

# NEDS

NATIONAL EVALUATION DATA SERVICES

## **ANALYSIS OF THREE OUTCOME PROXIES FOR POST-TREATMENT SUBSTANCE USE IN NTIES**

**July 2001**

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## **ANALYSIS OF THREE OUTCOME PROXIES FOR POST-TREATMENT SUBSTANCE USE IN NTIES**

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**CSAT**  
Center for Substance  
Abuse Treatment  
SAMHSA

# TABLE OF CONTENTS

Page

## FOREWORD

## ACKNOWLEDGMENTS

## EXECUTIVE SUMMARY ..... i

## I. INTRODUCTION ..... 1

### 1. BACKGROUND ..... 2

#### 1.1 The Advantages and Disadvantages of Collecting Post-treatment Follow-up Data ..... 2

#### 1.2 Initiatives Driving Standard and Regular Outcome Data Collection .... 3

#### 1.3 Prior Analyses on the Relationship Between Proxies and Outcomes .... 4

### 2. PURPOSE AND PARAMETERS OF THE PRESENT ANALYSIS ..... 6

## II. METHODS ..... 8

### 1. DATA USED FOR ANALYSIS ..... 8

### 2. ANALYTIC APPROACH ..... 9

### 3. VARIABLES INCLUDED IN THE ANALYSIS ..... 11

#### 3.1 Three Outcome Proxies ..... 11

#### 3.2 Other Control Variables ..... 12

#### 3.3 Outcome Variable ..... 13

#### 3.4 Other Potential Explanatory Variables ..... 14

## III. RESULTS ..... 15

### 1. DESCRIPTION OF THE THREE PROXIES ..... 15

#### 1.1 Length of Stay ..... 15

#### 1.2 Treatment Completion ..... 16

#### 1.3 Satisfaction with Treatment ..... 16

#### 1.4 LOS, Completion, and Satisfaction by Demographics ..... 17

### 2. RELATIONSHIPS BETWEEN PROXIES ..... 18

## TABLE OF CONTENTS (CONT.)

	<u>Page</u>
3. BIVARIATE ANALYSIS OF THE PROXIES .....	20
3.1 Client-level Relationship Between Proxies and Outcome .....	20
3.2 SDU-level Relationship Between Proxies and Outcome .....	24
4. MULTILEVEL ANALYSIS—THE HLM MODEL .....	28
4.1 General Models .....	29
4.2 Modality-specific Models .....	30
<b>IV. SUMMARY AND RECOMMENDATIONS .....</b>	<b>32</b>
1. SUMMARY .....	32
2. RECOMMENDATIONS FOR RESEARCH, POLICY AND PRACTICE .....	33
2.1 Recommendations for Research .....	34
2.2 Recommendations for Policy .....	35
2.3 Recommendations for Practice .....	36
<b>REFERENCES .....</b>	<b>37</b>
<b>APPENDIX A: LITERATURE REVIEW SUMMARY</b>	
<b>APPENDIX B: DESCRIPTION OF THE NATIONAL TREATMENT IMPROVEMENT EVALUATION STUDY AND CENTER FOR SUBSTANCE ABUSE TREATMENT DEMONSTRATIONS (1990-1992)</b>	
<b>APPENDIX C: THE HLM MODEL</b>	
<b>APPENDIX D: OTHER POTENTIAL EXPLANATORY VARIABLES USED IN HIERARCHICAL LINEAR MODELING (HLM)</b>	

## 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 continues to invest 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 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 analysis examines how well length of stay, treatment completion, and client satisfaction can serve as proxies for post-treatment substance use in the National Treatment Improvement Evaluation Study (NTIES). This report describes the relationship between the proxies and employs a statistical model to determine which proxies predict substance use at follow-up. The report concludes with a summary and recommendation for treatment research, policy and practice.

Sharon Bishop  
Project Director  
National Evaluation Data Services

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**EXECUTIVE SUMMARY**

# EXECUTIVE SUMMARY

## 1. INTRODUCTION

It is well documented that substance abuse treatment is effective, as well as cost effective, for combating one of society's most vexing problems. As treatment providers are held to greater standards of accountability by Federal, State and local funding agencies, it is important to document client successes. While the best documentation of these successes is through client follow-up data, many providers do not collect this data due to time and resource constraints. Intermediate data, however, is often collected by treatment providers.

It is not clear how well these intermediate data or "proxies" predict post-treatment outcomes. Three proxies that are collected by treatment providers or gleaned from administrative records are length of stay (LOS) in treatment, treatment completion, and client satisfaction with treatment. A review of the literature on the three proxies revealed that generally longer stays in treatment and treatment completion result in better substance use outcomes. The research was mixed, however, on the relationship between satisfaction and outcomes, with some studies reporting a positive relationship, another showing a positive, conditional relationship, and still another showing no correlation.

This work examines how well the three proxies—length of stay (LOS) in treatment, treatment completion, and client satisfaction with treatment—predict post-treatment substance use outcomes. Two analytic questions are addressed:

- What are the relationships between length of stay, treatment completion and satisfaction at the client level?
- How well do length of stay, treatment completion and satisfaction predict post-treatment substance use outcomes at the client and service delivery unit (SDU) levels?

Data for this analysis is from the National Treatment Improvement Evaluation Study (NTIES), a 5-year study to evaluate the effectiveness of comprehensive treatment services provided by CSAT- sponsored demonstration projects. Data on substance use, criminal behaviors, employment status, and other psychosocial measures were collected at intake, during treatment, and at post-treatment follow-up from a total of 4,411 NTIES clients. The sample size for this analysis is 3,205.

## **2. METHODOLOGY**

After a description of the relationship between the three proxies, three sets of analyses were performed. In the first, each proxy was examined to determine how well each alone predicted outcomes at the client level. The second set of analyses examined the predictive strength of the proxies at the SDU level. In the third set, hierarchical linear modeling (HLM) was used to establish which variables best predicted post-treatment substance use.

Several variables were used as controls for the predictive strength of the proxies in the modeling phase of the analysis, including modality, pre-treatment maximum use of any substance, age, race/ethnicity, and gender. In addition, several variables were added to the models to assure that the outcome proxies were not simply reflecting a more powerful variable. These SDU and client-level variables included whether the client helped develop the treatment plan; amount of time meeting with primary counselor per month; duration of the post-discharge period, total number of full-time equivalent staff in the SDU; ratio of clients to the number of full-time clinical staff; and revenues per client in the SDU.

## **3. RESULTS**

Results reveal an association between the three proxies. Clients who completed treatment were more likely to be very satisfied with treatment: 81 percent of those clients who completed treatment were very satisfied, compared to 47 percent of those who did not complete treatment. Clients who remained in treatment the longest were more likely to be highly satisfied with treatment compared to those with shorter length of stay (LOS). Clients in the longer LOS group were more likely to complete treatment than those in the shorter LOS group. When examining all three proxies together, it appears that those who were more satisfied with treatment completed at a much higher rate than those who were less satisfied, regardless of LOS.

At the SDU level, simple comparisons of the percentage difference between the three proxies and the outcome variable were made. The results revealed that, while the proportion of clients who were abstinent at follow-up generally reflected the proportion of very satisfied clients, the proportion of clients who completed treatment bears almost no apparent relationship to the proportion of clients who were abstinent at follow-up. Likewise, longer LOS bore little or no relationship to the proportion of clients abstinent within an SDU.

To test whether, and which, of the three proxies predict post-treatment substance use, multilevel modeling was performed. First, a model was constructed for the entire sample. All

variables thought to contribute to the variance in the outcome were selected. The significance of each variable in this “full” model was assessed. Only variables that attained significance at the  $p < .05$  level were included in the reduced model. In the reduced model, variables were retained based on their contribution to the reduction in variance at each step in the random effects model. Based on the results of this reduced model, the following variables were significant predictors of post-treatment abstinence:

- Methadone treatment: those in methadone had higher odds of using at follow-up
- High satisfaction: those who were highly satisfied with treatment had lower odds of using at follow-up
- Completion of treatment: those who completed treatment had lower odds of using at follow-up
- Participation in treatment plan development: those who helped develop their treatment plan had higher odds of using at follow-up
- Pre-treatment substance use: those who had higher pre-treatment use had greater odds of using at follow-up compared to those with lower pre-treatment use
- Duration of post discharge period: the longer the time between discharge and follow-up, the higher the odds that a client was using at follow-up.

Additional models were constructed for the non-methadone outpatient and long-term residential modalities. In the non-methadone outpatient modality, high satisfaction and pre-treatment substance use were significant predictors of post-treatment use. For clients in the long-term residential modality, satisfaction, pre-treatment use, and duration of post-discharge period were significant predictors of post-treatment use.

#### **4. RECOMMENDATIONS**

Based on the results of the analysis, a number of recommendations for research, policy and practice emerged. Further research should be conducted on the predictive power of these and other proxies. For example, the satisfaction measure used here is based on a single question. The predictive strength of other, more comprehensive measures of satisfaction could be examined. Proxies could also be tested for other outcome measures. In addition, the outcome measure of abstinence is quite restrictive. The three proxies, as well as others, could be examined in reference to other less restrictive substance use outcome measures such as maximum use post-treatment.

Policy makers should be cautious when using proxies in lieu of post-treatment outcomes, as this analysis shows them to be imperfect predictors of post-treatment substance use. In addition, results indicate that predictors of post-treatment substance use differ slightly by modality, and therefore caution should be used when examining treatment systems as a whole. For example, although treatment completion was significant in the general model, this proxy failed to be a significant predictor of outcomes in either of the modality-specific models.

Until better proxies are identified, providers and researchers should be fully supported in their efforts to collect outcome data, as many of these efforts are stymied by inadequate funding and lack of staff to perform adequate follow-up. Further, policy makers should support collaborations between the research and treatment communities.

Providers should be mindful of the relationship between services and client satisfaction. Exploring strategies to improve satisfaction, LOS and completion rates, and determining if doing so improves outcomes could prove beneficial to providers. Providers should also utilize outcome data to support their efforts to gain additional funding, ancillary services, and to expand and enhance treatment. While it is necessary to collect outcome data, providers should maximize these data to provide evidence of treatment effectiveness.

## **I. INTRODUCTION**

## I. INTRODUCTION

The value of substance abuse treatment in reducing drug use and associated problems has been well documented, and several hundred treatment systems nationwide deliver services widely shown to be effective and cost-beneficial. These treatment systems, operated by State and local governments and private organizations, include more than 15,000 substance abuse treatment units (SAMHSA, 2001). While treatment is generally effective, the quality and value of specific treatment providers vary across providers and over time for a specific provider.

