-related costs, \$215 for health care costs, and \$351 for earnings. Benefit-to-cost ratios of greater than one were found for residential and outpatient modalities, indicating that treatment benefits more than offset treatment costs in these treatment settings. Across all modalities, the average benefit-to-cost ratio was 3:1. In an assessment of substance abuse treatment in California, NORC and Lewin-VHI (1994) also found that the benefits of treatment exceeded treatment costs; benefit-to-cost ratios were 2:4 for residential, 2:9 for outpatient drug-free, and 4:7 for continuing methadone treatment. Earlier studies by Harwood et al. (1988) and Lessard et al. (1985) demonstrated significant benefits from residential and inpatient treatment.

¹ Flynn et al. (1999) estimated benefits under different assumptions about crime-related costs for clients who did not respond to questions about criminal activity. The values reported above are the most conservative and based on the assumption that clients who did not provide information on criminal activity had no associated crime-related costs. Using high estimates of crime-related costs for clients who did not respond, the resulting benefit-to-cost ratios were 2:7 and 3:3 for residential and outpatient treatment modalities, respectively.

2. THE EFFECTS OF TREATMENT INTENSITY ON CLIENT OUTCOMES

Harwood et al. (1988) estimated the effects of increased treatment duration on post-treatment crime-related costs using multivariate regression analysis. The analysis is similar to the work described in this paper. It compares the marginal benefits of an additional day of care to the incremental treatment costs. The authors found that an additional day of care was associated with a decrease in criminal activity and a benefit to society of approximately \$21 per day for residential treatment (compared to cost of \$18.50 per day) and \$18 per day for outpatient treatment (compared to cost of \$6 per day). However, no statistically significant relationship was found between treatment duration and crime-related costs for clients receiving outpatient methadone treatment.

Although the literature associating treatment intensity with economic benefits is limited, several studies have generally examined the relationship between treatment intensity and client outcomes.² Findings from a few selected studies are noted here. Moos et al. (1996) found that readmission rates were lowest for clients who attended residential treatment programs for more than eight weeks and highest for clients who attended residential programs for two weeks or less; the readmission rates were 50, 45, and 39 percent two years after discharge for programs of two weeks or less, two weeks to eight weeks, and over eight weeks, respectively. In a random assignment study, McCusker et al. (1996) found that increased treatment duration in residential therapeutic communities resulted in lower rates of drug use and relapse at follow-up. Etheridge et al. (1999) estimated the effects of length of stay, in-treatment counseling and self-help, and after-treatment care on post-treatment cocaine and alcohol use and criminal activity. For clients in long-term residential treatment programs for six months or more, the estimated odds of using cocaine on a weekly basis one year after treatment were one-third those of clients whose treatment duration lasted three to six months. Similarly, substantial reductions in criminal activity were realized by clients who received long-term residential and outpatient treatment for six months or more. In a recent analysis of the NTIES data, Orwin and Ellis (2000) found positive relationships between length of stay and the probability of abstinence for clients in outpatient drug-free and long-term residential modalities. No statistically significant effect of treatment duration on abstinence was found for outpatient methadone and short-term residential treatment or treatment provided in correctional facilities.

² The majority of studies find a positive and statistically significant relationship between length of stay and treatment outcomes. However, see Long et al. (1998) and Trent et al. (1998) for counter examples. Some studies have found that shorter treatment programs are more cost-effective than longer programs. For example, see Barnett et al. (1997).

Some studies have found a positive relationship between services received and outcomes (Brochu et al., 1997, Daley et al., 1998, Moos et al., 1995), while others have found no relationship (McLellan et al., 1994, Ouimette et al., 1998). Moos et al. (1995) found that more in-treatment individual and group therapy sessions were associated with lower readmission rates for clients age 18-34 who received inpatient care. Brochu et al. (1997) performed a pre/post study which showed that clients in residential rehabilitation facilities who participated in therapeutic counseling for more than 22 hours reduced the severity of their problems associated with alcohol and drug use more than those with fewer hours of therapeutic counseling in the five months following treatment. Daley et al. (1998) found in a randomized study that patients in outpatient treatment programs who participated in group and individual motivational therapy sessions increased their adherence and completion rates.

On the other hand, Etheridge et al. (1999) failed to find that increases in counseling during treatment were associated with lower criminal activity one year after treatment. Ouimette et al. (1998) also found no relationship between attending 12-step programs or counseling and substance abuse outcomes for clients without post-traumatic stress disorder. Outcomes were defined as an individual's ability to cope by using problem solving to deal with both social and substance abuse issues. McLellan et al. (1994) found that the number of substance abuse services provided to cocaine and opiate abusers during their inpatient or outpatient treatment episodes was not related to social adjustment and substance abuse outcome measures.

III. METHODOLOGY

For this study, we used regression analysis to identify the effects of treatment intensity on the post-treatment societal costs and earnings of clients. The regression model related length of stay and hours of counseling to client outcomes, while controlling for client addiction severity, demographic characteristics, prior treatment, treatment readiness, and comorbid medical conditions. We measured treatment benefits by calculating the estimated reductions in post-treatment health care costs, crime-related costs, and welfare payments, and increases in post-treatment earnings and taxes.

1. MEASURING BENEFITS

In conducting our analysis, we distinguished between benefits to society and benefits to the non-treated population. As the names imply, the first measure includes benefits that accrue to all members of society, including the clients under study, while the second measure excludes treatment benefits to those clients receiving treatment. The distinction allows one to separately identify the benefits to clients and the rest of society, which is more likely than the group of clients to consist of taxpayers whose taxes financially support government-funded substance abuse treatment.

The main difference between benefits to society and benefits to the non-treated population is in the treatment of “transfers” and client earnings. Transfers are a redistribution of payments or property from one person to another, such as theft losses or welfare payments. From an economic perspective, such transactions do not have any *direct* effect on the well being of society, since one person’s gain (client) is another’s loss (e.g., taxpayer, crime victim). Therefore, theft losses and welfare payments are not included in the calculation of benefits to society. However, theft losses and taxes used to make welfare payments to clients do affect non-treated individuals who are victims of crime and who pay taxes. In addition, we included increased earnings of clients in our calculation of benefits to society but only the additional income taxes from the additional earnings in our calculation of benefits to the non-treated population.

Exhibit III-1 below summarizes the different benefit measures. This is not an exhaustive list of the potential economic benefits to society and the non-treated population. For example, reductions in theft losses may ultimately benefit society to the extent that they lead to reductions in insurance premiums and expenditures on security devices. There are certainly other potential economic benefits of treatment that are not reflected in this study. We only included in our measures of economic benefits those factors that could be quantified with the available data.

EXHIBIT III-1		
COMPONENTS OF ECONOMIC TREATMENT BENEFITS		
	BENEFITS TO SOCIETY	BENEFITS TO NON-TREATED POPULATION
Health Care	Reductions in health care costs	Reductions in health care costs
Crime	Reductions in criminal justice costs (police protection, adjudication and sentencing, and corrections) and victim losses (lost wages, property damages, and medical costs)	Reductions in criminal justice costs (police protection, adjudication and sentencing, and corrections) and victim losses (lost wages, property damages, and medical costs)
	--	Reductions in theft losses
Earnings	Increases in (pre-tax) earnings	--
Taxes	--*	Increases in taxes from higher earnings
Welfare	--	Reductions in welfare payments

* Taxes are included in earnings.

To identify treatment benefits, we ran three separate regression models for each modality. We first used as our dependent variable the post-treatment costs associated with the components included in the calculation of benefits to the non-treated population (with the exception of taxes). These components were health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments. Together they represent post-treatment costs to the non-treated population. For taxes, we applied a marginal tax rate to the estimated effects from the regressions of client earnings (discussed below). We used the results from these two regression models (i.e., post-treatment costs and post-treatment earnings) to calculate benefits to the non-treated population. If, for instance, our regression results from the models indicated that an additional day of treatment reduced post-treatment costs to the non-treated population by \$3 and increased taxes by \$1, we would conclude that an additional day of treatment would create a \$4 benefit to the non-treated population.³

We next used as our dependent variable a measure of post-treatment costs to society. This measure was calculated as the sum of health care costs, criminal justice costs, and victim losses due to crime. Finally, a third model was estimated to identify the effects of treatment intensity on post-treatment client earnings. We then combined the results from these two regression models to identify the marginal benefits to society of increasing treatment intensity.

³ Most of these benefits would begin to accrue to the non-treated population and society soon after a client left treatment. For example, an avoided theft would result in less victim losses. However, the benefits in terms of reduced criminal justice costs are likely to occur only after sustained, large reductions in criminal activity, which alter the long-term allocation of funding for police, courts, and prisons at the State and Federal levels.

For instance, if our regression results revealed that an additional day of treatment reduced costs to society by \$2 and increased post-treatment earnings by \$10, we would conclude that an additional day of treatment would create a \$12 benefit to society.

2. DATA: SAMPLE, MEASURING COSTS AND EARNINGS, AND EXPLANATORY VARIABLES

The data used in this analysis came from the National Treatment Improvement Evaluation Study (NTIES), a federally-funded study designed to evaluate the treatment process at a number of treatment providers supported by the Center for Substance Abuse Treatment (CSAT) through demonstration grants. (For a summary of the NTIES study design and methodology, see Appendix D.) Data were collected on a purposive sample of clients from 72 different treatment providers. The treatment programs covered the major modalities, including short-term and long-term hospital and residential facilities, outpatient drug-free and methadone sites, and correctional treatment programs.⁴ Detailed information on NTIES is available in the final report by National Opinion Research Center (1997).

Data collection for NTIES was mainly carried out through a series of client interviews between the summer of 1993 and the fall of 1995. Questionnaires were administered at treatment intake, at treatment discharge, and approximately one year after stopping treatment (follow-up). The intake and follow-up questionnaires collected similar types of information on a number of subjects. Clients were asked about their drug and alcohol use, treatment history, health and health care utilization, living conditions, criminal activity, income, and work experiences. The discharge questionnaire administered at treatment exit was less detailed than either the intake or follow-up questionnaires and focused on clients' in-treatment experiences. Client record abstraction forms were also completed for some clients in order to provide additional or validating information.

In total, 6,595 clients completed an intake questionnaire. However, only 5,388 clients completed an intake and follow-up questionnaire. Of these 5,388 individuals, 4,411 qualified for the outcome analysis sample created by NORC and used in this analysis. NORC excluded

⁴ While separate analyses were performed for each modality, we do not report means or regression results for correctional programs. Our results for these programs generally indicate no positive relationship between treatment intensity and client outcomes. However, these programs include different modalities of care, and, therefore, our results may not be an accurate indication of the relationship between length of stay and/or counseling and benefits. Specialized modeling of the correctional programs may be necessary to clarify the effects of treatment intensity on client outcomes for correctional programs.

977 clients for the following reasons: they had not completed either a discharge interview or a record abstraction form, and therefore no information was available on the amount or type of treatment they received; their follow-up reference period deviated significantly from the targeted 12-month follow-up period (i.e., less than five months or greater than 20 months); or they were incarcerated for all or almost all of either the 12 months prior to intake or the follow-up reference period and therefore did not have any earnings or could not engage in criminal activity (NORC, 1997). Of the remaining 4,411 clients we only included those who had completed the discharge interview (3,679).⁵ We excluded clients who did not complete the discharge interview because the data elements from the discharge questionnaire were needed for the regression analysis.

2.1 Measuring the Benefits of Treatment: Pre- and Post-treatment Costs and Earnings

Our construction of pre- and post-treatment costs and earnings for clients relies heavily on measures developed in Koenig et al. (1999). Below, we present a brief description of the methodology used to develop the cost and earnings estimates. For a more detailed description, see Appendix A or Koenig et al. (1999).

As noted above, costs include health care costs, crime-related costs, and welfare payments. Health care costs were derived from information on the number of hospital inpatient admissions, the number of medical visits to office-based physicians or clinics, and the number of emergency room visits. We calculated costs by multiplying estimates of the average cost of a night in a hospital, a medical visit, and a visit to an emergency room by the corresponding number of times clients reported each type of health care utilization (see Appendix A for sources).

Pre- and post-treatment earnings and welfare payments were obtained from information collected by the intake and follow-up questionnaires. Clients were asked to indicate if any wages, salaries, or tips were received during the 12 months prior to intake and, if so, how much. Similar questions were asked on whether clients received welfare or relief payments, including General Assistance (GA) or Aid to Families with Dependent Children (AFDC). In addition, clients were asked to report income from unemployment compensation (UI), disability pay, and/or supplemental security income (SSI) received.

⁵ It was also necessary to exclude from our regression analysis two clients from a single long-term hospital facility. The remaining clients came from one short-term hospital facility, six short-term and 16 long-term residential facilities, seven methadone and 31 drug-free outpatient sites, and nine correctional facilities.

Crime-related costs include direct losses attributable to crimes, such as victim losses and theft losses as well as criminal justice costs. Victim losses include the value of property damaged in the commission of a crime, victim medical costs, and lost wages from work. Theft losses include the value of cash and property stolen. Our estimates of criminal justice costs include expenditures for police protection, adjudication and sentencing, and corrections. Data on crime-related costs were obtained from a variety of published sources, which are noted in Appendix A. After constructing estimates of average criminal justice costs, victim losses, and theft losses associated with different crimes, we constructed cost estimates by multiplying estimates of costs per crime by the number crimes clients reported committing and then summed across different types of crimes.

Cost data were obtained for 1994 when available or converted into 1994 dollars using appropriate price indexes. This approach standardized costs and earning estimates to the mid-year of the NTIES data collection effort.

2.2 Explanatory Variables

In Exhibit III-2, we present the explanatory variables used in the regression analysis. These variables correspond to the following categories: client demographic characteristics, in-treatment services and measures of intensity, measures of addiction severity, comorbid medical conditions, treatment readiness, and treatment history.

Data for the treatment services and intensity measures were typically obtained from self-reported information from the discharge interview. However, when such information was unavailable, either because a client did not complete a discharge interview or did not respond to a specific item, we attempted to obtain the necessary information from data reported on the client record abstract form. Many of our measures are based on the work by Orwin and Ellis (2000). Below, we present a description of the methodology used to construct the measures of treatment intensity and other explanatory variables.

EXHIBIT III-2	
EXPLANATORY VARIABLES USED IN REGRESSION MODELS	
VARIABLE	DATA DESCRIPTION (NTIES VARIABLE NAME)
Demographic	
Age	Age (R34)
Race/ Ethnicity	Race: White, Black, Hispanic, Other (R43, R44)
Gender	Gender (R29)
Education	College (R58), High School Degree (R62), GED (R61), No High School
Marital Status	Currently Married (R222)
Children	Number of children currently raising (R216)
In-Treatment Services and Intensity Measures	
Length of Stay in Treatment	Duration of index treatment episode (LOS)
Vocational and Educational Counseling Need	Vocational Counseling (R411), Academic Counseling (R61)
Received Vocational or Educational Counseling	Vocational (T389, F15A9, F15A10) Academic (T362, F15A11)
Counseling	Hours of individual and group counseling per month with substance abuse treatment provider (T183, T191)
Addiction/Severity Characteristics	
Primary Drug	Alcohol Only, Heroin Only, Crack/Cocaine Only, Single Other Drugs, Multiple Drugs (R113M1-R113M13)
Drug Use Prior to Treatment	Cash spent on drugs last 30 days (R127) Days drank alcohol in last 30 days (R140)
Comorbid Medical Conditions	
General Health	Excellent or good health (R423)
Symptoms of Mental Illness	Symptoms of mental illness 12 months prior to treatment (R289, R294, R297, R298, R302, R303, R306, R307, R309)
Received Medical Services	Medical services (T457, F15A1-F15A2)
Received Mental Health Services	Mental health services (T424, F15A3)
Treatment Readiness and Motivation	
Importance of Drug Treatment	Drug treatment very important (R92)
Importance of Alcohol Treatment	Alcohol treatment very important (R162)
Self Referral	Self referred into treatment (R84A1-R84A3)
Referred by Legal Authority	Drug treatment required by legal authority (R373)
Treatment History	
Prior Treatment Experience	Number of times entered treatment prior to index treatment episode (R258)
Attended Alcoholics (AA), Cocaine (CA), or Narcotics Anonymous (NA)	Attended AA, CA, or NA five or more times in last 12 months (R274)

Note: NTIES variable names indicate the data source: R=intake questionnaire, T=discharge questionnaire, F=client record abstraction form.

Counseling

Information on individual and group counseling was gathered during the discharge interview and during abstraction of client records. We used data about counseling from the discharge interview to construct our measure of counseling hours per month. However, some serious limitations concerning information from the discharge interview are worth noting. First, clients were asked about counseling sessions with a single client-selected staff member whom clients identified as being “the most important to [them].” If a client could not identify such a staff member, no counseling information was collected (slightly more than 6 percent of clients could not identify such a person). Second, the data collected do not distinguish between group and individual counseling.

Two items on the discharge questionnaire were used to calculate the amount of counseling received from each clients’ principal provider. Item T183 refers to the frequency of counseling (5+/wk, 2-4/wk, 1/wk, 2-4/mo, and 1/mo) and item T191 to the average duration (10 min, 10-29 min, 30-59 min, 1-2 hrs, and more than 2 hrs). We used the interval midpoints of frequency and duration of counseling and multiplied the resulting values to calculate hours of counseling per month. For example, if a patient went to counseling two to four times per week for 30 to 59 minutes then the calculated frequency would be three times per week for 44.5 minutes or 8.9 hours per month.

We chose not to use data on counseling from the client record abstraction form because a number of providers did not record the frequency of counseling sessions for their clients. No information on individual and group counseling was available from the client record abstraction form for 18 and 17 percent of all clients, respectively. In addition, the information reported the number of times counseling services were provided for the client during the entire treatment period by the following categories: 1 time, 2-3 times, 4-10 times, 11 or more times, number uncertain, and not mentioned in record. The most widely selected category was “11 or more times,” with 33 percent of clients falling into this category for individual counseling and 49 percent falling into this category for group counseling. Because so many clients fell into the “11 or more times” category, using these categorical measures of counseling may produce biased estimates of the effects of counseling in our regression analysis.

Academic and Vocational Counseling

In addition to group and individual counseling, we identified clients who needed and received academic and vocational counseling. These types of counseling services may be

particularly important for reducing the criminal activity of clients and increasing their earning potential. Generally, whether a client received a service was taken from self-reported information in the treatment discharge questionnaire; whether the services were needed was determined using the client's stated priorities at intake. Clients were considered in need of educational counseling if they did not have a high school diploma or graduate equivalent degree (GED). Clients indicated in the discharge questionnaire if they received vocational or educational counseling while in treatment. If this information was not available, the information from the client record abstraction form was used to identify clients who had received educational or vocational counseling services.

General and Mental Health Status

Variables used to measure clients' mental and general health status were created from the clients' perceptions of their health status at intake and reported symptoms of mental illness. Clients who reported "excellent" and "good" general health were categorized into one group, while those who reported "fair" or "poor" general health were grouped into another category. The mental health status variable generally follows the measure created by Orwin and Ellis (2000) and records a client as suffering from a mental health condition if a client reported at intake one of the following symptoms not related to drug use: sudden fear, depression, suicide attempts, suicidal thoughts within the past 12 months, or hallucinations at any time in his or her life.

IV. DESCRIPTIVE STATISTICS

In this section, we discuss some descriptive measures of the variables included in the regression analysis. We begin by presenting our measures of costs and earnings for the pre- and post-treatment periods. The entries in Exhibit IV-1 represent average costs and earnings per client per day. We have converted our measures of pre- and post-treatment costs and earnings used in the regression analysis into per day measures to increase their comparability. The non-standardized pre-treatment costs/earnings correspond to the 12 months prior to intake, while the post-treatment costs/earnings correspond to the follow-up reference period, which varied from client to client and averaged approximately 10 months.⁶

Clients in long-term residential facilities had the greatest pre-treatment costs per day for both cost measures, while clients in outpatient programs generally had the least costs per day. These measures give an indication of client severity. Clients in short-term hospitals and methadone facilities realized the largest change in post-treatment costs, while clients in short-term residential treatment facilities realized the smallest. The most significant decrease in non-treated and societal costs per day occurred in long-term residential facilities. On average, clients in all modalities, except short-term residential facilities, realized an increase in earnings per day post-treatment.

EXHIBIT IV-1					
AVERAGE PRE- AND POST-TREATMENT COSTS AND EARNINGS PER DAY BY MODALITY					
	Short-term Hospital	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Average Costs to the Non-treated Population per Day					
After	\$37.99	\$14.40	\$28.22	\$20.15	\$32.45
Before	\$40.55	\$43.94	\$70.39	\$37.98	\$65.48
Average Costs to Society per Day					
After	\$18.13	\$11.05	\$16.45	\$12.54	\$19.71
Before	\$25.22	\$29.20	\$44.08	\$26.67	\$33.46
Average Earnings per Day					
After	\$7.10	\$19.42	\$9.44	\$15.15	\$6.02
Before	\$6.67	\$20.93	\$7.01	\$10.03	\$7.51

Source: Authors' analysis of NTIES data

⁶ In our regression analysis, we controlled for the fact that clients have different follow-up reference periods by including the length of the period as a control variable in the empirical models.

Means and percents for client background variables are presented in Exhibit IV-2. The average age of clients was 32.7 years, with methadone detoxification facilities having the oldest population (36.9) and long-term residential facilities having the youngest (30.3) on average. The majority of clients across modalities were male (68.3 percent), African American (57.4 percent), single (89.0 percent), in either good or excellent health (62.5 percent), did not suffer from any mental health conditions (81.5 percent), and did not hold a high school degree or GED (45.8 percent).

EXHIBIT IV-2					
MEANS AND PERCENTS FOR BACKGROUND VARIABLES AT					
INTAKE BY MODALITY					
BACKGROUND VARIABLE	Short-term Hospital (N=213)	Short-term Residential (N=660)	Long-term Residential (N=839)	Outpatient (N=1566)	Methadone Detox. (N=278)
Age	35.1	31.2	30.3	32.3	36.9
Gender					
Male	65.7%	69.1%	49.5%	71.6%	66.9%
Female	34.3%	30.9%	50.5%	28.4%	33.1%
Race/Ethnicity					
White	8.00%	36.2%	22.5%	18.1%	23.7%
Black	90.6%	45.5%	61.9%	61.9%	46.8%
Hispanic	0.9%	16.5%	11.0%	15.3%	29.1%
Other race	0.5%	1.8%	4.6%	4.7%	0.4%
Education					
College	11.3%	26.8%	16.9%	19.7%	14.7%
High school	15.5%	26.2%	19.0%	20.4%	25.5%
GED	17.8%	15.3%	12.2%	13.9%	16.2%
No high school degree	55.4%	31.7%	51.9%	46.0%	43.6%
Number of children	0.55	0.41	0.53	0.58	0.73
Married	20.2%	26.3%	16.2%	19.4%	25.2%
Working at intake	34.7%	66.1%	45.1%	50.3%	29.5%
Comorbid medical conditions					
Health good or excellent	18.0%	78.5%	70.4%	69.3%	57.6%
Mental health condition	49.0%	10.4%	16.5%	20.3%	3.6%

Source: Data from the NTIES

In Exhibit IV-3, we present descriptive statistics related to treatment readiness and addiction severity. With the exception of methadone clients, the majority of clients reported that treatment for drugs was very important, while many fewer clients reported that treatment for alcohol was very important. While beliefs on the importance of treatment are an indication of readiness for treatment, the low percentage of clients who reported that alcohol treatment was very important is, in part, a reflection of the relatively small number of alcohol abusers in the sample; approximately 13 percent of clients from all modalities indicated that alcohol abuse was the only reason for treatment. Clients in short-term hospital and residential facilities, who are often more severe addiction cases, responded more frequently than their counterparts that treatment was very important. This finding suggests that self-reported importance of treatment may be more an indication of addiction severity than treatment readiness alone. Most clients, when asked to identify what substance(s) they sought treatment for, identified multiple substances rather than a single substance.