Substance abuse treatment managers and regulators seek data-based indicators of provider performance. With data-based indicators, managers and regulators can monitor quality and identify treatment providers who need assistance with quality improvement. The “gold standard” for gauging treatment provider performance is post-treatment outcome data. Post-treatment data indicate whether clients have achieved and retained a healthier life after leaving the oversight of treatment providers. Collecting data from clients who have left treatment requires considerable time and expenditures for maintaining client locator information, locating and interviewing them, and analyzing the data. For this reason, many treatment system managers and regulators rely on intermediate data that are collected during treatment or at treatment exit as proxies for ultimate outcomes. There are at least three ways outcome proxies may be used:

- Proxies may help clinicians identify whether or not a given client is more likely to have positive post-treatment outcomes.
- Proxies may help treatment program managers estimate the proportion of clients from an SDU that will have positive post-treatment outcomes.
- Proxies may help a system manager or a policy analyst benchmark the performance of an SDU.

While intermediate outcomes are sometimes used as proxies for post-treatment outcomes, research has been inconclusive regarding their adequacy in this role. This report examines the relationship between three measures (length of stay, treatment completion, and client satisfaction with treatment) and follow-up substance use outcomes within four treatment modalities using the National Treatment Improvement Evaluation Study (NTIES) data.

This chapter reviews the context for the use of outcome proxies and summarizes the prior research on the quality of the proxies. Subsequent chapters outline the methods employed, results obtained, and recommendations for research, policy, and practice.

## **1. BACKGROUND**

Several national and State-level post-treatment follow-up studies have demonstrated that substance abuse treatment is effective in reducing drug and alcohol use, reducing associated criminal behavior, and improving health and productivity (Gerstein et al., 1997; Simpson & Curry, 1997; Schildhaus et al., 1998). The benefits of treatment have also been shown to far outweigh the costs of treatment (Koenig et al., 1999; Gerstein et al., 1994; Finigan, 1996). These studies reflect the quality and effectiveness of the national treatment system. Additional data are required, however, to monitor the quality and effectiveness of specific treatment providers more closely or to document the impact of emerging treatment programs.

This section summarizes the challenges in collecting post-treatment follow-up data that may make intermediate outcomes more feasible; Federal, State, and private sector initiatives to strengthen the use of data in performance measurement and monitoring; and prior research into the quality of those outcome proxies.

### **1.1 The Advantages and Disadvantages of Collecting Post-treatment Follow-up Data**

The strongest evidence of treatment effectiveness is based upon post-treatment follow-up data on client behaviors and status. Follow-up data are generally collected at a specified interval after treatment is completed, and can provide information on the long-term impact of treatment. Comprehensive post-treatment follow-up studies generally capture information regarding clients' substance use, criminality, health, productivity, and family and social relationships.

While follow-up data is desirable, it is burdensome to collect. Follow-up data collection requires locating clients who have left treatment, which is sometimes difficult when clients are transient. Additionally, clients are sometimes unwilling to cooperate in treatment effectiveness studies after treatment is completed. Follow-up interviews take time, must be completed by trained data collectors, and generate data processing and analysis requirements for providers. When resources are tight, under-funded treatment follow-up studies often end up with poor sample sizes and poor quality data.

Intermediate outcomes are data collected during treatment, at treatment exit, or extracted from client records, and are sometimes more feasible to collect than post-treatment outcomes. Examples of such data include length of stay (LOS), treatment completion, and satisfaction with treatment. LOS is simply the amount of time clients remained in treatment. Completion status is defined as whether or not a client finished a program as determined by the provider's criteria,

and is routinely reported as part of clinical administrative data sets. Satisfaction with treatment is often collected at treatment discharge by treatment providers using a variety of instruments and scales that range from a few simple items to more complex and multifaceted satisfaction scales. While these are not the only proxies that can determine long-term outcomes, these proxies are relatively easy to collect and have been collected in other large, national substance abuse studies (e.g., DATOS, SROS).

## **1.2 Initiatives Driving Standard and Regular Outcome Data Collection**

Since the early 1990s, outcome data have become increasingly important to stakeholders on Federal, State and local levels. On the Federal level, the passage of the Government Performance and Results Act (GPRA) in 1993 brought Federal accountability to the forefront. The Act holds the Federal government responsible for achieving program results, service quality and customer satisfaction, among other things. On the State and local levels, outcome data may be used to make important funding allocation decisions, to document accountability, and to determine the cost/benefit of services. Private and public sector managed behavioral health care organizations (MBHOs) report data on quality and effectiveness when competing for treatment contracts. Some advocacy bodies are also seeking to gather and report outcome data. Initiatives across these levels to support outcome reporting are described below.

Currently, States are required to collect substance abuse admissions data on each client enrolled in programs funded through the Substance Abuse Prevention/Treatment (SAPT) block grant. This data is used to monitor system utilization, and is also reported by States to the Substance Abuse and Mental Health Administration's Treatment Episodes Data Set (TEDS). Some States also voluntarily collect and report data collected on clients who leave substance abuse treatment. These voluntary intermediate outcome measures include changes in client substance use behavior and status (e.g., employment, homelessness) between treatment admission and discharge. Several States (e.g., Oregon, Maine) have put performance monitoring systems in place to gauge the effectiveness of funded treatment providers.

In 1997, CSAT launched the Treatment Outcomes Performance Pilot Study (TOPPS) program to assist States in further developing outcome data collection and monitoring systems. In 1997, CSAT awarded TOPPS contracts to 14 States. A supplemental "enhancement" led to new awards to 19 States for "TOPPS II" projects. Under TOPPS II, CSAT sought to facilitate cross-state comparisons by utilizing standardized admission, discharge and follow-up data. Some States collect additional data. For example, customer satisfaction data is collected by 16 of the 19 TOPPS II States, though at different intervals. Of the 16 States collecting satisfaction data, 5 collect data at follow-up; 6 collect data at discharge; 1 collects data at discharge and

follow-up; and 4 collect data during treatment and at discharge. The four States that collect client satisfaction data during treatment and at discharge are specifically examining the relationship between client satisfaction and clinical outcomes.

Managed behavioral health care organizations (MBHOs) contract with States or local providers and with private health plans to manage substance abuse and mental health services. The MBHOs in turn contract with networks of treatment providers. MBHOs may use outcome data to monitor treatment providers; they may also report outcome data to payers or to the public. The National Committee for Quality Assurance (NCQA) has published “outcome” measures on participating health plans, including behavioral health outcome measures. One large MBHO, Kaiser Permanente, conducts specialized research on topics of interest, including patient satisfaction.

As the push for data-based accountability in substance abuse treatment continues, treatment providers and the agencies that manage or finance treatment will use intermediate outcomes in lieu of, or sometimes in addition to, post-treatment follow-up outcomes. The question remains as to how well intermediate outcome measures *predict* post-treatment outcomes. The following section reviews the literature regarding the association between three intermediate outcome measures and post-treatment substance use outcomes.

### **1.3 Prior Analyses on the Relationship Between Proxies and Outcomes**

A review of the literature was conducted on LOS, treatment completion and satisfaction as they relate to substance use outcomes. Multiple databases were searched, including MEDLINE and PsycINFO. A total of 19 articles, books, and book chapters were identified. Appendix A contains a matrix summarizing key features of each article, including research questions addressed, study design, and relevant findings.

There is a consistent and positive relationship between the three proxies studied here (LOS, treatment completion, and client satisfaction with treatment) and post-treatment substance use outcomes. Exhibit I-1 compares the number of articles that support the association between the three measures and substance use outcomes with those that do not. It should be noted that some articles indicate a relationship between a measure and outcomes, but only conditionally; for example, an article may conclude that LOS is associated with substance use outcomes, but only for clients in drug-free outpatient treatment.

<b>EXHIBIT I-1</b>		
<b>DATA-BASED ASSOCIATION BETWEEN PROXIES AND</b>		
<b>OUTCOMES IN THE LITERATURE*</b>		
	<b>Positive Association with Substance Use Outcomes (# of articles)</b>	<b>No Association with Substance Use Outcomes (# of articles)</b>
LOS n = 11	10	1
Treatment completion n = 7	6	1
Satisfaction n = 4	3	1

\* Some articles reported on multiple proxies.

Research indicates that, in general, longer LOS results in better substance use outcomes. This has been shown in national studies including the Drug Abuse Reporting Program (DARP), the Treatment Outcome Prospective Study (TOPS), and the Drug Abuse Treatment Outcomes Study (DATOS). Simpson's research on DARP, a study of more than 16,000 individuals admitted to treatment in four different modalities, concluded that longer stays in treatment were associated with better substance use outcomes (1981). Research from TOPS, a longitudinal study of more than 11,000 individuals across the country, also found that time in treatment was related to substance use outcomes (Condelli & Hubbard, 1994; French et al., 1993; and Hubbard et al., 1989). Hubbard's analysis of DATOS indicated that a LOS of six months or more in drug-free outpatient and long term residential was associated with reduced substance use at follow-up (Hubbard et al., 1997). Similarly, in Hser's examination of residential treatment sites involved in DATOS, longer stays in residential treatment were related to post-treatment cocaine abstinence (Hser et al., 1999). In an analysis of the NTIES data, Greenfield found that for each 1-month increase in LOS, clients were 9 percent less likely to practice risk behaviors such as intravenous drug use during follow-up (Greenfield, 2000). Another analysis of NTIES data examined LOS in relationship to post-treatment costs to society. Findings indicate that a longer LOS is associated with reduced post-treatment costs (Koenig et al., 2000).

Some studies have noted that LOS may only impact the outcomes for clients in specific modalities or for clients who use certain substances. This was the case in the TOPS study, which concluded that LOS in the therapeutic community was a predictor of post-treatment heroin, cocaine and marijuana use, but not a predictor of heavy alcohol use. Also, LOS in residential treatment was a predictor of psychotherapeutic drug use only (Condelli and Hubbard, 1994).

Like length of stay, prior studies have found that clients who complete treatment have better substance use outcomes than those who do not (e.g., leave against medical advice or are discharged for non-compliance). In a study of comprehensive services for crack-dependent mothers, Magura et al. (1999) concluded that completers and those still enrolled in the program 12 months after admission had higher rates of abstinence and lower levels of cocaine present in hair samples than non-completers. Similarly, the DC Initiative, a comparative study of two 12-month treatment programs in the District of Columbia, found that those who completed all components of treatment in either program reported less substance use at follow-up (Nemes et al., 1999). Some studies have found no relationship between treatment completion and substance use outcomes. For example, Ravndal and Vaglum (1998) examined 200 clients admitted to a therapeutic community in Norway. After controlling for psychopathology and other baseline measures, they concluded that completing treatment was not related to substance use outcomes five years after treatment.