EXHIBIT IV-3					
MEANS AND PERCENTS FOR TREATMENT READINESS AND ADDICTION CHARACTERISTICS BY MODALITY					
VARIABLE	Short-term Hospital (N=213)	Short-term Residential (N=660)	Long-term Residential (N=839)	Outpatient (N=1566)	Methadone Detox. (N=278)
Treatment Readiness					
Drug tx very important	86.9%	82.9%	84.0%	63.0%	1.8%
Alcohol tx very important	15.0%	35.8%	25.9%	27.0%	5.6%
Treatment required by law	18.3%	28.2%	25.4%	40.9%	8.8%
Self referred	69.5%	61.4%	59.1%	57.9%	61.6%
Addiction Severity					
\$ for drugs past 30 days	\$875	\$811	\$522	\$283	\$1,304
Times drank past 30 days	12.4	5.5	5.3	4.3	3.7
Primary Drug					
Alcohol only	13.1%	12.4%	7.3%	25.1%	NA
Cocaine/Crack only	28.2%	26.4%	29.0%	22.7%	NA
Heroin only	0.5%	8.3%	2.0%	2.3%	57.9%
Single other drug	0.0%	5.6%	4.3%	7.5%	NA
Multiple substances	58.2%	47.3%	57.4%	42.4%	42.1%

Source: Data from the NTIES, NA= not applicable

In Exhibit IV-4, we present descriptive statistics for treatment characteristics. Individual and group counseling was more frequently attended by clients in short-term hospital and residential programs than by clients in other modalities. The need for vocational and academic counseling was most likely to be met for clients in long-term residential facilities. With the

exception of methadone detoxification, a large number of clients attended either Alcoholics Anonymous, Cocaine Anonymous, or Narcotics Anonymous five or more times in the 12 months prior to intake. In addition, for most clients the NTIES treatment episode was not their first time in treatment.

EXHIBIT IV-4					
MEANS AND PERCENTS FOR TREATMENT					
CHARACTERISTICS BY MODALITY					
VARIABLE	Short-term Hospital (N=213)	Short-term Residential (N=660)	Long-term Residential (N=839)	Outpatient (N=1566)	Methadone Detox. (N=278)
Length of stay	11.7	65.0	92.5	119.8	143.9
Hours of individual or group therapy per month	14.0	17.2	10.9	11.1	4.7
Vocational counseling					
Needed	41.2%	35.9%	42.9%	38.1%	56.2%
Needed and received	2.4%	6.1%	9.6%	5.5%	1.2%
Academic counseling					
Needed	67.1%	56.7%	58.3%	56.3%	57.0%
Needed and received	0.5%	4.1%	13.6%	7.3%	1.2%
Received health services	83.6%	83.7%	72.2%	50.6%	51.1%
Received mental health services	34.0%	29.4%	26.5%	23.0%	10.6%
Prior drug/alcohol treatment					
Number of treatments	2.8	1.3	1.7	1.6	2.7
Attended AA, CA, NA 5+ times last 12 months	46.0%	61.8%	55.3%	50.8%	28.8%

Source: Data from the NTIES, NA=not applicable

V. FINDINGS

We performed separate regression analyses for both cost measures (benefits to society and the non-treated population) and for earnings. In the first set of analyses, we estimated the impact of treatment on post-treatment costs to the non-treated population; these costs include health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments received by clients. The estimates from these analyses were used to calculate the marginal benefits to the non-treated population from an additional day of treatment and hour of counseling.

In the second set of analyses, our measure of post-treatment costs to society was used as the dependent variable, calculated as the sum of the health care costs, criminal justice costs, and victim losses due to crime. Note that the costs to society differ from the costs to the non-treated population in that the former do not include theft losses and welfare payments. The final set of analyses models post-treatment earnings as dependent on treatment intensity and other factors. The regression results from these two analyses (i.e., costs to society and earnings) were combined to determine the marginal benefits to society from an additional day of treatment and hour of counseling.

Each set of analyses included the same set of measures of treatment intensity (i.e., length of stay and hours of counseling per month) and background variables, with only a few exceptions. First, some variables (e.g., alcohol only as primary drug) were not applicable for clients who received methadone outpatient care. Second, some cells for the background and control variables were empty (or almost empty) for certain modalities and, thus, parameter estimates were not obtainable. As an additional control, we included pre-treatment values for the dependent variable in each model. We also included a variable for the length of the follow-up period in each model.

Finally, as demonstrated in Exhibit V-1, a good number of clients have neither post-treatment costs to the non-treated population nor post-treatment costs to society associated with them. In addition, a large percentage of clients had no legitimate earnings in the post-treatment period. We therefore proceeded by estimating logistic regression models using the complete sample and ordinary least squares (OLS) regression models using observations for clients with post-treatment costs and earnings. This two-part estimation technique is similar to the approach used in the analysis of health expenditures as part of the RAND Health Insurance Experiment (Newhouse, 1993; Duan et al., 1982).

The logistic regressions model the probability that a client has positive post-treatment costs to the non-treatment population, positive post-treatment costs to society, and positive post-treatment earnings. In the OLS models, we used the log of costs and earnings as our dependent variable.

EXHIBIT V-1					
PERCENT OF CLIENTS WITH NO POST-TREATMENT COSTS OR EARNINGS					
COST/EARNING	Short-term Hospital	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Costs to Non-treated Population	13.7%	29.7%	13.7%	13.0%	16.8%
Costs to Society	22.9%	36.5%	30.1%	37.9%	31.2%
Earnings	61.5%	30.8%	47.9%	48.7%	74.6%

Source: Authors' analysis of NTIES data.

In the tables below, we present our regression results for the main variables of interest.⁷ Findings from two model specifications are presented. Model 1 includes the full set of explanatory variables presented in Exhibit III-1, with the exception of the indicator variables showing whether or not a client was in need of vocational or educational counseling and whether or not a client received vocational or educational counseling. As additional controls, we also included pre-treatment values of the dependent variable and the length of the post-treatment follow-up reference period in the regression models. Model 2 includes all the same explanatory variables as Model 1 plus the indicator variables for vocational and education counseling needed and services received.⁸

While separate analyses were performed for each modality, we do not report the results for correctional programs. Our results for these programs generally indicate no positive relationship between treatment intensity and client outcomes. However, these programs include different modalities of care, and, therefore, our results may not be an accurate indication of the

⁷ We tested some additional hypotheses related to: (1) how the effects of length of stay and counseling vary depending on client severity; and (2) whether or not client-to-staff ratios are important determinants of client outcomes in the NTIES data. These findings are discussed in Appendix C.

⁸ Model 1 and Model 2 assume a continuous, linear relationship between our treatment intensity variables and post-treatment costs and earnings. This simple specification may not be appropriate if, for example, the marginal benefits of each additional day of treatment or counseling begin to diminish at some point during the treatment episode. We included squared values of our treatment intensity variables in earlier specifications of the models to test for diminishing returns but dropped them because they were not statistically significant and did not change the basic findings of this study.

relationship between length of stay and/or counseling and post-treatment costs and earnings. Specialized modeling of the correctional programs may be necessary to clarify the effects of treatment intensity on client outcomes.

Examining the effects of treatment on clients who received methadone treatment presented unique challenges. The methadone clients included individuals who stopped treatment (methadone detoxification) and individuals who were still in treatment at the time of the follow-up interview (methadone maintenance). For methadone maintenance, longer lengths of stay may not be associated with improved client outcomes, once a client is stabilized after an initial period of treatment. Our cumulative measures of costs over the follow-up period (as opposed to measures relating to a short, fixed period before the follow-up interview) are also likely to mitigate our ability to identify any positive effects of treatment duration on costs for methadone maintenance. We therefore model methadone maintenance separately from methadone detoxification. We present some results from an examination covering all methadone clients that identifies the benefits of continuous methadone care relative to stopping methadone treatment.

1. REGRESSION RESULTS AND MARGINAL BENEFITS TO THE NON-TREATED POPULATION

In this subsection, we present our results from the regression analysis of costs to the non-treated population. We then use these results to estimate the marginal benefits to the non-treated population of an additional day of care and hour of counseling.

1.1 Regression Results

Exhibit V-2 shows the odds ratios (OR) for length of stay, hours of individual and group counseling per month, and the variables indicating whether or not a client in need of academic or vocational counseling received those services. The logistic regressions model the probability that a client has positive post-treatment costs. Therefore, odds ratios less than one indicate that increases in the explanatory variable are associated with a decreased probability of post-treatment costs. Across most modalities, we find that longer lengths of stay are associated with a lower probability of post-treatment costs. The results indicate that the effects of length of stay are stronger in residential modalities than in outpatient treatment settings. The effects of hours of counseling per month are only statistically significant for clients in methadone detoxification. For clients in other modalities, individual and group counseling hours are not statistically significant and are more likely to be predictive of a higher rather than lower probability of post-treatment costs. Similarly, clients who needed and received education and vocational counseling

are not associated with a lower probability of post-treatment costs than needy clients who did not receive these services. In fact, our results indicate that the odds of a needy client in long-term residential care who received educational counseling incurring post-treatment costs to the non-treated population were more than three times higher than a needy client who did not receive educational counseling.

EXHIBIT V-2								
REGRESSION RESULTS (LOGISTIC) FOR COSTS TO								
NON-TREATED BY MODALITY ¹								
Dependent Variable=Prob (Post-treatment Costs > 0)								
VARIABLE	SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
LOS	0.9952**	0.9970**	0.9962**	0.9945**	0.9970**	0.9968**	1.0005	-
Counsel	0.9851	0.9875	1.0192	1.0188	1.0012	1.0047	0.8832**	-
Educational Counseling	-	1.9033	-	3.1782**	-	1.4266	-	-
Vocational Counseling	-	0.7828	-	1.8289	-	1.0868	-	-
Pseudo-R ²	0.0953	0.1048	0.2135	0.2250	0.1389	0.1481	0.4379	-
Number of Observations	448	448	533	533	943	943	185	-

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Table entries are odds ratios. Costs to the non-treated population include health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments. Model did not converge for short-term hospital, results not shown. Model 2 was not estimated for methadone detox. because fewer than four clients received educational or vocational counseling.

In Exhibit V-3, the regression results for the OLS models are presented. These findings relate only to clients with positive post-treatment costs to the non-treated population. For Models 1 and 2, length of stay was found to be statistically significant for short-term residential and outpatient drug-free treatment modalities. Since the dependent variable is the natural logarithm of post-treatment costs for these models, the parameter estimate reported in the table below indicate the percent reduction in post-treatment costs with each additional day of treatment. The results suggest a stronger effect of increasing length of stay for clients in short-term residential facilities than for clients in outpatient settings; each additional day of care for a client with post-treatment costs is associated with a 0.3 percent and 0.1 percent reduction in costs for short-term residential and outpatient drug-free modalities, respectively.

We find a significant effect for counseling in the short-term hospital modality: one additional hour of counseling is associated with a decrease in costs to the non-treated population of 2.5 percent. In addition, our results indicate that clients in outpatient drug-free settings who needed and received vocational counseling were associated with 43.5 percent less post-treatment costs than clients who needed but did not receive vocational counseling. With the exception of these modalities, individual and group counseling and vocational and educational counseling are generally not found to be predictive of lower post-treatment costs.

EXHIBIT V-3										
REGRESSION RESULTS (OLS) FOR COSTS TO NON-TREATED BY MODALITY ¹										
Dependent Variable=Log (Post-treatment Costs)										
Includes only Clients with Post-treatment Costs > 0										
VARIABLE	SHORT-TERM HOSPITAL		SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX.	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
LOS	-0.0062	-	-0.0031**	-0.0030*	0.0003	0.0003	-0.0012*	-0.0012*	-0.0005	-
Counseling	-0.0251*	-	-0.0080	-0.0075	0.0087	0.0069	0.0022	0.0030	-0.0222	-
Educational Counseling	-	-	-	-0.3015	-	-0.2301	-	-0.1156	-	-
Vocational Counseling	-	-	-	0.0845	-	0.1357	-	-0.4351*	-	-
Adjusted R ²	0.0104	-	0.1412	0.1337	0.1481	0.1467	0.0522	0.0523	0.1020	-
Observations	124	-	315	315	460	460	726	726	153	-

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Costs to the non-treated population include health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments. Model 2 was not estimated for short-term hospital or methadone detox., because fewer than five clients received educational or vocational counseling in these modalities.

1.2 Methadone Maintenance Versus Methadone Detoxification

While we did not include clients in continuous methadone treatment in the analysis above, we wanted to measure the benefits of methadone maintenance relative to detoxification. To do that we pooled the responses of clients who discontinued methadone treatment and those who were still in treatment at the time of the follow-up interview. We then modified Model 1 in two ways. First, we excluded the variable "length of stay" from the model and instead included an indicator variable that takes the value "one" if a client has discontinued treatment and the value "zero" if a client is still receiving methadone at follow-up. This allowed us to measure the relative benefits of methadone maintenance versus detoxification. Second, we modified our counseling variable to reflect the total number of hours of counseling rather than hours per

month of treatment. This was necessary to ensure that our measure of counseling for clients of different treatment duration were comparable, since we no longer control for length of stay in our regression analysis.

We again performed a series of regressions using post-treatment costs to the non-treated population as our dependent variable using the slightly modified regression model. As described above, we first modeled the probability of post-treatment costs using logistic regressions on all observations (zeros and non-zeros) and then performed OLS regressions to model the post-treatment costs or earnings for clients who had post-treatment costs (i.e., observations with non-zero post-treatment cost values). We found that clients who discontinued treatment had a lower probability of post-treatment costs than clients who continued treatment ($p < .05$). This unexpected result appears to be due mainly to the fact that more methadone maintenance clients received welfare payments: 76.4 percent of methadone maintenance clients received some welfare, while 63.7 percent of methadone detoxification clients received welfare in the post-treatment period. No statistically significant relationship was found between whether or not clients continued methadone treatment and post-treatment costs in the OLS regression.

1.3 Marginal Benefits

Using the regression results reported above, we calculated the expected marginal benefits of an additional day of treatment or hour of counseling to the non-treated population.⁹ A description of our methodology for calculating marginal benefits as well as expected benefits by different client characteristics appears in Appendix B. The benefits reported in the tables below are the average expected benefits across clients within a modality for the 12 months following treatment. If the results relating to a given modality did not indicate a significant relationship between post-treatment outcomes and length of stay or counseling, we did not calculate a marginal benefit in order to provide conservative estimates of marginal benefits. Also, we did not calculate benefits in instances where additional counseling was found to be associated with *higher* post-treatment costs or *lower* post-treatment earnings. These results are counterintuitive and require further investigation. We are concerned that they are not reflective of the true marginal effects of counseling, but may be either an indication that our models are not

⁹ The estimates reported in Exhibit V-4 include estimates of the additional taxes generated by higher earnings. To obtain the effects of an addition day or hour of counseling on taxes, we used the results from the earnings equations discussed below (see section in 1.2). If either length of stay or counseling was found to be statistically significant in the analysis of earnings, we estimated the additional taxes by applying a marginal tax rate to the estimated additional clients earnings. See Appendix B for further details.

adequately controlling for client severity or a result of the poor conceptual measure of counseling in the NTIES. Further investigation into this issue is needed.

The results reported in Exhibit V-4 indicate that the marginal benefits from an additional day of treatment are greatest for short-term residential treatment and smallest for long-term residential, with the benefits from outpatient drug-free care falling in the middle. In addition, the expected additional benefits from an additional hour of counseling per month are generally greater than the benefits from an additional day of treatment: for short-term hospital, the expected benefit is \$294 and \$31 for methadone detoxification. Since the length of stay at short-term hospital programs is less than one month (average 11.7 days for the one short-term hospital in our analysis), the results relate to an additional hour of counseling in treatment. However, the average length of stay is approximately five months for methadone detoxification. Therefore, the benefits reported in Exhibit V-4 for counseling roughly correspond to an additional five hours of counseling for methadone detoxification clients.

EXHIBIT V-4					
ANNUAL MARGINAL BENEFITS FROM AN ADDITIONAL DAY OF TREATMENT OR HOUR OF COUNSELING (PER MONTH) BY MODALITY ¹					
VARIABLES	Short-term Hospital ²	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Benefits to Non-Treated Population					
LOS	-	\$21.17	\$5.19	\$13.09	-
Counseling	\$293.66	-	³	-	\$30.70

Source: Authors' calculation using regression results from analysis of NTIES data.

¹ If variable was not statistically significant, benefits were set equal to zero.

² These results are based only on findings from the OLS models.

³ Counseling for long-term residential was found to have a negative effect on benefits, so no marginal benefit was calculated.

2. REGRESSION RESULTS AND MARGINAL BENEFITS TO SOCIETY

In this subsection, we present our analyses for the marginal benefits to society. To construct these estimates, we conducted two sets of regression analyses. The first set used “post-treatment costs to society” as the dependent variable and the second used “post-treatment earnings” as the dependent variable. The regression results from these two analyses were then combined to estimate the marginal benefits to society of an additional day of care or hour of counseling. For instance, if our regression results for “costs to society” indicate that an additional day of care is associated with a \$3 decrease in post-treatment costs and a \$10 increase

in post-treatment earnings, we would conclude that the marginal benefits to society of an additional day of care is \$13.

2.1 Regression Results: Post-treatment Costs to Society

In Exhibits V-5 and V-6, we consider the effects of length of stay and counseling on post-treatment costs to society. Increased length of stay is statistically associated with a lower probability of post-treatment costs to society for clients in residential treatment settings. This result implies that longer lengths of stay are associated with greater benefits to society. The size of the effects on costs to society are similar for short-term and long-term residential modalities. These results, however, are generally not as strong as the comparable effects of length of stay on costs to the non-treated population. In addition, no significant effect is found for the outpatient drug-free modality. Furthermore, none of the counseling measures were statistically significant in any of the models for costs to society.

EXHIBIT V-5								
REGRESSION RESULTS (LOGISTIC) FOR COSTS TO SOCIETY BY MODALITY ¹								
Dependent Variable=Prob (Post-treatment Costs > 0)								
VARIABLE	SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
LOS	0.9969**	0.9966**	0.9970**	0.9964**	0.9988	0.9987	0.9986	-
Counseling	0.9875	0.9875	0.9964	0.9988	1.0004	1.0022	0.9646	-
Educational Counseling	-	1.9033	-	1.4157	-	1.0718	-	-
Vocational Counseling	-	0.7828	-	1.5119	-	1.0563	-	-
Pseudo-R ²	0.0853	0.0827	0.0867	0.0840	0.0712	0.0679	0.2224	-
Observations	531	531	631	631	1072	1072	199	-

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Table entries are odds ratios. Costs to society include health care costs, criminal justice costs and victim losses due to crime. Model did not converge for short-term hospital, results not shown. Model 2 was not estimated for methadone detox., because fewer than four clients received educational or vocational counseling.

In Exhibit V-6, we present our findings from the OLS regression for costs to society. For clients in short-term residential programs, increases in length of stay and increases in counseling are associated with reductions in post-treatment costs. We find significant effects of length of stay on costs in outpatient programs. Consistent with our finding for costs to the non-treated population, increased counseling is associated with lower post-treatment costs for the modality of short-term hospital.

EXHIBIT V-6 REGRESSION RESULTS (OLS) FOR COSTS TO SOCIETY BY MODALITY ¹ Dependent Variable=Log (Post-treatment Costs) Includes only Clients with Post-treatment Costs > 0										
VARIABLE	SHORT-TERM HOSPITAL		SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
LOS	0.1214	-	-0.0040**	-0.0047**	-0.0012	-0.0008	-0.0017**	-0.0017**	-0.0002	-
Counseling	-0.0397*	-	-0.0123*	-0.0117	-0.0027	-0.0061	0.0071	0.0079	-0.0317	-
Educational Counseling	-	-	-	0.4481	-	-0.3016	-	-0.2715	-	-
Vocational Counseling	-	-	-	0.2383	-	-0.2005	-	-0.3246	-	-
Adjusted R ²	-0.1059	-	0.1166	0.1095	0.1782	0.1837	0.1023	0.1036	0.0987	-
Observations	98	-	337	337	441	441	665	665	137	-

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Costs to society include health care costs, criminal justice costs and victim losses due to crime. Model 2 was not estimated for short-term hospital or methadone detox, because fewer than five clients received educational or vocational counseling in these modalities.

2.2 Regression Results: Earnings

The regression analyses for post-treatment earnings are shown in Exhibits V-7 and V-8. We generally find no relationship between length of stay and the probability of a client having post-treatment earnings. With respect to counseling, *increases* in the number of hours of individual or group counseling is associated with a *decrease* in earnings for clients in long-term residential treatment. A similar finding was reported by Orwin and Ellis (2000), who examined the effects of treatment services on the probability of abstinence using the NTIES data. If the most severe clients required and received the most counseling, this finding may be an indication that our models do not adequately control for client severity. Alternatively, this counterintuitive finding may be due to our counseling variable being poorly measured. Finally, the results indicate that clients who needed and received educational counseling in outpatient drug-free programs were 1.6 times more likely to have post-treatment earnings than clients who needed but did not receive such services.

EXHIBIT V-7								
REGRESSION RESULTS (LOGISTIC) FOR EARNINGS BY MODALITY ¹								
Dependent Variable=Prob (Post-treatment Earnings > 0)								
VARIABLE	SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
LOS	1.0009	1.0007	0.9997	0.9999	1.0006	1.0004	0.9999	-
Counseling	1.0017	1.0019	0.9763**	0.9775*	0.9976	0.9988	1.0458	-
Educational Counseling	-	0.6925	-	1.3429	-	1.6029*	-	-
Vocational Counseling	-	2.0172	-	0.6207	-	0.7715	-	-
Pseudo-R ²	0.1774	0.1751	0.2033	0.2022	0.1676	0.1624	0.3913	-
Observations	438	438	559	559	936	936	189	-

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Table entries are odds ratios. Model did not converge for short-term hospital, results not shown. Model 2 was not estimated for short-term hospital or methadone detox., because fewer than five clients received educational or vocational counseling in these modalities.