The relationship between client satisfaction and substance use outcomes is less prevalent in the literature. In a study of more than 200 substance abusers, Chan et al. (1997) found that satisfaction was correlated with improvements in Addiction Severity Index (ASI) drug and alcohol scores at follow-up. The DARP study also found that those who were more satisfied with treatment had better drug, but not alcohol, outcomes (Simpson and Lloyd, 1979). McLellan and Hunkeler's 1998 study, however, reached a different conclusion. In their study of HMO clients in the Kaiser Permanente system, they found that satisfaction was not correlated with drug or alcohol use at follow-up. They concluded that "satisfaction measures may be a separate domain that should not be considered a proxy for improvement in symptoms or functioning" (p. 575). The clients who participated in this study were more highly educated and had higher incomes than those in many publicly funded substance abuse treatment programs. Such differences in client populations points to the need for more study of satisfaction in diverse client populations.

## **2. PURPOSE AND PARAMETERS OF THE PRESENT ANALYSIS**

The present analysis was designed to determine if three intermediate outcome measures are adequate proxies for post-treatment outcomes using data from the National Treatment Improvement Evaluation Study (NTIES). NTIES was conducted by the National Opinion Research Center (NORC) for the Center for Substance Abuse Treatment (CSAT) to evaluate the effectiveness of comprehensive treatment services provided by CSAT-sponsored demonstration projects. The NTIES project collected longitudinal data from purposive samples of substance abuse treatment clients drawn from service delivery units (SDUs). Data on substance use, criminal behaviors, employment status, and other psychosocial measures were collected at

intake, during treatment, and at post-treatment follow-up from a total of 4,411 NTIES clients. For more details on NTIES, see Appendix B.

The present analysis examines the relationship between three intermediate outcomes measures and substance use outcomes one year after discharge from treatment.

The two analytic questions addressed are:

- Is there an association between length of stay, treatment completion and client satisfaction at the client level?
- How well do length of stay, treatment completion and client satisfaction predict post-treatment substance use outcomes at the client and SDU levels?

This report is intended not only for researchers, but for practitioners and policy analysts as well. After reviewing this document, practitioners should have a better understanding of whether and how these three outcome proxies can be used to demonstrate program effectiveness, while those focused on policy should have a better understanding of how to interpret these measures as budget and program planning decisions are made.

## **II. METHODS**

## II. METHODS

This analysis used client and service delivery unit (SDU)-level information from the National Treatment Improvement Evaluation Study (NTIES), and employed a combination of analytic strategies to provide a comprehensive understanding of the outcome proxies and their relationship with post-treatment follow-up outcomes. This chapter describes the data used for the analyses, the analytic approaches employed, and the specific variables included.

### 1. DATA USED FOR ANALYSIS

Data for this report were taken from NTIES, a 5-year study of treatment effectiveness supported by the Center for Substance Abuse Treatment (CSAT). In 1993 and 1994, the project collected longitudinal data on a purposive sample of 6,593 clients in 71 CSAT-funded treatment programs. These programs included demonstration projects as well as programs that served critical populations. As a result, NTIES may not be a representative sample of treatment programs and clients. A full description of NTIES data is found in Appendix B.

Client data were obtained at intake, treatment exit and one year after treatment exit. A total of 6,595 clients completed an NTIES intake questionnaire. Of those, more than 80 percent (5,388) completed a follow-up interview. NORC excluded 977 from this follow-up sample for three reasons: no discharge interview or record abstraction form was completed; the follow-up reference period was significantly different from the intended 12-month follow-up; or clients were incarcerated for all or most of the follow-up period. Of the remaining 4,411, another 1,206 were excluded for purposes of this analysis for the following reasons:

- Client was receiving treatment in a criminal justice setting (709)
- Client was still in treatment (494)
- Client died (3).

This resulted in a final sample size of 3,205 clients in 59 SDUs. The distribution of SDUs within modalities is provided in Exhibit II-1.

<b>EXHIBIT II-1</b>		
<b>SDUS BY MODALITY</b>		
<b>Modality</b>	<b>Number of SDUs</b>	<b>Percent</b>
Non-methadone Outpatient	28	47
Long-term Residential	17	29
Short-term Residential	7	12
Methadone	7	12
Total	59	100%

The distribution of clients within each of the four modalities is provided in Exhibit II-2.

<b>EXHIBIT II-2</b>		
<b>DISTRIBUTION OF CLIENTS BY MODALITY</b>		
<b>Modality</b>	<b>Number of Clients</b>	<b>Percent</b>
Non-methadone Outpatient	1365	43
Short-term Residential	807	25
Long-term Residential	776	24
Methadone	257	8
Total	3205	100%

Missing or invalid data resulted in additional reductions in analysis sample sizes for some analyses. The most limited analysis sample in this report included 2,547 clients, or about 80 percent of the final sample.

## **2. ANALYTIC APPROACH**

A variety of analytic strategies were used to address the research questions outlined in Chapter I, ranging from simple to complex. Relationships among the three proxies were identified through simple cross-tab analysis. Then, the following approaches were used to describe the relationship between proxies and outcomes:

- Client Level Relationship Between Proxies and Outcome.** At the client level, the first step in the analysis was to determine how accurate a proxy measure would be in predicting post-treatment outcomes for any given client. For this analysis, simple cross-tabulations were calculated. Accuracy was assessed by examining “unexpected” proxy-outcome relationships, e.g., where clients had a positive proxy

but negative outcome, or a negative proxy but a positive outcome. For this, simple comparisons of proportions were used.

- **SDU Level Relationship Between Proxies and Outcome.** At the SDU level, the raw (unadjusted) proportion of clients with a positive proxy was compared with the raw proportion of clients with a positive outcome for each of the 59 SDUs in the analysis. This analysis simulated what a treatment system manager might observe if (s)he looked at the average proxy ratings for an SDU, and what the actual post-treatment substance use outcome rate would have been for that SDU.
- **Multilevel Modeling.** Again at the client level, the final step in the analysis was to determine whether the proxies are generally associated with improved outcomes. For example, if clients are more satisfied, are they also generally more likely to have a positive outcome? Utilizing the Hierarchical Linear Modeling (HLM) technique, this was assessed by determine if the proxies were significant predictors of substance use outcomes after controlling for demographics and treatment setting, and additional treatment-related variables. This was done for the entire sample (general model) and for two of the four modalities (modality-specific models).

Simple bivariate analysis was completed at the client level to examine the relationship between the proxies and the outcome variable. Additional analyses were completed at the SDU level to gauge the degree of agreement between SDU rankings based solely on a proxy and rankings based on the ultimate outcome; that is, for each proxy (LOS, treatment completion, or satisfaction) the proportion of clients with a positive proxy and the proportion who were abstinent at follow-up were shown graphically for each SDU. Subsequently, the variability of the proxy was measured in order to assess the robustness of the proxy in predicting outcomes. The larger the variability of the proxy from the SDU abstinence rate, the less robust the proxy is in predicting abstinence.

To identify the relationships between the proxies and outcomes, statistical models that incorporated a combination of client- and SDU-level data were required to predict substance use at follow-up. For this purpose, the HLM program, developed by Bryk and Raudenbush (1992), was employed. The HLM technique was designed to account for possible nesting of clients within SDUs, while employing the best client and SDU predictors of follow-up behavior. Models were developed for the entire sample, as well as for two modalities: non-methadone outpatient and long-term residential. It was determined that the other two modalities, methadone and short-term residential, did not have sufficient numbers of SDUs to conduct separate HLM analyses (each had only seven SDUs).

In developing the models, HLM 5.0, by SSI Scientific Software, was employed (Raudenbush, Bryk, Cheong & Congdon, 2000). To construct the general HLM model (i.e.,

entire sample), all variables thought to contribute to the variance in the outcome were selected. The significance of each variable in this “full” model was assessed. To construct the reduced general HLM model, analysts selected those variables that achieved significance at  $p < .05$  in the full model. The decision to retain a given variable was based on its contribution to the reduction of variance at each step in the random effects model. Since the dependent variable was dichotomous (i.e., any alcohol/drug use versus no use), the non-linear Bernoulli solution was employed (see Appendix C, The HLM Model, for additional technical details).

Similar procedures were used in constructing models for the non-methadone outpatient modality and the long-term residential modality.

### **3. VARIABLES INCLUDED IN THE ANALYSIS**

This section describes the variables used in the analysis, including the three outcome proxies; other controls, such as modality and client pre-treatment characteristics; the outcome variable, post-treatment substance use; and other potential explanatory variables.

#### **3.1 Three Outcome Proxies**

The three outcome proxies examined in these analyses are length of stay (LOS), completion of treatment, and client satisfaction with treatment. Although there are a variety of measures that could be tested as proxies for long-term outcomes, these three were chosen because they are relatively easy to collect. In addition, because similar measures have been collected in large, national studies (e.g., DATOS, SROS), it is believed that one, two, or all of these measures are being collected by many treatment providers.

Length of stay (LOS) is defined as the amount of time clients remained in treatment before the program reported their last day of services. LOS can be treated as a continuous variable or divided into groups and treated as a dichotomous or categorical variable. For purposes of these analyses, a dichotomous LOS variable was created in which the one-third of the clients with the longest LOS (calculated by modality) were differentiated from the remaining two-thirds of clients. The cut points for the top one-third LOS for each modality (i.e., the minimum number of days in treatment that would put a client in the top 33% for LOS in their modality) is provided below:

- Methadone = 174 days
- Non-methadone Outpatient = 127 days

- Short-term Residential = 28 days
- Long-term Residential = 99 days.

For the remainder of this report, “Longer LOS” refers to the one-third of clients with the longest LOS in their modality.

Discharge status was reported by the SDU and obtained by research staff through record abstraction. Clients either completed treatment, were discharged against medical advice (“client-initiated exit”), were discharged for administrative reasons (“provider-initiated exit”), or were discharged for other reasons (e.g., referred, died, incarcerated). Approximately 37 percent of all clients enrolled completed treatment and an almost identical number (36%) were client-initiated exits. Another 15 percent were provider-initiated exits. Additionally, 12 percent of the clients had other discharge statuses, which includes referral to another program, incarcerated, program was not sure why treatment was incomplete, and other. Overall, more clients did not complete treatment. For purposes of these analyses, treatment completion is a dichotomous variable, where clients either did or did not complete treatment.