The regression results from the OLS models are reported in Exhibit V-8. The findings reveal much stronger relationships between length of stay and post-treatment earnings than those found in the logistic model. Statistically significant effects are found for both residential and the outpatient drug-free modalities. The parameter estimates indicate that an additional day of care in long-term or outpatient programs is roughly associated with a 0.3 percent increase in post-treatment earnings. The magnitude of the effect for short-term residential programs is smaller at 0.2 percent.

As with the logistic regressions, we again find a negative relationship between hours of counseling and post-treatment earnings for long-term residential settings. In addition, we find a similar effect of counseling for clients who discontinued methadone treatment. As noted above, these findings, while puzzling, are consistent with the results reported by Orwin and Ellis (2000). For the long-term residential and outpatient drug-free modalities, we find that needy clients (those clients that did not have a high school diploma or GED) who received educational counseling services earned less than clients who needed but did not receive educational counseling, holding other factors constant.

EXHIBIT V-8										
REGRESSION RESULTS (OLS) FOR EARNINGS BY MODALITY ¹										
Dependent Variable=Log (Post-treatment Costs)										
Includes only Clients with Post-treatment Costs > 0										
VARIABLE	SHORT-TERM HOSPITAL		SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
LOS	-0.0539	-	0.0020*	0.0020*	0.0028**	0.0032**	0.0029**	0.0029**	0.0005	-
Counseling	-0.0005	-	-0.0011	-0.0009	-0.0173*	-0.0178**	0.0056	0.0039	-0.0756**	-
Educational Counseling	-	-	-	0.2763	-	-0.4943*	-	-0.3848*	-	-
Vocational Counseling	-	-	-	-0.0424	-	-0.0133	-	0.1085	-	-
Adjusted R ²	0.2828	-	0.1616	0.1543	0.2826	0.2858	0.2322	0.2470	0.5569	-
Observations	54	-	303	303	289	289	478	478	48	-

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Model 2 was not estimated for short-term hospital or methadone detox., because fewer than five clients received educational or vocational counseling in these modalities.

2.3 Methadone Maintenance Versus Methadone Detoxification

As discussed above, we performed regression analysis to assess the beneficial effects of methadone maintenance relative to detoxification. We followed the same approach as was indicated for our analysis of costs to the non-treated population. Here, however, we ran two models; the first model used post-treatment costs to society as the dependent variable and the second used post-treatment earnings. We again modeled the probability of post-treatment costs or earnings using logistic regressions and then performed OLS regressions to model the post-treatment costs or earnings for clients who had post-treatment costs or earnings.

In the logistic regression model, we found no statistically significant relationship between whether or not a client discontinued methadone treatment and the probability of post-treatment costs. However, we did find in our OLS model that methadone maintenance clients were associated with almost a 52 percent lower post-treatment costs to society than methadone detoxification clients (p < .10). No statistically significant relationship was found between whether or not a client discontinued methadone treatment and post-treatment earnings.

2.4 Marginal Benefits

Using the regression results reported for Model 1 in Exhibits V-5 through V-8, we calculated the expected annual benefits of an additional day of treatment or hour of counseling per month to the society. As noted above, a detailed description of our methodology for calculating marginal benefits appear in Appendix B. Recall that the marginal benefits we calculated correspond to the average expected marginal benefit across clients within a modality for the 12 months following treatment.

EXHIBIT V-9					
ANNUAL MARGINAL BENEFITS FROM AN ADDITIONAL DAY OF TREATMENT OR HOUR OF COUNSELING (PER MONTH) BY MODALITY ¹					
VARIABLES	Short-term Hospital ²	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Benefits to Society (Includes Earnings)					
LOS	-	\$31.98	\$15.11	\$27.39	-
Counseling	\$329.67	\$48.00	-. ³	-	-. ³

Source: Authors' calculation using regression results from analysis of NTIES data.

¹ If variable was not statistically significant, benefits were set equal to zero.

² These results are based only on findings from the OLS models.

³ Counseling for long-term residential and methadone detox. modalities was found to have a negative effect on benefits, so no marginal benefit was calculated.

We again find that the marginal benefits from an additional day of treatment are greatest for short-term residential treatment and smallest for long-term residential. Marginal benefits to society from an additional day of treatment are more significant than those realized by the non-treated population (see Exhibit V-4), due, in large part, to the effects of length of stay on post-treatment earnings. Increased earnings account for roughly 46, 77, and 78 percent of the benefits to society for short-term residential, long-term residential, and outpatient modalities, respectively.

We also find large benefits from an additional hour of counseling provided in short-term hospitals. The average length of stay for short-term residential programs is slightly more than two months. Therefore, the \$48 benefits reported above for an additional hour of counseling per month in short-term residential programs roughly corresponds to an additional two hours of counseling while in treatment.

Although not shown in the table above, our results for methadone maintenance relative to detoxification indicate that methadone maintenance would benefit society by approximately \$2,900 a year per client (or \$7.90 per day) relative to clients who discontinued methadone treatment.

VI. DISCUSSION

In the table below, we again present the marginal benefits to the non-treated population and society from an additional day of treatment or hour of counseling per month. These marginal benefits were derived from the results in the regression analysis discussed in the previous section. How then do these marginal benefits compare with the additional costs of treatment?

EXHIBIT VI-1					
ANNUAL MARGINAL BENEFITS OF LOS AND COUNSELING BY MODALITY ¹					
VARIABLES	Short-term Hospital ²	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Benefits to Non-Treated Population					
LOS	-	\$21.17	\$5.19	\$13.09	-
Counseling	\$293.66	-	- ³	-	\$30.70
Benefits to Society (Includes Earnings)					
LOS	-	\$31.98	\$15.11	\$27.39	-
Counseling	\$329.67	\$48.00	- ³	-	- ³

Source: Authors' calculation using regression results from analysis of NTIES data.

¹ If variable was not statistically significant, benefits were set equal to zero.

² These results are based only on findings from the OLS models.

³ Counseling for long-term residential and methadone detox. modalities was found to have a negative effect on benefits, so no marginal benefit was calculated.

In Koenig et al. (1999), treatment costs were estimated for the 72 providers attended by the clients who completed NTIES questionnaires. Koenig et al. calculated treatment costs by estimating average revenue per client per day for the 62 programs with data. For the remaining 10 providers, per day costs were imputed using the weighted average for the modality. Revenue information from the 12-month follow-up administrative questionnaire was used to construct estimates of costs for the programs from which clients were surveyed. These results indicate that average costs per day were roughly \$72 for non-hospital based short-term residential programs, \$55 for long-term residential, \$14 for outpatient drug-free programs, and approximately \$9 for methadone treatment.¹⁰

¹⁰ NORC collected expense and revenue data from baseline administrative questionnaires of the NTIES and estimated per day treatment costs. This self-administered questionnaire was sent to 604 service delivery units identified by the Center for Substance Abuse Treatment as being a direct or indirect recipient of CSAT demonstration grant funding. In total, 520 responses were received and 68 percent of respondents completed information on expenses and revenues for the 12-month period ending May 31, 1993. The cost results reported by NORC from their analysis do not differ significantly from the results reported by Koenig et al. (1999). They estimated the average cost for a day of treatment was \$130 for short-term hospital and residential programs, \$49 for long-term residential, \$15 for outpatient drug-free programs, and \$13 for methadone programs (NORC, 1997).

Our results indicate that the benefits from an additional day of treatment relative to the cost of treatment vary by modality. For short-term residential care, the marginal benefits to the non-treated population and society offset roughly 29 percent and 44 percent of the costs of an additional day of care, respectively. For long-term residential treatment, marginal benefits relative to the average cost of an additional day of care were nine percent for benefits to the non-treated population and 27 percent for benefits to society. For outpatient drug-free, the marginal benefits to the non-treated population were roughly 94 percent of the cost of an additional day of care, while the benefits to society exceeded the average costs of an additional day of care by approximately 96 percent. Finally, the \$7.90 average benefit to society of a day of methadone treatment (not shown in table) relative to methadone detoxification corresponds to roughly 87 percent of the cost per day of methadone treatment.

With regard to the benefits derived from an additional hour of counseling, NORC (1997) used the NTIES administrative cost data to construct estimates of total costs per hour of clinical staff time. These costs include costs associated with medical staff, such as physicians, psychiatrists, nurses, and other medical personnel, and therapeutic staff such as psychologists, social workers, counselors, and other therapists or rehabilitation specialists. Average costs per clinical hour were \$40 for short-term residential (includes hospital-based programs) and \$31 for methadone. Using these values, our results indicate that the marginal benefits from an additional hour of counseling in short-term hospitals exceed the costs by a significant margin. For short-term residential, the \$48 benefit corresponds to an additional two hours of counseling (since average length of stay is two months), which is estimated to cost \$80. Thus, the marginal benefits from an additional hour of counseling per month in short-term residential programs offset approximately 60 percent of the costs. Performing a similar analysis for methadone detoxification, the marginal benefits from an additional hour of counseling in methadone programs offsets approximately 20 percent of the cost.

VII. CONCLUSIONS

In this study, we used regression analysis to estimate the relationship between treatment intensity and post-treatment societal costs associated with substance abuse treatment clients. Using data from the National Treatment Improvement Evaluation Study, we measured benefits by the estimated reductions in crime-related (including criminal justice) and health care costs and welfare payments, and increases in client earnings and taxes associated with an additional day of treatment or hour of counseling per month. While this is an extensive list, it is by no means an exhaustive list of the potential benefits from substance abuse treatment. In particular, it only includes factors that could be easily quantified and ignores such factors as the psychological effects of crime on victims and their families or the disruptive effects of substance addiction on the families of abusers, for example.

1. SUMMARY OF CONCLUSIONS

Our results indicate that longer treatment duration is associated with reduced post-treatment costs and increased client earnings for clients in short-term and long-term residential and outpatient drug-free programs. The marginal benefits from an additional day of treatment to the non-treated population were approximately \$5 for long-term residential treatment, \$13 for outpatient drug-free care, and \$21 for short-term residential treatment.

The marginal benefits to society were larger than those to the non-treated population because of the additional benefits from increased client earnings. Marginal benefits to society were roughly \$15 for long-term residential treatment, \$27 for outpatient drug-free care, and \$32 for short-term residential treatment. The benefits to society represent offsets to the average cost of a day of treatment of approximately 27 percent for long-term residential treatment and 44 percent for short-term residential treatment. Moreover, our estimates of the marginal benefits of an additional day of care in outpatient drug-free programs exceeded the costs of an additional day by approximately 96 percent. In addition, we estimated that methadone maintenance was associated with a \$2,900 annual benefit to society relative to methadone detoxification. This is an average benefit of \$7.90 per day, which is approximately 87 percent of the average cost of a day of methadone treatment.

We also found that an additional hour of counseling per month in a short-term hospital was associated with marginal benefits that exceeded the additional cost of the counseling. The estimated marginal benefits from counseling in residential programs and methadone outpatient treatment settings offset 60 and 20 percent of the cost of an additional hour of counseling per month in these modalities, respectively.

The comparison of average treatment costs to marginal treatment benefits likely understates the true value of the additional treatment. While we use average costs, it is a poor estimate of marginal costs. The true marginal cost of an additional day of care is likely less than the average cost of a day of care. Average cost of a day of care for a client is defined as the total cost of the treatment episode divided by the number of days in treatment. Total costs include several one-time, labor intensive items (e.g., intake), which likely cause the average cost of a day of care to exceed the marginal cost of an additional day of care. This effect is particularly noticeable for short-term programs that perform relatively more client intakes; however, treatment is likely to be more intensive during the beginning of care in all treatment settings. In addition, our measure of costs for an hour of clinical staff time (from National Opinion Research Center, 1997) includes costs for medical staff who typically do not provide individual or group counseling to clients. Because therapeutic staff earn less than medical staff, these estimates are too large for an accurate comparison of the marginal benefits of individual and group counseling to the marginal costs. Moreover, our findings with respect to counseling do not distinguish between individual and group counseling. Therefore, our costs for comparison purposes should be a combination of costs for therapeutic staff time to perform individual and group counseling on a per client basis.

2. IMPLICATIONS OF THE FINDINGS

2.1 Policy

If we take our findings at face value, they suggest that an additional day of outpatient drug-free care provides additional benefits to society that exceed the additional costs, while an additional day of care in residential facilities provides notable but insufficient benefits to offset the additional cost of treatment. With respect to methadone, our results suggests that the annual benefits to society of methadone maintenance relative to detoxification are almost enough to cover the cost of the treatment. From a policy perspective, the issue is where and how to devote Federal, State, and local resources in a way that maximizes societal welfare. According to our findings, preventing clients from withdrawing from outpatient drug-free treatment prematurely, perhaps due to financial or other constraints, would be a worthwhile investment of public resources. Similar implications are suggested by the results for methadone treatment, although our findings are not as strong as for outpatient drug-free care.

With respect to the residential facilities, the fact that marginal benefits do not exceed the additional costs does not suggest that treatment in these programs is not cost beneficial. In fact, a number of studies, including Koenig et al. (1999) which used NTIES data, have found that the

total benefits of a treatment episode in residential facilities justify public expenditures for these treatments. Instead, the findings suggest that public support of treatment services might be best devoted to ensuring that clients who need treatment receive it rather than using limited resources to provide an additional day of treatment for a client who is ready for less intensive outpatient care. Furthermore, our results suggest that partially subsidized care may be appropriate for clients receiving residential care who face financial constraints that may force them to leave treatment early. This approach recognizes that residential treatment yields benefits to society but that these marginal benefits are not entirely sufficient to cover the complete cost of the additional care.

2.2 Practice

It is important that the policy implications of this paper be interpreted with care. Residential treatment is often a vital component of treatment for clients. Moving clients to an outpatient setting before they are adequately prepared will limit the clinical effectiveness of treatment and, thus, the economic benefits. Part of the treatment process and the challenge for providers is determining when a client is ready to be moved from a residential to an outpatient treatment setting. In this respect, each client will be different, depending on addiction severity and individual characteristics. However, because of fixed budgets and requirements from third-party payers, providers often face external pressure to shorten treatment duration. Moreover, with fixed funding from government sources, providers face a trade-off between increasing the length of stay of existing clients and increasing the number of clients who can access care. Trying to strike a balance between these two alternatives can be difficult.

The NTIES data do not provide detailed information on where clients are in the treatment process; that is, we cannot readily identify the type of care clients were receiving immediately prior to the index treatment episode. Therefore, we were not able to study how benefits varied depending on whether or not a client was receiving the necessary continuum of care. Nevertheless, this is an important issue from an economic and clinical point of view. For providers, our findings suggest that providing an additional day of care in a residential setting to a client who has already received treatment may not be cost beneficial. At that point, providers should help transition clients to outpatient care and devote resources to helping new clients enter treatment. Efforts to assist providers in identifying when clients may be ready for less intensive care can help optimize the value to clients and taxpayers of the limited public resources devoted to substance abuse treatment.

To what extent can providers substitute more individual or group counseling for shorter lengths of stay? Our results suggest that for some modalities, counseling provided during treatment may be an important determinant of treatment benefits. If so, the issue is whether or not additional counseling and other treatment services can produce the same treatment benefits with shorter lengths of stay. However, there is again a limit to how far this substitution effect can be pushed; at some point, the benefits of an extra hour of care will not be sufficient to offset the losses from a shorter treatment duration. Moreover, providers may already be substituting hours of counseling for length of stay. Additional pressure to push for further substitution may end up reducing the quality of care and the probability of successful treatment outcomes. Finding the trade-off between counseling and length of stay would seem to be an important issue for future research.

2.3 Study Limitations and Future Research

There are a number of limitations of this study, some of which provide areas for future research. First, our measure of post-treatment costs and earnings only relate to the post-treatment reference period of approximately 12 months. If benefits from treatment last longer than this period, we have underestimated the benefits of treatment duration and counseling. Second, the NTIES covered a purposive sample of clients at programs that received CSAT demonstration funding. Therefore, the results may not apply to the treatment population in general. Third, some caution needs to be exercised in interpreting the results due to data limitations. For example, our ability to accurately measure the amount of counseling clients received is limited by the type of information collected in the NTIES discharge questionnaire. The questionnaire only asks clients to identify counseling received by a single clinician who was identified by clients as being important to them. Fourth, the responses from many clients could not be included in this analysis because of missing information. If data are missing in a non-random way then our results could be biased. For example, clients with poor outcomes may have been harder to locate or less likely to complete a follow-up questionnaire if found. Finally, this study focused on length of stay and counseling. There are other ways to improve treatment and treatment outcomes. It is important to identify those factors and measure their impacts on treatment. These limitations suggest that similar analyses need to be performed using different data sets. Additional analyses should examine the importance of factors other than those considered in this study in determining treatment success and benefits to society. Additional research will either support or refute our findings and enhance our understanding.

Some of the results reported in this study were counterintuitive and require further investigation. For example, what can explain the positive association between counseling and

costs or negative association between counseling and earnings in some modalities? A negative relationship between counseling and probability of client substance abstinence was found by Orwin and Ellis (2000). If the most severe clients required and received the most counseling, this finding may be an indication that our models did not adequately control for client severity. Alternatively, it may be due to the poor conceptual measure of counseling in the NTIES. Further investigation into this issue would be useful.

Our inability to separate out the effects of individual and group counseling was disappointing. Replacing individualized care with group services could reduce the costs of treatment. With increased financial pressure from third-party payers, providers may already be responding in this way. The question is how will this type of treatment impact client outcomes and the benefits of treatment?

Finally, the relatively small R-squares reported for the regression models showed that our models were unable to explain a substantial amount of variation in post-treatment costs. This poor ability to explain the variation in outcomes occurred despite having included pre-treatment costs and earnings as additional control variables. Additional modeling of data in the NTIES and other data sets may provide additional insights into the relationships between treatment intensity and the economic benefits of substance abuse treatment.

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APPENDIX A

COST METHODOLOGY

Health Care Costs

Client health care costs were derived from information on the number of hospital inpatient admissions, the number of medical visits to office-based physicians or clinics, and the number of emergency room (ER) visits. We calculated the cost by multiplying estimates of the average cost of a night in a hospital, a medical visit, and an ER visit by the corresponding number of times clients reported each type of health care utilization. The cost data came from the American Hospital Association's *Hospital Statistics: 1998 Edition* for hospital costs per day, the American Medical Association's *1996 Physician Marketplace Statistics* for the cost of a visit to a physician, and Williams (1996) for the cost of ER visits.

Annual Earnings and Social Welfare Benefits

The second set of outcomes used to measure treatment benefits includes two components of clients' incomes: earnings and welfare payments. Both the client intake and follow-up questionnaires included questions on current or most recent employment, type of work, rate of pay, hours worked per week, and number of months in the current or last job. Clients were asked to indicate if any wages, salaries, or tips were received during a specified prior time period and, if so, how much. Similar questions were asked on whether clients received welfare or relief, including General Assistance or Aid to Families with Dependent Children. In addition, clients reported information on income received from unemployment compensation, disability pay, and/or Supplemental Security Income.

Crime-Related Costs

Crime-related costs include direct losses attributable to crimes, such as theft losses, and criminal justice costs. Our estimates for crime-related costs include expenditures for police protection, adjudication and sentencing, and corrections. We also include costs to victims (i.e., property damages, medical costs, and lost wages from work) and theft losses. As the full set of data required to calculate the average costs per client for all modalities was not available for a single year in one source, we were forced to pull the data from a variety of sources. We calculated an average cost per client for each component using four main data sources: *Justice Expenditure and Expenditures Extracts, 1992*; *Crimes in the United States*; *Criminal Victimization in the United States, 1994*; and *The Corrections Yearbook, 1997*.

We used a two-step process to approximate the per-client cost of police protection. First, separate cost estimates were calculated for each type of crime reported in NTIES by multiplying an estimated cost of police protection per crime by the number of self-reported crimes. Second, we aggregated the costs of police protection across all of the crimes attributed to a respondent to obtain a total cost of police protection per client.

This process required us to estimate separate police costs for each type of crime in NTIES.¹¹ To obtain estimates of police costs, we used the product of three components: (1) national expenditures for police per arrest; (2) the probability that a reported crime is “cleared” by an arrest; and (3) the percent of crimes reported to police. We estimated the costs of adjudication and sentencing by multiplying the number of times a client reported being arrested by the estimated average cost of an arrest. The average cost of an arrest was obtained by dividing national judicial and legal expenditures by the total number of arrests. This value, however, overstates the adjudication and sentencing costs associated with criminal offenses, since some court costs are incurred for civil and other types of offenses. We decided to approximate the average cost of adjudication and sentencing for criminal offenses by using half of the estimated average cost per arrest.

Corrections’ costs consist of separate estimates for time spent in jail and time spent under other forms of supervision, such as parole or probation. We obtained the average per day costs of jail and probation/parole for 1994 from *The Corrections’ Yearbook, 1997*. With respect to information on probation/parole, NTIES has two limitations. First, no information is collected on the amount of time respondents spent under probation/parole. Second, the NTIES data do not allow us to identify individuals who may have been on probation/parole during some part of their reference period but who were not under such supervision at the time the intake and follow-up interviews were administered. Any estimate of probation/parole costs will, therefore, underestimate the true costs, because we cannot identify all the respondents who were under this type of supervision. Furthermore, since we do not know how long respondents who are under probation/parole were under supervision, we needed to impose some additional assumptions. To calculate costs for clients under supervision at the time of the intake and follow-up interviews, we assumed that the time spent under probation/parole was six months.

We calculated costs to victims as the sum of property damages, medical costs, and lost wages from work and theft losses as the value of property and cash stolen. The average victim

¹¹ While estimating costs for each type of crime complicates the analysis, we wanted our estimates to reflect the level of resources devoted to preventing different types of crimes.

cost and theft losses for different crimes were obtained using data from the *Criminal Victimization in the United States, 1994*. We then multiplied the average costs to victims and theft losses per crime by the number of self-reported crimes in NTIES and aggregated these losses across different crimes. No victim or theft losses were calculated for the crimes of selling drugs and prostitution. For incidents of shoplifting, only theft losses were calculated.