Client satisfaction was obtained from the NTIES discharge interview through a single question asking clients to rate the helpfulness of treatment on a 3-point scale (very much, somewhat, not at all). Although a single question cannot assess a client’s satisfaction with treatment in the same way that comprehensive and multidimensional satisfaction instruments can, this variable nonetheless provides a general approximation of satisfaction. These analyses differentiate clients who reported treatment to be very helpful from those who reported treatment to be somewhat or not at all helpful.

### **3.2 Other Control Variables**

In addition to the three proxies, modality and pre-treatment characteristics were also included in the model as control variables. These variables are described below.

#### **Modality**

For the general HLM model, the methadone modality was entered into the model, while other modalities were given the opportunity to subsequently enter the model using the HLM

exploratory analysis function. As the proxies (and other variables) may differ in their impact on substance use outcomes within a particular modality, additional models were developed for two of the four modalities: non-methadone outpatient and long-term residential. It was determined that the other modalities, methadone and short-term residential, did not have sufficient numbers of SDUs for analyses.

### **Client Pre-treatment Characteristics**

Four pre-treatment characteristics were utilized for the HLM analysis:

- Maximum use—the maximum number of days a client used any substance in the 30 days prior to receiving treatment. This was a 6-level, categorical variable.
- Age—the client’s age at the time of the baseline interview; this was a continuous variable.
- Race/ethnicity—a single, multilevel race/ethnicity variable was converted into dichotomous variables for the following groups: Hispanic, Black/African American, Native American, other racial group, and white.
- Gender—male/female.

The outcome variables, 30 day substance use at follow-up, and other potential explanatory variables are described in the following sections.

### **3.3 Outcome Variable**

The main purpose of these analyses is to test how well three outcome proxies predict post-treatment substance use in the NTIES data. The most restrictive and conservative outcome was selected for this analysis: whether (or not) clients had any use of any substance (drugs or alcohol) during the 30 days prior to the follow-up interview. Instead of using a single substance (e.g., client’s main drug at admission), it was determined that any use of any substance would be a more comprehensive and conservative measure of use; that is, it is important to know whether or not a client is using her/his main substance(s) at follow-up, as well as whether or not the client is using another substance (or substances). The conservative nature of the outcome variable could mask the predictive strength of the proxies, however; therefore, the results presented in the following chapter should be viewed with this in mind. Future analysis could utilize other, less restrictive outcome variables, including maximum use of the client’s primary substance at follow-up, or maximum use of any substance at follow-up.

### **3.4 Other Potential Explanatory Variables**

A combination of client- and SDU-level variables were also selected to further refine the model and assure that the outcome proxies are not simply reflecting another more powerful variable (or variables). The goal in selecting an extended list of explanatory variables was to determine whether other SDU- and client-level factors actually account for some of the variance in outcomes attributed to the proxies. The following client- and SDU-level variables were selected for inclusion in the model:

- Whether (or not) the client helped develop the treatment plan
- Amount of time the client reported meeting with their primary counselor (in minutes per month)
- Duration of the post-discharge period
- Total number of staff (full-time equivalents) in the SDU
- Ratio of clients to the number of full-time equivalent clinical staff
- Revenues per client in the SDU.

The definitions of these variables are listed in Appendix D, Other Potential Explanatory Variables Used in Hierarchical Linear Modeling.

### **III. RESULTS**

### III. RESULTS

This chapter details the results of two analysis questions, namely, is there an association between length of stay (LOS), treatment completion and client satisfaction with treatment, and how well do these variables predict post-treatment substance use outcomes? After a description of the three proxies and their relationship to each other, three sets of analyses were performed. In the first, each proxy was examined to determine how well each alone predicted outcomes at the client level. The second set of analyses examined the predictive strength of the proxies at the SDU level. In the third set of analyses, hierarchical liner modeling (HLM) was used establish which variables best predicted post-treatment substance use.

#### 1. DESCRIPTION OF THE THREE PROXIES

Out of the final analysis sample of 3,205 clients, length of stay was available for all clients; satisfaction was missing or not reported for 635 (20%), and completion status was missing or not reported for 30 (0.9%). Below are brief descriptions of each proxy and their frequency distribution by modality (Exhibits III-1 through III-3). Chi-square tests show significant differences across modalities for all proxies.

##### 1.1 Length of Stay

The longer LOS variable indicates whether or not a client's treatment duration was in the top one-third of all clients in that modality. The frequency distribution for this variable is provided in Exhibit III-1.

<b>EXHIBIT III - 1</b>				
<b>LENGTH OF STAY BY MODALITY</b>				
<b>Value</b>	<b>Methadone % (#)</b>	<b>Non-methadone Outpatient % (#)</b>	<b>Short-term Residential % (#)</b>	<b>Long-term Residential % (#)</b>
Longer LOS (highest one-third)	35 (89)	34 (468)	51 (409)	34 (266)
Shorter LOS (lower two-thirds)	65 (168)	66 (897)	49 (398)	66 (510)
Total	100 (257)	100 (1365)	100 (807)	100 (776)

Due to the fact that a large number of client in short-term residential treatment had a length of stay of 28 days, approximately half of the clients in this modality fell into the Longer LOS group.

## 1.2 Treatment Completion

Completion is defined as whether or not the provider considered the client to have completed treatment (Exhibit III-2). A greater percentage of short-term residential clients completed treatment compared to other modalities, but this is not surprising since the duration of treatment in this modality is shorter than other modalities.

<b>EXHIBIT III-2</b>				
<b>TREATMENT COMPLETION BY MODALITY</b>				
<b>Value</b>	<b>Methadone % (#)</b>	<b>Non-methadone Outpatient % (#)</b>	<b>Short-term Residential % (#)</b>	<b>Long-term Residential % (#)</b>
Completed treatment	12 (29)	22 (296)	70 (565)	36 (279)
Did not complete treatment	88 (222)	78 (1054)	30 (240)	64 (490)
Total	100 (251)	100 (1350)	100 (805)	100 (769)

The distribution of satisfaction by modality is provided below.

## 1.3 Satisfaction with Treatment

For purposes of this analysis, satisfaction is defined as whether or not a client reported that the treatment program has been very helpful versus somewhat or not at all helpful. In terms of satisfaction, 81 percent of short-term residential clients were very satisfied with treatment, compared to 58 percent of long-term residential, 55 percent of non-methadone outpatient, and 31 percent of methadone clients (Exhibit III-3).

<b>EXHIBIT III-3</b>				
<b>CLIENT SATISFACTION BY MODALITY</b>				
<b>Value</b>	<b>Methadone % (#)</b>	<b>Non-methadone Outpatient % (#)</b>	<b>Short-term Residential % (#)</b>	<b>Long-term Residential % (#)</b>
Very Helpful	31 (71)	55 (558)	81 (551)	58 (374)
Not Very Helpful	69 (156)	45 (456)	19 (131)	42 (273)
Total	100 (227)	100 (1014)	100 (682)	100 (647)

The proxies are also examined across demographics in the following section.

#### **1.4 LOS, Completion, and Satisfaction by Demographics**

For analytic purposes, the race/ethnicity and gender variables were changed from categorical to dichotomous “yes/no” variables. The proportion of clients with positive proxy status varied across some demographic lines (Exhibit III-4). A greater proportion of African Americans were very satisfied with treatment compared with non-African Americans (64% compared to 55%). Fewer African Americans had a longer length of stay, however, compared with non-African Americans (36% compared to 43%). Additionally, fewer Native Americans were very satisfied with treatment compared to non-Native Americans. Reasons for these demographic differences are not immediately clear and would require investigation that is beyond the scope of this analysis.

<b>EXHIBIT III-4</b>				
<b>PROXY STATUS FOR HISPANICS, AFRICAN AMERICANS, NATIVE AMERICANS, AND FEMALES</b>				
<b>Demographic Group</b>		<b>Very Satisfied N = 2570 (%)</b>	<b>Completed Treatment N = 3175 (%)</b>	<b>Longer LOS N = 3205 (%)</b>
Hispanic	Yes	59	39	35
	No	61	36	39
African American	Yes	64**	36	36
	No	55	38	43**
Native American	Yes	48	41	30
	No	61*	37	39
Female	Yes	62	37	37
	No	60	37	39

\* p < .05      \*\* p = .000

There were no differences in proxy status by gender group or average age (not shown).

## 2. RELATIONSHIPS BETWEEN PROXIES

Associations exist between the three proxies. Overall, only 7 percent of clients had longer LOS, completed treatment, and were very satisfied. Conversely, 20 percent were in the shorter LOS group, did not complete treatment, and were somewhat or not at all satisfied. The majority of clients (63%) had two proxies in common. The main relationships between the proxies are briefly described below:

- More than 80 percent of those who completed treatment reported high satisfaction with treatment. Similarly, the majority of those who did not complete treatment were less satisfied with treatment (53%).
- Clients in the long LOS group were more likely to complete treatment compared to the shorter LOS group (47 % versus 30%, respectively). Interestingly, more than half of both the longer and shorter LOS group did not complete treatment. This is in keeping with the fact that, as noted earlier, most clients did not complete treatment.

- Clients who remained in treatment longer were more likely to be highly satisfied with treatment compared to those who were in the shorter LOS group (71% versus 54%).

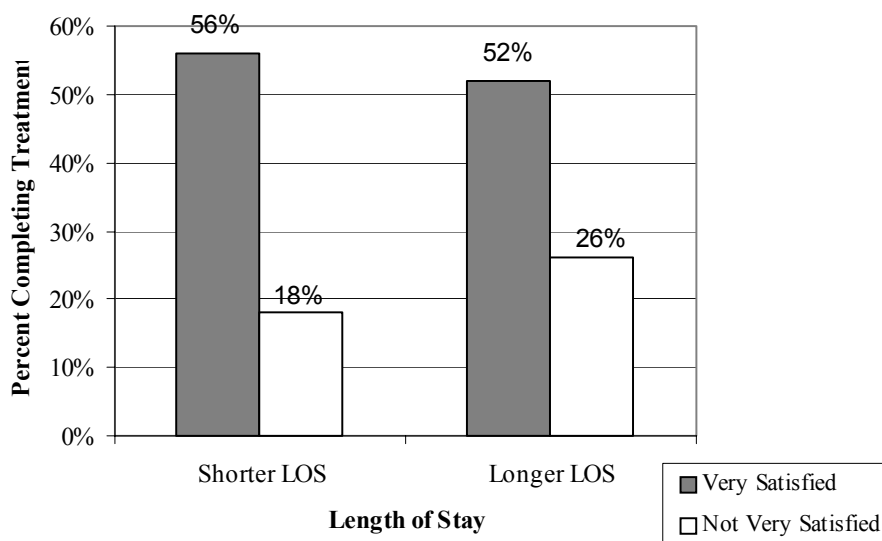
The relationships between the proxies were significant at the  $p < .001$  level.