APPENDIX B

MARGINAL BENEFITS TO NON-TREATED POPULATION AND SOCIETY

We were interested in identifying the benefits from an additional day of treatment or hour of counseling from our regression results. These marginal benefits are measured in terms of reduced or avoided post-treatment costs from a one unit change in length of stay or hour of individual or group counseling. Expected post-treatment costs for a client are equal to the probability that a client has positive post-treatment costs (Prob (Cost > 0)) multiplied by the expected value of costs, conditional on costs being greater than zero (E(Cost > 0)), plus the probability that a client does not incur any post-treatment costs (Prob (Cost = 0)) multiplied by an expected cost of zero:

$$\begin{aligned} E(\text{Cost}) &= \text{Prob}(\text{Cost} > 0) * E(\text{Cost} > 0) + \text{Prob}(\text{Cost} = 0) * E(\text{Cost} = 0), \\ &= \text{Prob}(\text{Cost} > 0) * E(\text{Cost} > 0). \end{aligned}$$

By differentiating this equation with respect to length of stay or counseling (represented by X), we are able to generate the following equation for the change in expected costs (i.e., the benefits if the change is a reduction in costs) from a one unit change in the variable X:

$$\frac{\partial E(\text{Cost})}{\partial X} = \frac{\partial \text{Prob}(\text{Cost} > 0)}{\partial X} * E(\text{Cost} > 0) + \frac{\partial E(\text{Cost} > 0)}{\partial X} * \text{Prob}(\text{Cost} > 0).$$

The first component represents the marginal probability associated with a unit change in X and can be obtained from the logistic regression results by the following formula:

$$\frac{\partial \text{Prob}(\text{Cost} > 0)}{\partial X} = \beta_X^{\text{Logistic}} * \text{Prob}(\text{Cost} > 0)[1 - \text{Prob}(\text{Cost} > 0)].$$

The third component represents the marginal change in costs from a one unit change in X and can be obtained from the OLS regression results by the following formula:

$$\frac{\partial E(\text{Cost} > 0)}{\partial X} = \beta_X^{\text{OLS}} * E(\text{Cost} > 0).$$

The parameter estimates from the OLS equations are multiplied by the expected value of costs to transform it from an elasticity.¹²

An estimate of the probability that post-treatment costs would be greater than zero and an estimate of post-treatment costs (conditional on costs being greater than zero) were obtained for each client from the estimated logistic and OLS regression equations. Estimates of post-treatment costs (conditional on positive post-treatment costs) and the probability of positive post-treatment costs were annualized by evaluating the OLS and logistic regression equation assuming a 12 month follow-up reference period. For estimates of costs, we multiplied the vector of explanatory variable by the vector of parameter estimates to obtain a predicted value for the log of post-treatment costs. We then transformed the value to post-treatment costs by taking the anti-log and applying a smearing adjustment. The smearing adjustment corrects for the “retransformation” bias and was computed as the mean of the anti-logs of the residuals for each of the relevant regressions (Duan, 1983).

To estimate the marginal effect of length of stay or counseling on taxes, we used the marginal benefits due to increased earnings. If either length of stay or counseling was found to be statistically significant in the analysis of earnings, the additional taxes were estimated by applying a marginal tax rate to the estimated additional client earnings. The marginal benefits due to increased earnings were calculated as described above. The marginal tax rates we used were 1995 Federal marginal income tax rates for unmarried taxpayers. We used 1995 tax rates because this was the year in which most of the NTIES follow-up interviews occurred. We used estimates of individual post-treatment client earnings obtained from the OLS regression equations to identify the most appropriate marginal income tax rate for each client. These marginal tax rates are reported in the table below.

EXHIBIT B-1	
IRS'S MARGINAL TAX RATES, 1995	
REPORTED YEARLY INCOME	TAX RATE
Less than or equal to \$23,350	15%
Greater than \$23,350 and less than or equal to \$58,550	28%
Greater than \$58,550 and less than or equal to \$117,950	31%
Greater than \$117,950 and less than or equal to \$256,500	36%
Greater than \$256,500	39.6%

¹² Recall that the dependent variable in the OLS equations was the log of costs or earnings. The parameter estimate therefore represents the percent change in the dependent variable due to a one unit change in X.

For example, if a client's expected earnings were \$20,000 according to the regression model and the marginal effect of an additional day of treatment was an annual increase in earning of \$10, we would estimate that income taxes paid by this client would increase by \$1.50.

Our approach to approximating changes in income taxes paid by clients has a number of limitations. First, it does not consider taxable income from sources other than earnings or the amount of tax deductions a client is eligible for. These omissions were allowed because of data limitations. To the extent that the deductions offset all or most of the unrecognized taxable income, these omissions may not affect our results significantly. In addition, we do not consider income and employment taxes other than Federal income taxes. In this respect, we believe our estimates of the benefits from increased income taxes are relatively conservative.

Marginal benefits from an additional day of treatment or hour of counseling were calculated for each client based on their characteristics. We then calculated the average marginal benefits for clients within each modality. In the tables below, we report average expected benefits to the non-treated population and society by different client characteristics.

EXHIBIT B-2										
MARGINAL BENEFITS TO NON-TREATED POPULATION										
BY MODALITY AND CLIENT CHARACTERISTICS ¹ (EXCLUDES TAXES)										
VARIABLES	SHORT-TERM HOSPITAL		SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX.	
	LOS	Counsel	LOS	Counsel	LOS	Counsel	LOS	Counsel	LOS	Counsel
Male	-	\$266	\$19	-	\$5	-	\$9	-	-	\$37
Female	-	\$355	\$18	-	\$2	-	\$9	-	-	\$19
High School Degree or Above	-	\$253	\$17	-	\$3	-	\$8	-	-	\$26
No High School Degree	-	\$330	\$22	-	\$3	-	\$10	-	-	\$37
Treatment Very Important	-	\$308	\$19	-	\$3	-	\$9	-	-	\$26
Treatment Not Very Important	-	\$194	\$18	-	\$2	-	\$8	-	-	\$86
Drug of Choice is Heroin	-	\$392	\$20	-	\$3	-	\$12	-	-	\$34
Drug of Choice is Cocaine	-	\$296	\$16	-	\$3	-	\$7	-	-	NA
Drug of Choice is Alcohol	-	\$136	\$17	-	\$4	-	\$7	-	-	NA
Poly Drug User	-	\$333	\$19	-	\$3	-	\$11	-	-	\$25

Source: Authors' calculation using regression results from analysis of NTIES data.

¹ If variable was not statistically significant, benefits were set equal to zero. Counseling for long-term residential was found to have a negative effect on benefits, so no marginal benefit was calculated.

EXHIBIT B-3										
MARGINAL BENEFITS TO SOCIETY (INCLUDING EARNINGS)										
BY MODALITY AND CLIENT CHARACTERISTICS ¹										
VARIABLES	SHORT-TERM HOSPITAL		SHORT-TERM RESIDENTIAL		LONG-TERM RESIDENTIAL		OUTPATIENT		METHADONE DETOX.	
	LOS	Counsel	LOS	Counsel	LOS	Counsel	LOS	Counsel	LOS	Counsel
Male	-	\$326	\$36	\$45	\$23		\$32	-	-	
Female	-	\$338	\$23	\$39	\$8		\$15	-	-	
High School Degree or Above	-	\$318	\$35	\$43	\$20		\$35	-	-	
No High School Degree	-	\$340	\$25	\$42	\$11		\$19	-	-	
Treatment Very Important	-	\$327	\$31	\$44	\$15		\$23	-	-	
Treatment Not Very Important	-	\$352	\$35	\$39	\$13		\$37	-	-	
Drug of Choice is Heroin	-	\$47	\$21	\$38	\$25		\$31	-	-	
Drug of Choice is Cocaine	-	\$355	\$32	\$40	\$15		\$22	-	-	
Drug of Choice is Alcohol	-	\$163	\$37	\$42	\$12		\$36	-	-	
Poly Drug User	-	\$362	\$31	\$42	\$16		\$25	-	-	

Source: Authors' calculation using regression results from analysis of NTIES data.

¹ If variable was not statistically significant, benefits were set equal to zero. Counseling for long-term residential was found to have a negative effect on benefits, so no marginal benefit was calculated.

APPENDIX C

ADDITIONAL MODEL SPECIFICATIONS

We were interested in examining a number of additional hypotheses through different specifications of the model and present the findings from these additional analyses in this appendix. Specifically, we wanted to address the following questions:

- # How do the benefits of an additional day of treatment or hour of counseling vary with client severity (in terms of pre-treatment costs)?
- # Are client-to-staff ratios an important determinant of treatment benefits?

The Effects of Length of Stay and Counseling by Client Severity

We addressed the first issue by truncating the data at different points in the distribution of pre-treatment costs to the non-treated population and then performed our regression analysis. We used this approach to test the idea that the most severe clients in terms of criminal activity, health care utilization, or welfare status would be the most difficult to treat. Moreover, it is plausible that economic benefits from treatment are likely to be smaller for the least severe clients; that is, clients who engage in little criminal activity and health care utilization, and who are least likely to receive welfare benefits, would likely experience little reductions in post-treatment costs.

To implement this simple approach, we divided the data into three samples. We first eliminated clients with pre-treatment costs falling within the bottom quartile (least severe). Our second sample included clients falling within the middle 50 percent of the distribution for costs. Lastly, we eliminated those clients in the top quartile in terms of pre-treatment costs to the non-treated population (most severe clients). We estimated Model 1 (from our previous analysis) using data for each sample and report these results in Exhibit C-1 (logistic) and Exhibit C-2 (OLS).

The results from the logistic regressions with respect to length of stay are consistent with the view that benefits due to cost reductions are smaller for the most and least severe clients. For each of the modalities for which estimation was possible, the effects of length of stay on post-treatment costs were largest when the sample excluded clients falling in the bottom and top quartile of the distribution of pre-treatment costs. However, this effect is less evident in the OLS models; in fact, the length of stay variable is only statistically significant for the outpatient drug-free modality when the sample that excludes the least severe clients in terms of pre-treatment

costs is used. When significant, the effects of counseling appear to be strongest when the highest and lowest cost clients are excluded from the sample. While these results and those with respect to length of stay in the logistic regressions are consistent with a differential treatment effect, further investigation and refinement of the analysis performed is needed.

EXHIBIT C-1				
REGRESSION RESULTS (LOGISTIC) FOR COSTS TO NON-TREATED				
BY MODALITY FOR SELECTED SAMPLES ¹				
Dependent Variable=Log (Post-treatment Costs)				
VARIABLE	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Upper 75th percentile in terms of Pre-Treatment Costs				
LOS	0.9946**	0.9962	0.9962**	-
Counseling	0.9722	1.0165	1.0111*	-
Middle 50th percentile in terms of Pre-Treatment Costs				
LOS	0.9938**	0.9947*	0.9959**	-
Counseling	0.9669*	1.0093	1.0056	-
Bottom 75th percentile in terms of Pre-Treatment Costs				
LOS	0.9940**	0.9950**	0.9972**	0.9969
Counseling	0.9857	1.0068	0.9970	0.8057**

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Table entries are odds ratios. Costs to the non-treated population include health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments. Model did not converge for short-term hospital and methadone detox, results not shown.

EXHIBIT C-2					
REGRESSION RESULTS (OLS) FOR COSTS TO NON-TREATED BY					
MODALITY FOR SELECTED SAMPLES ¹					
Dependent Variable=Log (Post-treatment Costs)					
Includes only Clients with Post-treatment Costs > 0					
VARIABLE	Short-term Hospital	Short-term Residential	Long-term Residential	Outpatient	Methadone Detox.
Upper 75th percentile in terms of Pre-Treatment Costs					
LOS	-0.0269	-0.0016	0.0006	-0.0012*	-0.0015
Counseling	-0.0431**	-0.0094	0.0039	0.0006	0.0220
Middle 50th percentile in terms of Pre-Treatment Costs					
LOS	0.1318	0.0007	0.0015	0.0001	-0.0026
Counseling	-0.0544*	-0.0022	0.0069	0.0003	0.0423
Bottom 75th percentile in terms of Pre-Treatment Costs					
LOS	0.0196	-0.0013	0.0009	-0.0003	-0.0010
Counseling	-0.0214	-0.0061	0.0132*	0.0035	-0.0414

Source: Authors' analysis of NTIES data. * 0.05 < p < 0.10, ** p < 0.05

¹ Costs to the non-treated population include health care costs, criminal justice costs, victim and theft losses due to crime, and welfare payments.

Post-treatment Costs and Client-to-staff Ratios

We investigated the effects of client-to-staff ratios on post-treatment costs. Client-to-staff ratios were constructed from information collected from the NTIES administrative questionnaire, which surveyed programs about services, staff, and clients. We created two staffing ratios: the first ratio included the number of full-time equivalent clinical staff (i.e., no clerical personnel), and the second measure only included counselors, social workers, therapists, and psychologists (excluded staff include psychiatrists, medical doctors, nurses, and other medical staff). We added a client-to-staff ratio variable to the list of explanatory variables in Model 1 and performed our regression analysis for the new model specification.

Our second measure of client-to-staff ratios seemed to improve the fit of the models more than the ratios based on all clinical staff. Therefore, we focus on the results from the regressions using this second measure. In addition, since data from only one short-term hospital program was collected, it was not possible to include client-to-staff ratios as an explanatory variable in these models.

The findings related to client-to-staff ratios were mixed. Although the hypothesized effect is that lower client-to-staff ratios should be associated with better client outcomes (i.e., lower costs and higher earnings), this result was not always found. For long-term residential programs, lower client-to-staff ratios were associated with lower costs to the non-treated population in the logistic regression ($p < .05$) and the OLS regression ($p < .10$) and higher earnings ($p < .10$). The results indicate that one less client per staff member lowers the relative odds of having post-treatment costs by 38 percent while reducing post-treatment costs for clients with costs by almost six percent. In addition, one less client per staff member in long-term residential facilities was associated with a seven percent increase in earnings for clients with some earnings in the post-treatment period.

For outpatient drug-free programs, lower client-to-staff ratios were consistently associated with a *higher* probability of post-treatment costs. In addition, the results from the logistic earnings regression for methadone detoxification indicate that lower client-to-staff ratios were associated with a lower probability of post-treatment earnings ($p < .05$, OR = 1.196). These counterintuitive findings may be reflecting the fact that facilities that treat more severe clients need to maintain lower client-to-staff ratios, and, if so, it suggests that our measures of client severity are not adequately controlling for differences in client across modalities. Further investigation of this issue would seem warranted.

APPENDIX D

**DESCRIPTION OF THE NATIONAL TREATMENT IMPROVEMENT
EVALUATION STUDY AND CENTER FOR SUBSTANCE ABUSE
TREATMENT DEMONSTRATIONS (1990-1992)**

The National Treatment Improvement Evaluation Study (NTIES) was a national evaluation of the effectiveness of substance abuse treatment services delivered in comprehensive treatment demonstration programs supported by the Center for Substance Abuse Treatment (CSAT). The NTIES project collected longitudinal data between FY 1992 and FY 1995 on a purposive sample of clients in treatment programs receiving demonstration grant funding from CSAT. Client-level data were obtained at treatment intake, at treatment exit, and 12 months after treatment exit. Service delivery unit (SDU) administrative and clinician (SDU staff) data were obtained at two time points, one year apart.

1. THE NTIES DESIGN

The NTIES study design had two levels—an administrative or services component and a clinical treatment outcomes component.

1.1 The Administrative/Services Component

This study component was designed to assess how CSAT demonstration funds were used, what improvements in services were implemented at the program level, and what kind and how many programs and clients were affected by the demonstration awards. Four data collection instruments were used to gather administrative/services data: the NTIES Baseline Administration Report (NBAR), the NTIES Continuing Administrative Report (NCAR), the NTIES Exit Log, and the NTIES Clinician Form (NCF).

The unit of analysis for the administrative component was the SDU, defined by CSAT as a single site offering a single level of care. The classification of *level of care* is based on three parameters: (1) facility type (e.g., hospital, etc.); (2) intensity of care (e.g., 24-hour, etc.); and (3) type of service (e.g., outpatient, etc.). An SDU could be a stand-alone treatment provider or it could be one component of a multi-tiered treatment organization. For example, a large county mental health agency may be the *organization* within which the SDU is located. The organization may have multiple substance abuse treatment components, such as a county hospital and a county (ambulatory) mental health center. The county hospital may have multiple SDUs, such as an inpatient detoxification service, an outpatient counseling service, and a hospital

satellite center providing transitional care. In summary, the SDU provided NTIES evaluators with a stable, uniform level of comparison for examining service delivery issues.

A range of key clinician-specific data elements (within the administrative component) were assessed using the NTIES Clinician Form (NCF). The NCF items were an important adjunct to the (SDU) facility-level instruments; these items assessed clinician training, experience, client exposure, and service provision, and were completed by all counseling and clinical (medical and therapeutic) staff at the individual SDUs.

1.2 Clinical Treatment Outcomes Component

The unit of analysis for the clinical treatment outcomes component was individual client data. NTIES measured the clinical outcomes of treatment primarily through a “before/after” or “pre- to post-treatment” design. This method compares behaviors or other individual characteristics in the same participants, measured in similar ways, before and after an intervention.

Information about clients’ lives for the *before* period were obtained from the NTIES Research Intake Questionnaire (NRIQ), which was administered sometime during the clients’ first three weeks of treatment. The specific areas assessed included:

- # Drug and alcohol use
- # Employment
- # Criminal justice involvement and criminal behaviors
- # Living arrangements
- # Mental and physical health.

Information about clients’ lives for the *after* period were obtained from the NTIES Post-discharge Assessment Questionnaire (NPAQ), with the same areas assessed at roughly 12 months post-treatment. Other client data sources included a treatment discharge interview (NTIES Treatment Experience Questionnaire, NTEQ), abstracted client records, urine drug screens collected at the time of the follow-up interview, and arrest reports from state databases.

1.3 The Outcome Analysis Sample

Between August 1993 and October 1994, research staff successfully enrolled 6,593 clients at 71 SDUs to participate in three waves of an in-person, computer-assisted data collection protocol. These SDUs were chosen from the universe of treatment units receiving demonstration grant funding from CSAT. Some of the selected facilities were wholly supported by CSAT awards, while others received only indirect support or none.

Clients were interviewed at admission to treatment, when they left treatment, and then at 12 months after the end of treatment. Less than 10 percent of the recruited clients refused or avoided participation, and more than 83 percent of the recruited individuals (5,388 clients) completed a follow-up interview. Additional sample exclusions included:

- # Missing or undetermined treatment exit date
- # Inappropriate length of follow-up interval (less than 5 or more than 16 months)
- # Clients incarcerated for most or all of the follow-up period.

The additional sample exclusions resulted in a final outcome analysis sample of 4,411 individuals.

2. TREATMENT DEMONSTRATION PROGRAMS

CSAT initiated three major demonstration programs and made 157 multiyear treatment enhancement awards across 47 States and several territories during 1990 through 1992. One objective common to all demonstrations was CSAT's emphasis on the provision of "comprehensive treatment" services to targeted client populations. The recipients of these awards focused special attention on the substance abuse treatment service needs of minority and special populations located primarily within large metropolitan areas. The demonstration programs are briefly described below.

2.1 Target Cities

Under this demonstration, nine metropolitan areas were selected to receive awards, of which half were included in the NTIES purposive sample. The following treatment improvement activities were explicitly provided for in the awards:

-
- # Establishment of a Central Intake Unit (CIU) with automated client tracking and referral systems in place
 - # Provision of comprehensive services, including vocational, educational, biological, psychological, informational, and lifestyle components
 - # Improved inter-agency coordination (e.g., mental health, criminal justice, and human service agencies)
 - # Services for special populations—adolescents, pregnant and postpartum women, racial and ethnic minorities, and public housing residents.

2.2 Critical Populations

Under this demonstration program, awardees were required to implement “model enhancements” to existing treatment services for one or more of the following critical populations: racial and ethnic minorities, residents of public housing, and/or adolescents. Special emphasis was given to services provided to the homeless, the dually diagnosed, or persons living in rural areas. A total of 130 grants were awarded, covering services such as vocational support/counseling, housing assistance, integrated mental health and/or medical services, coordinated social services, culturally directed services, and others.

2.3 Incarcerated and Non-Incarcerated Criminal Justice Populations

Under this demonstration program, funds were directed toward improving the standard of comprehensive treatment services for criminally involved clients in correctional and other settings. Some program emphasis was placed on ethnic and/or racial minorities. Nine correctional setting demonstrations were funded: five in prisons, three in local jails, and one across a network of juvenile detention facilities. All projects included a screening component to identify substance-abusing inmates, a variety of targeted treatment interventions (e.g., therapeutic communities, intensive day treatment programs), and a substantial aftercare component.

A total of 10 non-incarcerated projects were funded. Five programs targeted interventions at clients in diversionary programs, three focused services on probationers or parolees, and two programs targeted both populations. Almost all of the funded demonstration projects included the following components:

- # Basic eligibility determination, followed by systematic screening and assessment
- # Referral to treatment
- # Graduated sanctions and incentives while in treatment
- # Intensive supervision in treatment
- # Community-based aftercare with supervision and service coordination.

In total, 19 criminal justice projects were funded as part of the CSAT 1990-1992 demonstrations, and as indicated in the next section, these projects were purposively over-sampled in order to obtain a more robust evaluation of this program.

3. DESCRIPTION OF SDUs AND CLIENTS BY TREATMENT MODALITY AND PROGRAM TYPE

The 71 SDUs contributing clients to the outcome analysis sample are characterized by modality and (demonstration) program type in Exhibit D-1. Among the 698 SDUs in the NTIES universe: 52 percent (n=365) were Target Cities programs, 39 percent (n=274) were Critical Populations programs, and 9 percent (n=59) were Criminal Justice programs.

In terms of the SDUs sampled for the NTIES outcome analysis, 44 percent were Target Cities programs, 38 percent were Critical Populations programs, and 23 percent were Criminal Justice programs. Criminal Justice SDUs were purposely over-sampled as part of the NTIES evaluation design (CSAT, 1997). Nearly half of the sampled SDUs were (non-methadone) outpatient programs, and about one-quarter were long-term residential programs.

EXHIBIT D-1						
SDUs IN THE OUTCOME ANALYSIS SAMPLE						
Program Title Number of SDUs (% of NTIES Universe)¹³	NTIES Sample	Methadone	Outpatient	Long-Term Residential	Short-Term Residential	Correctional
Target Cities n=365 (52%)	31 (44%)	6	15	6	4	0
Critical Populations n=274 (39%)	27 (38%)	1	13	10	3	0
Criminal Justice n=59 (9%)	13 (23%)	0	5	0	0	8
Totals N=698 (100%)	71 (100%)	7	33	16	7	8

As shown in Exhibit D-2, 59 percent of all NTIES clients were sampled from Target Cities SDUs. Slightly more than 21 percent of all NTIES clients were sampled from Critical Populations SDUs and 20 percent were sampled from Criminal Justice SDUs. Outpatient (non-methadone) SDUs treated more than one-third (35%) of the clients in the outcomes analysis sample, and almost 80 percent of these were sampled from Target Cities programs.

EXHIBIT D-2					
SDUs IN THE OUTCOMES ANALYSIS SAMPLE					
Program Title Number of Clients (% of Analysis Sample)	Methadone	Outpatient	Long-Term Residential	Short-Term Residential	Correctional
Target Cities n=2,600 (59%)	377 (89%)	1,214 (78%)	504 (60%)	505 (58%)	0
Critical Populations n=931 (21%)	45 (11%)	220 (14%)	298 (35%)	368 (42%)	0
Criminal Justice n=880 (20%)	0	132 (8%)	39 (5%)	0	709 (100%)
Totals n=4,411 (100%)	422	1,566	841	873	709

Readers who are interested in more detailed information about the NTIES project are invited to visit the NEDS Web site at: <http://neds.calib.com>. The NEDS Web site provides the full-length version of the NTIES Final Report (1997), as well as copies of all data collection instruments employed in NTIES.

¹³ The original NTIES universe of SDUs included a program type called *Specialized Services*. Because clients for the outcome analysis sample were not drawn from these SDUs (n=94), they are excluded from the Exhibit.

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