If the three proxies are examined together (Exhibit III-5), high satisfaction with treatment appears to be strongly related to the likelihood that clients completed treatment, regardless of length of stay. Conversely, *low* satisfaction was strongly associated with clients not completing treatment, regardless of length of stay. Of the 2,547 clients with valid, non-missing data on treatment completion, satisfaction, and length of stay, analysis revealed that:

- In both the shorter and longer LOS groups, a greater percentage of the very satisfied clients completed treatment compared to the less satisfied clients.
- Slightly more of the very satisfied clients in the shorter LOS group completed treatment compared to the very satisfied clients in the longer LOS group (56% and 52%, respectively).
- Slightly more of the less satisfied clients in the longer LOS group completed treatment compared to the less satisfied clients in the shorter LOS group (26% and 18%, respectively).

### EXHIBIT III - 5

#### RELATIONSHIP BETWEEN SATISFACTION AND TREATMENT COMPLETION FOR SHORTER AND LONGER LOS



The next section turns to address how these variables relate to post-treatment outcomes.

### 3. BIVARIATE ANALYSIS OF THE PROXIES

The main purpose of this report is to test whether, and which of, three proxies predict post-treatment substance use. This section describes results of bivariate analysis of the three proxies at both the client and SDU level to determine how well they predict post-treatment substance use.

#### 3.1 Client-level Relationship Between Proxies and Outcome

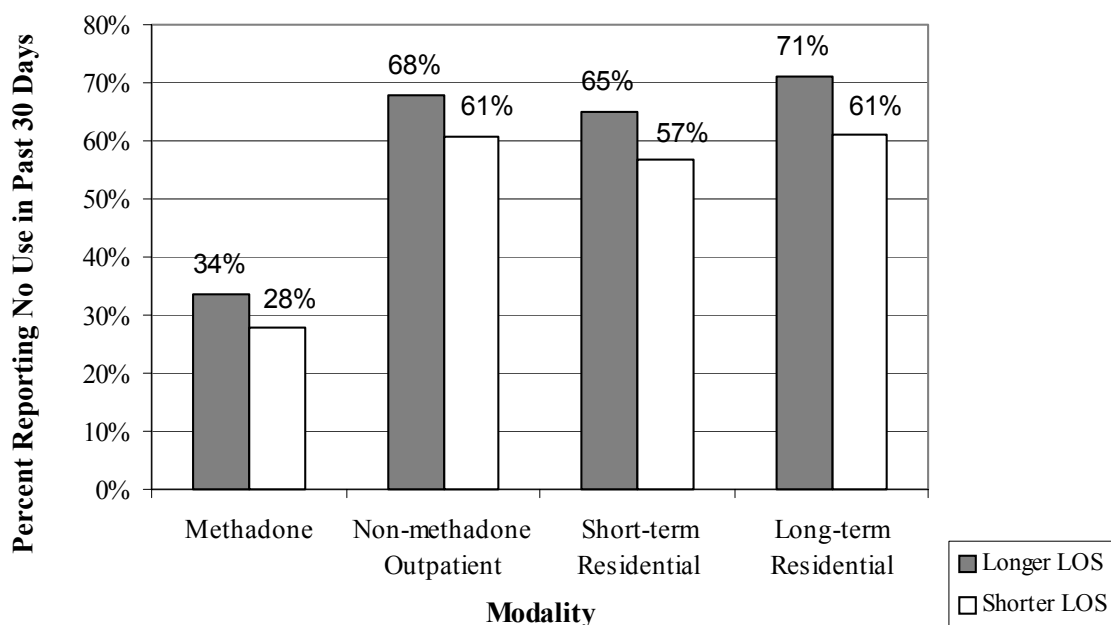
Providers and funders do not always have the time, money or personnel to conduct rigorous statistical analysis. Often, they must rely on intermediate outcome data without controlling for other factors to make judgments about treatment services. It is important to examine the three proxies in much the same way that a provider or funder might; that is, examining how well each of these variables predict substance use outcomes on their own. These findings will be compared with more sophisticated analysis utilizing multilevel modeling in section 4.

Treatment duration has been regarded as an important predictor of outcomes: clients who remain in treatment longer are generally better off at follow-up. This analysis added to prior research by exploring treatment duration as a proxy for post-treatment outcome. Overall, those who were in treatment longer were also more likely to be abstinent at follow-up (Exhibit III-6).

<b>EXHIBIT III-6 RELATIONSHIP BETWEEN LENGTH OF STAY AND PAST 30-DAY SUBSTANCE USE</b>		
	<b>Longer LOS % (n)</b>	<b>Shorter LOS % (n)</b>
No use in past 30 days	65 (803)	57 (1128)
Some use in past 30 days	35 (429)	43 (845)
Total	100 (1232)	100 (1973)

When examined by modality, methadone appears to differ from the other three modalities (Exhibit III-7) in terms of substance use outcomes. Whereas approximately one-third of clients with a longer LOS in methadone were abstinent at follow-up, two-thirds of clients with a longer LOS in the other modalities were abstinent.

**EXHIBIT III - 7**  
**RELATIONSHIP BETWEEN LENGTH OF STAY AND**  
**PAST 30-DAY SUBSTANCE USE, BY MODALITY**



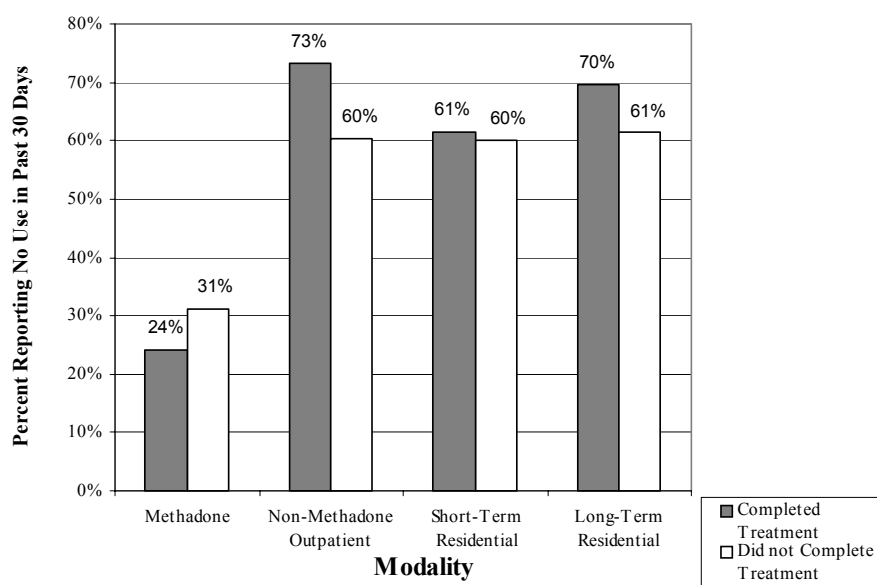
The above exhibit also illustrates that LOS is an imprecise proxy for post-treatment outcome. For example, although a longer LOS is generally associated with abstinence, more than one-half of the shorter LOS clients in non-methadone modalities were abstinent at follow-up.

In terms of treatment completion, more completers were abstinent at follow-up than non-completers, but non-completers still had high abstinence rates (Exhibit III-8).

<b>EXHIBIT III-8</b>		
<b>RELATIONSHIP BETWEEN TREATMENT COMPLETION AND PAST 30-DAY SUBSTANCE USE</b>		
	<b>Completed Treatment</b> % (n)	<b>Did Not Complete</b> % (n)
No Use in Past 30 Days	65 (765)	57 (1150)
Some Use in Past 30 Days	35 (404)	43 (856)
Total	100 (1232)	100 (1973)

Among methadone treatment clients, those who did not complete treatment were more likely to be abstinent than those who did complete treatment (31% and 24%, respectively) (Exhibit III-9). In the other three modalities, however, those who completed treatment were more likely to be abstinent at follow-up. In addition, more than 60 percent of both completers and non-completers in non-methadone modalities were abstinent at follow-up.

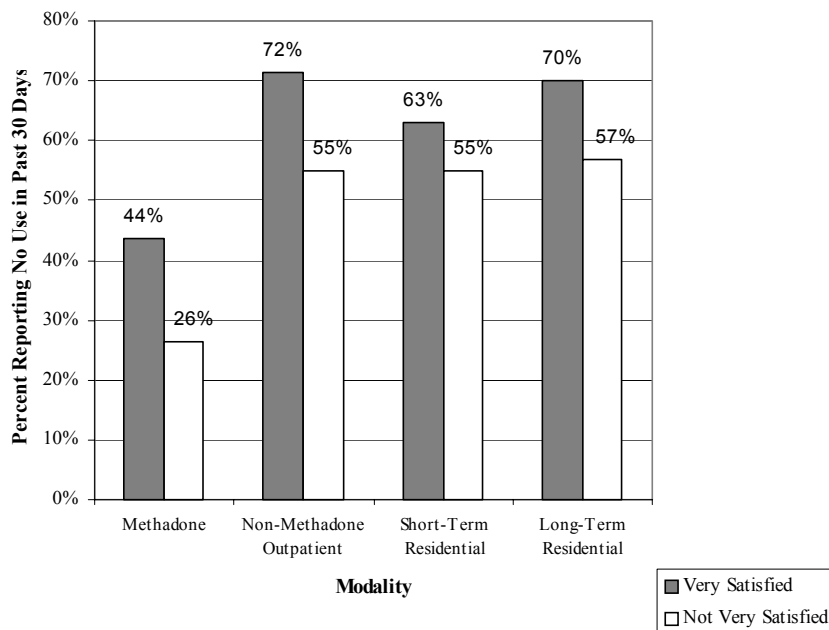
**EXHIBIT III-9**  
**RELATIONSHIP BETWEEN TREATMENT COMPLETION AND PAST 30-DAY SUBSTANCE USE BY MODALITY**



Across the entire sample, clients who were more satisfied were also more likely to be abstinent at follow-up (Exhibit III-10).

<b>EXHIBIT III-10</b>		
<b>RELATIONSHIP BETWEEN SATISFACTION AND PAST 30-DAY SUBSTANCE USE</b>		
	<b>Very Satisfied % (n)</b>	<b>Not Very Satisfied % (n)</b>
No Use in Past 30 Days	67 (1040)	51 (518)
Some Use in Past 30 Days	33 (514)	49 (498)
Total	100 (1554)	100 (1016)

**EXHIBIT III-11**  
**RELATIONSHIP BETWEEN SATISFACTION AND PAST 30-DAY SUBSTANCE USE, BY MODALITY**



The link between satisfaction and abstinence is also true within each modality, although some between modality differences exist (Exhibit III-11). For example, although it is true that across all modalities, those who are more satisfied are also more likely to be abstinent at follow-up, clients in methadone are less likely to be abstinent than those in other modalities.

Like length of stay, Exhibit III-11 demonstrates the limitations of satisfaction as a robust proxy for post-treatment outcomes; that is, not all clients who are very satisfied with treatment will be abstinent at follow-up. For example, despite the fact that more methadone clients who were very satisfied were abstinent at follow-up compared to those who were less satisfied (44% versus 26%), more than half of the very satisfied clients (56%) were not abstinent. Using the above numbers as an example, if a methadone treatment provider found that all of its clients reported being very satisfied with treatment and assumed that, because satisfaction is associated with post-treatment abstinence, most (or all) of the clients would also be abstinent at follow-up, the provider would be over-estimating the number of abstinent clients. Similarly, just as not all highly satisfied clients are abstinent at follow-up, not all clients who are less satisfied are using drugs or alcohol at follow-up. For example, within the three non-methadone modalities, at least 55 percent of those who were not very satisfied were nonetheless abstinent at follow-up.

The results presented thus far establish the three proxies as generally robust predictors of outcome, but show their limitations for use alone as proxies. The next section examines the proxies from the standpoint of a treatment system manager or a policy analyst who receives reports aggregated at the SDU level.

### **3.2 SDU-level Relationship Between Proxies and Outcome**

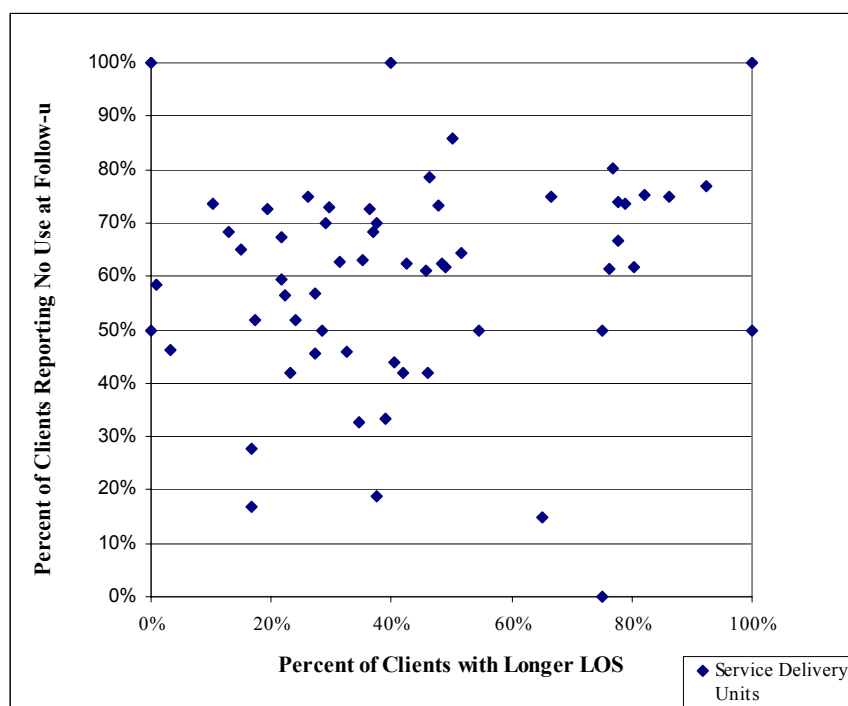
Substance abuse treatment providers often report on the proportion of clients who were satisfied or who completed treatment for the purpose of assessing provider performance by funding or regulatory agencies. For this analysis, LOS, treatment completion, and client satisfaction were each compared with the average proportion of abstinent clients for each SDU.

This analysis employed simple comparisons of the percentage difference between the proxies and the outcome variable within each SDU. For each proxy, the average proportion of clients with a positive proxy is compared to the average proportion who were abstinent in each SDU. Overall, the proportion of clients who were abstinent at follow-up ranged from 0 to 100 percent of clients, though only five SDUs had less than 30 percent of clients abstinent and only four had greater than 80 percent of clients who were abstinent. Most SDUs had between 40 and 80 percent abstinence rates at follow-up.

#### **Length of Stay**

Longer LOS bore little or no relationship to the proportion of abstinent clients within an SDU (Exhibit III-12). If a strong relationship existed, the points on the scatter plot in Exhibit III-12 would have more of a linear formation; that is, an SDU with a small proportion of clients with a longer LOS would also have a small proportion of clients who were abstinent at follow-up, and a larger proportion of clients with a longer LOS would correspond to a larger proportion of clients who were abstinent. The proportion of clients who had a longer LOS ranged from 0 to 100 percent among the 59 SDUs. This range reflects provider philosophy and treatment goals, in addition to client characteristics and provider effectiveness. Some providers define their treatment to last for a span of time that may either fall short or exceed the threshold for the highest-third LOS within each modality.

**EXHIBIT III-12**  
**PROPORTIONS OF CLIENTS WITH NO SUBSTANCE USE IN PAST 30 DAYS AND**  
**CLIENTS WHO HAD A LONGER LENGTH OF STAY**



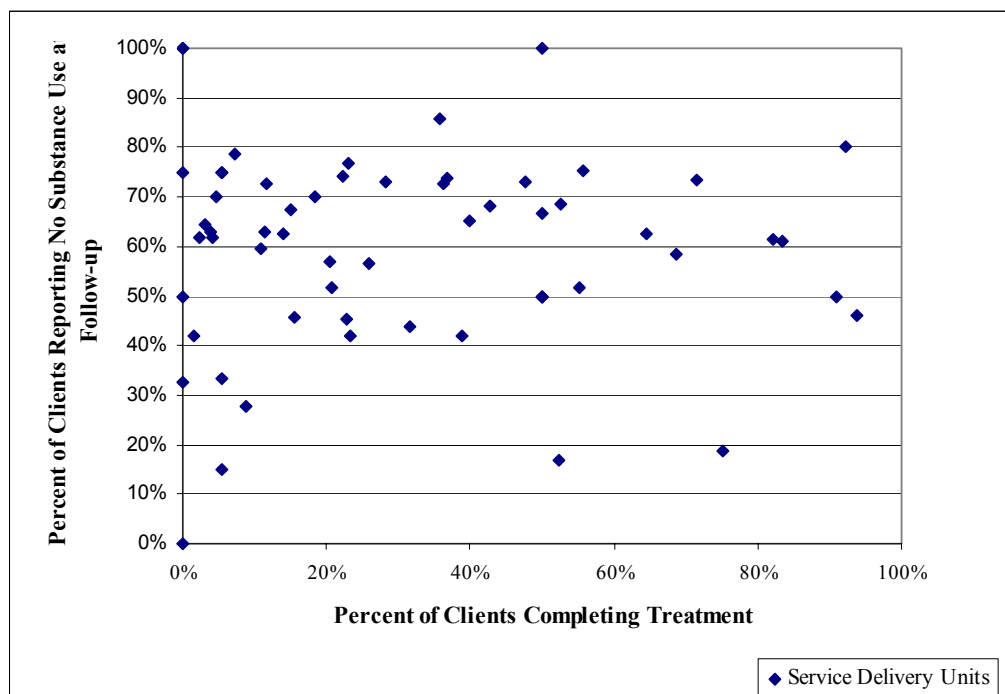
The absolute difference between the proportion of abstinent clients and the proportion of very satisfied clients was also examined (not shown). On average, the difference between longer LOS and abstinence at follow-up was 27 percent; that is, the proportion of clients in an SDU who were in treatment longer was, on average, 27 percent higher or lower than the proportion of

clients who were abstinent at follow-up. The difference in these rates was greatest among long-term residential SDUs (31%) and smallest among methadone SDUs (21%). The smaller variance indicates that longer LOS and abstinence rates are more similar among methadone SDUs than among other SDUs. The reason for the greater similarity among methadone SDUs compared to SDUs in other modalities is unclear, and will require further investigation.

### Treatment Completion

The proportion of clients per SDU who completed treatment bears little relationship to the proportion who were abstinent at follow-up. The proportion of clients who completed treatment ranged from 0 to more than 90 percent. Similar to LOS, there was no clear relationship between the proportion of clients who completed treatment and the proportion of clients who were abstinent at follow-up (Exhibit III-13). For example, in those SDUs with completion rates between 0 and 10 percent, the abstinence rates range from 0 to 100 percent.

**EXHIBIT III-13**  
**PROPORTIONS OF CLIENTS WITH NO SUBSTANCE USE IN PAST 30 DAYS AND**  
**CLIENTS WHO COMPLETED TREATMENT**



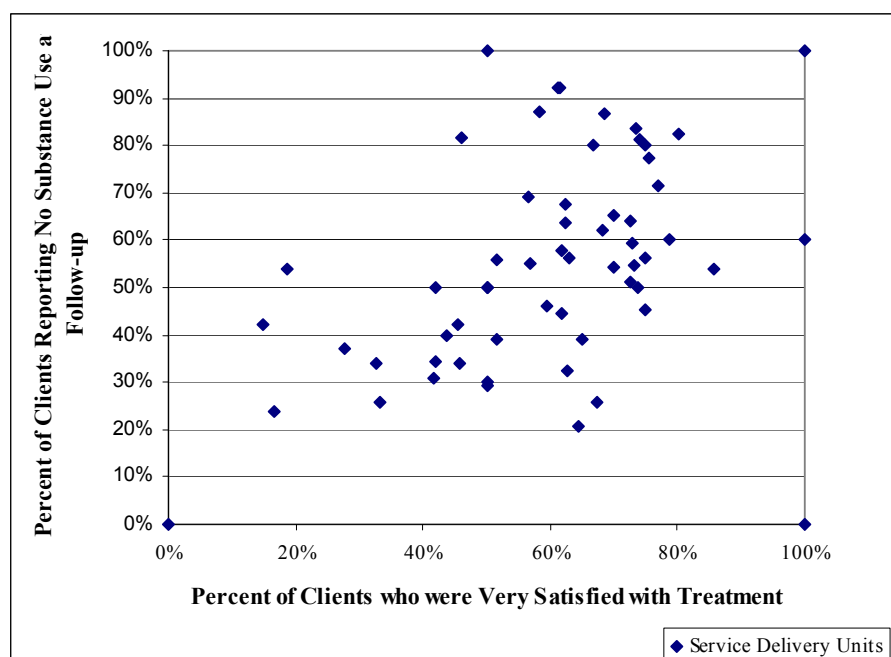
On average, the difference between the proportion of clients who completed treatment and the proportion who were abstinent at follow-up is 37 percent. The difference was greater among non-methadone outpatient SDUs (42%) and smallest among methadone SDUs (24%). This Exhibit also demonstrates that treatment completion by itself may under-represent the proportion of clients who are abstinent: nearly 80 percent of the SDUs had abstinence rates equal to or higher than the treatment completion rates. This may be due, in part, to the fact that relatively few clients in the sample completed treatment (37%). Although it is important that service providers collect information on treatment completion, completion rates may not necessarily reflect provider performance in terms of substance use outcomes.

### Client Satisfaction

The proportion of clients in a single SDU reporting that they were very satisfied with treatment ranged from 0 to 100 percent. There was a positive but largely insignificant relationship between satisfaction and abstinence. Generally, the proportion of clients who were abstinent at follow-up was similar to the proportion who were very satisfied with treatment (Exhibit III-14).

#### EXHIBIT III-14

#### PROPORTIONS OF CLIENTS WITH NO SUBSTANCE USE IN PAST 30 DAYS AND CLIENTS WHO WERE HIGHLY SATISFIED WITH TREATMENT



The variability in this proxy is striking. For example, in one SDU, 100 percent of the clients were abstinent and none were very satisfied, while in another SDU, only 50 percent were abstinent but 100 percent were highly satisfied. Such examples should caution the treatment system manager or the policy analyst to rely on more than client satisfaction to rate provider performance.

On average, there is a 17 percent difference between abstinence and high satisfaction within a single SDU. Again, the rates of high satisfaction and abstinence are more similar among methadone SDUs than among SDUs in other modalities.

If the three proxies are examined at an SDU level without controlling for other factors, it would appear that only satisfaction is associated with abstinence at follow-up. As previously discussed, however, satisfaction is an imperfect proxy for post-treatment substance use. Treatment system managers, policy analysts, and other individuals examining these types of data should be cautious in interpreting such results without additional information.

The next section examines the proxies using multilevel modeling.

#### **4. MULTILEVEL ANALYSIS—THE HLM MODEL**

To construct the general HLM model, all variables thought to contribute to the variance in the outcome were selected. The significance of each variable in this “full” model was assessed. Only variables which attained significance at  $p < .05$  were included in the reduced model. To construct the reduced general HLM model, analysts selected those variables that achieved significance in the full model. Similar procedures were conducted for analysis of the non-methadone outpatient modality and the long-term residential modality.

The SDU and client-level factors in the fixed effects models, both general and modality-specific, are presented in Exhibit III-15 below.

<b>EXHIBIT III-15 HLM GENERAL AND MODALITY SPECIFIC MODEL ODDS RATIOS FOR SDU AND CLIENT PREDICTOR(S) OF NO SUBSTANCE USE DURING FOLLOW-UP</b>						
<b>Predictors</b>	<b>General Model</b>		<b>Modality Specific Models</b>			
	<b>All 4 Modalities</b>		<b>Non-methadone Outpatient Only</b>		<b>Long-term Residential Only</b>	
	<b>Full</b>	<b>Reduced</b>	<b>Full</b>	<b>Reduced</b>	<b>Full</b>	<b>Reduced</b>
<b>SDU Predictor(s)</b>						
Methadone Modality-Yes/No	-3.609***	-3.173***	NA	NA	NA	NA
<b>Client Predictor(s)</b>						
Duration of Post-discharge Period	-1.002***	-1.002***	-1.009	NA	-1.004***	-1.004***
Max. Pre-treatment Use	-1.204***	-1.215***	-1.334***	-1.347***	-1.193***	-1.191**
High Satisfaction - Yes/No	1.768***	1.746***	1.660**	1.848**	1.738**	1.765**
Treatment Completion - Yes/No	1.353*	1.458**	1.836**	NA	1.308	NA
Length of Stay	0.001	NA	1.001	NA	1.887	NA
Patient Helped Develop Tx Plan	-1.287*	-1.300**	-1.126	NA	-1.496	NA
Age	1.012	NA	1.024***	NA	1.555	NA
Female -Yes/No	1.139	NA	1.132	NA	-1.125	NA
Hispanic -Yes/No	-1.131	NA	1.138	NA	-1.108	NA
African American -Yes/No	-1.055	NA	1.032	NA	-1.302	NA
Native American -Yes/No	-1.518	NA	1.006	NA	1.229	NA
Other Non-white Race -Yes/No	1.026	NA	-1.308	NA	2.012	NA
Minutes/Month of Counseling	1.000	NA	-1.001	NA	1.496	NA

\* p<.05, \*\* p<.01, \*\*\*p<.001 NA designates predictors that were excluded from a particular model.

A description of these results is provided in the following sections.

#### 4.1 General Models

Similar results were found for both the full and reduced general models. Each of the variables that were significant in predicting post-treatment abstinence in the full model also accounted for significant reduction of the variance in post-treatment abstinence in the reduced model. When examining the predictive strength of the proxies in the reduced model, results indicate that, for those who were very satisfied with treatment, the odds of abstaining from post-treatment substance use was 75 percent greater than the odds for clients who were not highly satisfied. In addition, for clients who completed treatment, the odds of abstaining from substance use at follow-up was 46 percent greater than those who did not complete treatment. The longer LOS variable was not a significant predictor of post-treatment abstinence in either the full or the reduced model. Consequently, another LOS variable was substituted into the full model to determine if a different method of examining LOS would change the results. This new

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LOS variable was categorical, with length of stay divided into deciles by modality. Again, LOS was not a significant predictor of post-treatment abstinence.

Along with satisfaction and treatment completion, a number of other variables were significant predictors of post-treatment substance use outcomes. The only SDU factor that was a significant predictor of abstinence at follow-up was whether or not the SDU provided methadone services. The odds of clients from SDUs in that modality using any substance at follow-up was more than 3 times greater than the odds for client from SDUs providing all other types of treatment. For clients with more pre-treatment substance use, the odds of being abstinent at follow-up were 20 percent lower than the odds for clients with less pre-treatment use. Interestingly, clients who helped develop their treatment plan had nearly 30 percent lower odds of abstaining from substance use at follow-up. Finally, the duration of the post-discharge period was also a significant predictor. Results indicate that the odds of being abstinent during follow-up were approximately 16 times lower for each additional month in the follow-up period (.002 per day x 30 days = .06 per month).

#### **4.2 Modality-specific Models**

The results for analysis conducted on both the non-methadone outpatient and long-term residential modalities are presented below.

##### **Non-methadone Outpatient Modality**

Many of the variables that were significant in the general model were also significant in the non-methadone outpatient models. In the full model (i.e., where all variables were added into the model together), treatment completion and satisfaction were again significant predictors of post-treatment substance use, as were pre-treatment maximum use and age. When these four variables were added to the reduced model, however, only satisfaction and pre-treatment maximum use remained significant. Specifically, for those who were highly satisfied with treatment, the odds of being abstinent at follow-up was 85 percent greater than the odds for those who were not highly satisfied. Similarly, clients with more pre-treatment substance use had lower odds of being abstinent at follow-up than for those with less pre-treatment use (OR = -1.35). None of the SDU level variables (e.g., FTEs, revenues per client) were significant in either the full or reduced model for this modality.

### **Long-term Residential Modality**

In this modality, three client-level variables predicted post-treatment substance use in both the full and reduced models. None of the SDU-level variables were significant. Results indicate that, for clients in long-term residential treatment, the greatest predictor of post-treatment substance use was satisfaction with treatment. As with the previous models, clients who were highly satisfied with treatment had higher odds of being abstinent at follow-up than those for clients who were not highly satisfied. In addition, pre-treatment maximum use and duration of the follow-up period were also significant predictors of substance use outcomes.

The HLM results suggest that satisfaction and treatment completion are significant predictors of substance use at follow-up across all modalities, but they are not the only predictors. Pre-treatment use, methadone modality, and duration of the follow-up period also predict whether or not a client is abstinent at follow-up. Within two of the four modalities, two variables predicted substance use outcomes: satisfaction and pre-treatment maximum use. Duration of the follow-up period was significant for long-term residential, but not for non-methadone outpatient. Interestingly, no SDU-level variables were significant predictors for either modality.

## **IV. SUMMARY AND RECOMMENDATIONS**

## IV. SUMMARY AND RECOMMENDATIONS

This report explored three outcome proxies and their impact upon a single but very rigorous post-treatment outcome: any past 30 day substance abuse measured at follow-up. The two analysis questions analyzed using the NTIES data were:

- Is there an association between length of stay, satisfaction and treatment completion, and the outcome proxies?
- How well do length of stay, satisfaction and treatment completion, and the outcome proxies, predict post-treatment substance use?

The ability of the three proxies to predict post-treatment substance use was examined at both the client level and the SDU level to give multiple perspectives to the question; that is, from the perspective of a treatment provider, who would be interested in predicting the number of clients currently in treatment who will achieve abstinence, and from the perspective of a treatment system manager or policy analyst, who would be interested in examining provider performance.

This chapter summarizes and discusses the findings and identifies recommendations for policy, practice, and research.

### 1. SUMMARY

Is there an association between the outcomes proxies? These analyses show that there is an association between clients regarding their status on the three outcomes proxies tested. Those who were in treatment longer or completed treatment were more likely to be very satisfied. Additionally, those who had a shorter LOS were more likely not to complete treatment. When comparing all three proxies together, high satisfaction is associated with treatment completion regardless of LOS.

How well do the proxies predict post-treatment substance use? When controlling for other factors using HLM techniques, client satisfaction and treatment completion are predictors of post-treatment abstinence across the entire sample, even after controlling for the nesting effects of clients within SDUs.

While the HLM results point to a positive relationship between satisfaction and treatment completion with post-treatment abstinence, they are imprecise on a client by client basis. For example, more than half of the very satisfied methadone clients were not abstinent. Also, among

clients in the other three modalities, more than half of those who were *not* very satisfied were abstinent. This example indicates that alone, proxies only provide partially accurate predictions of outcomes on a client-by-client basis.

At the SDU level, basic comparisons of proxies to the outcome indicate that none of the three outcome proxies provided a compelling reflection of actual post-treatment outcomes achieved for a given treatment provider. The proportions of clients with positive proxies status (i.e., longer LOS, completed treatment, or very satisfied) were sometimes substantially different from the proportions of clients with positive post-treatment outcomes. While it is true that SDUs with a greater percentage of very satisfied clients often had higher rates of abstinence, this was not the case with LOS or treatment completion. Judgements regarding provider performance based entirely on the proxies may not fully reflect actual provider performance.

There are several limitations to this analysis. First, only a single outcome variable was assessed, and this variable was extremely restrictive. Such a conservative outcome may mask the strength of the proxies in predicting other less restrictive measures of substance use outcomes such as change in use between pre- and post-treatment, or maximum use post-treatment. In addition, only three proxies were studied. More comprehensive data on client satisfaction may yield more robust and accurate predictions of client and treatment provider performance. Other methods of defining treatment completion may also yield different results. For example, if administrative discharges were removed from the group of non-completers, completion may have proved to be a significant predictor of post-treatment substance use in the individual modalities. Moreover, the NTIES data do not include a control group for comparison purposes, and the sampling frame was based upon CSAT-sponsored demonstration grants rather than a representative array of treatment providers nationwide.

These results support the value of collecting outcome proxies, but these three proxies by themselves are not sufficient. Because the collection of outcome data is difficult and expensive, however, the use of proxies should not be discarded. Instead, it is necessary to more fully explore these and other indicators as predictors of post-treatment behaviors.

## **2. RECOMMENDATIONS FOR RESEARCH, POLICY AND PRACTICE**

The results of the analyses presented in this report generally suggest that outcome proxies can be useful to collect, but should be neither collected nor interpreted in isolation. The specific recommendations of these results for research, policy and practice are discussed below.

## 2.1 Recommendations for Research

Based on the results of these analyses, a number of recommendations for future analysis have emerged. These recommendations are listed below.

- **Examine other proxies.** Proxies are often less costly and more expedient to collect than long-term outcomes. It would be beneficial, then, to identify other proxies for post-treatment substance use.
- **Examine other substance use outcomes.** This analysis examined LOS, treatment completion and satisfaction as proxies for post-treatment abstinence. As previously mentioned, this is a very restrictive outcome, which could mask the ability of the proxies to predict other measures of substance use at follow-up. Therefore, proxies should be tested for other substance use outcomes.
- **Examine outcomes in other domains.** In addition to substance use outcomes, future research could integrate data from other systems (criminal justice, labor, vital statistics) to determine long-term outcomes in these areas as well.
- **Examine other potential explanatory variables.** Several variables, including client-to-staff ratio, revenues per client and the amount of time in counseling, did not remain in the final HLM model. Future investigations should examine the impact of other client and SDU variables on outcomes.
- **Integrate post-treatment follow-up studies with regular outcome monitoring systems.** Because LOS and satisfaction are imperfect proxies for post-treatment substance use, researchers must continue conducting long-term follow-up with clients to determine the impact of treatment.
- **Calibrate proxy data with adjustments to post-treatment results.** For example, if results show that females have worse outcomes than males, estimates of program performance could be adjusted to reflect the fact that some providers have more female clients.
- **Examine whether satisfaction is a stronger (or weaker) proxy using a scale rather than a single question for satisfaction.** NTIES utilized a single question on the helpfulness of treatment. The use of standardized satisfaction measures may produce different results.

Where appropriate, investigators should develop research plans in partnership with providers in order to ensure that the results will be applicable to practitioners.

## 2.2 Recommendations for Policy

Results of the HLM analysis indicate that clients who are very satisfied with treatment are more likely to be abstinent at follow-up. Similarly, the analysis also concluded that, in general, individuals who complete treatment are more likely to abstain from using substances at follow-up. This proxy was not significant, however, in the modality-specific models. In order to improve client outcomes, policies and practices should be adopted that increase clients' overall satisfaction and improve completion rates.

Although the HLM analysis indicates a relationship between satisfaction and treatment completion with post-treatment substance use, a treatment system manager, who may receive only aggregated information about an SDU, may not be able to reach this same conclusion. Instead, this treatment system manager may look at the percentage of clients in an SDU who were very satisfied (or who completed treatment) and compare that with the percentage who were abstinent at follow-up. They would find that the variance between the percent of clients who were highly satisfied (or who completed treatment) and those who were abstinent at follow-up can differ greatly from one SDU to another. Based on these results, the following policy recommendations are made:

- **Remain cautious if intermediate outcomes are used in lieu of post-treatment outcomes.** Proxies may give some insight into provider performance, but in order to get a complete picture of performance, these proxies should be examined in conjunction with other client and SDU data.
- **Provide adequate support to providers and researchers in their efforts to collect outcome data.** Many providers have neither the budget to fund evaluation activities nor the in-house staff to conduct this work. Therefore, providers must be given both financial support and technical assistance to measure treatment outcomes effectively.
- **Strengthen systemic data collection efforts by States.** Using the TOPPS II model, States should work with providers to collect client follow-up data to more fully document treatment outcomes.
- **Support policies that enhance collaboration between the research and treatment communities.** Research must ultimately be useful to the treatment community. To ensure this, treatment professionals should be included in the early stages of development for specific research projects, as well as for comprehensive research plans at the local, State, and national levels.

Overall, long-term follow-up provides the most accurate information on treatment outcomes. The difficulty with conducting long-term follow-up is that this type of data collection is

expensive, time-consuming and labor intensive. Therefore, support should also be directed towards further examining these proxies and identifying other proxies for post-treatment outcomes.

### 2.3 Recommendations for Practice

In each of the analyses performed, satisfaction appears to be an indicator of post-treatment substance use. Data on client satisfaction, therefore, should be collected by substance abuse treatment providers in conjunction with other outcome data. The TOPPS II States studying the link between satisfaction and outcomes provide a model for frequency of collecting satisfaction data. In these studies, data on client satisfaction is collected during treatment as well as at the end of treatment. Below are additional recommendations for service providers.

- **Monitor the relationship between services provided and client satisfaction.** What contributes to a client's satisfaction (or lack of it)?
- **Explore strategies to improve satisfaction, LOS, and treatment completion rates, and determine if doing so improves post-treatment outcomes.** Through monitoring of these and other variables, providers can utilize data to continuously improve treatment programs.
- **Utilize outcome data to support efforts in obtaining additional funding for expanded or enhanced treatment and ancillary services.** Along with internal quality improvement efforts, providers can and must use data to provide concrete evidence of treatment effectiveness.

Accountability is increasingly important on the Federal, State, and local levels, and two of the proxies, client satisfaction and treatment completion, can provide limited information on treatment outcomes, but are not adequate substitutes for follow-up data. Until adequate proxies are identified, follow-up data must be collected in order to determine the long-term impact of substance abuse treatment.

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## REFERENCES

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## **APPENDICES**

**APPENDIX A:  
LITERATURE REVIEW SUMMARY**

<b>APPENDIX A: LITERATURE REVIEW SUMMARY</b>				
<b>Relevant Proxy(ies)</b>	<b>Article</b>	<b>Relevant Hypothesis(es)/Research Questions</b>	<b>Design</b>	<b>Relevant Findings</b>
Treatment completion	Karson, S., & Gesumaria, R.V. (1997). Program description and outcome of an enhanced, 6-month residential therapeutic community. In DeLeon, G. (Ed.), <i>Community as method: Therapeutic communities for special populations and special settings</i> (pp. 199-212). Westport, CT: Praeger Publishers.	Are there differences in the effectiveness of standard and enhanced inpatient and outpatient treatment services?	Random assignment to one of two 12 month programs – 1 enhanced, 1 standard. 461 adults, more than 70% males, nearly all were African American. 70% used cocaine/crack as the primary drug. Follow-up at 3 months post-dc.	Retention was better at enhanced program at 3 and 6 month points during treatment, but there were no differences between programs at 9 months or with treatment completion rates. At 3 months post-dc, clients in both programs achieved gains in drug/crime/alcohol outcomes. Completers achieved more gains than non-completers.
Treatment completion	Magura, S., Laudet, A., Kang, S-Y., & Whitney, S.A. (1999). Effectiveness of comprehensive services for crack-dependent mothers with newborns and young children. <i>Journal of Psychoactive Drugs</i> , 31 (4), 321-337.	1. Can comprehensive services (parenting, medical, etc., etc.) for young families impact the parents' addiction problems, psychological distress, social productivity, and preserve the family unit?  2. Are changes in any of the above associated with program completion and the type and intensity of services?	“Prospective longitudinal study of a representative sample of new admissions” to a comprehensive family services program. One site. N=173 women. Follow-up interviews were conducted 12 months after admission.	Completers and those still enrolled in the program had higher abstinence rates and lower levels of cocaine present in hair samples 12 months post-admission than non-completers. Also, more intensive use of services were associated with lower levels of cocaine present in hair samples at 12 months.

**APPENDIX A (CONT.):  
LITERATURE REVIEW SUMMARY**

Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
Treatment completion	Nemes, S., Wish, E.D., & Messina, N. (1999). Comparing the impact of standard and abbreviated treatment in a therapeutic community: Findings from the District of Columbia treatment initiative experiment. <i>Journal of Substance Abuse Treatment, 17</i> , 339-347.	<p>“1. Did Standard Inpatient and Abbreviated Inpatient clients differ with regard to post-discharge recidivism, urinalysis results and employment status at the time of follow-up?</p> <p>2. How was treatment completion related to these outcomes?”</p>	DC Initiative – Random assignment of 412 individuals into two 12-month treatment programs with different durations of inpatient (10 months vs. 6 months). Clients interviewed at intake and 1-2 years post-treatment. Follow-up interview assessed the 6 months following treatment and the 3 months before the follow-up interview. The majority in both programs were African American and males.	Program attended did not impact outcomes. Completers of both the inpatient and outpatient components (for either program) reported less alcohol and drug use at followup. Completers of both components also had better criminal outcomes.
Treatment completion	Ravndal, E. & Vaglum, P. (1998). Psychopathology, treatment completion and 5-Year outcome: A prospective study of drug abusers. <i>Journal of Substance Abuse Treatment, 15</i> , 135-142.	Does treatment completion predict long-term outcomes (social functioning, substance abuse and death) after correcting for personality disorders and psychopathology at intake?	5-year follow-up on 200 clients admitted to one Norwegian TC (1.5 yrs treatment program). Nearly 70% were male. Most clients were poly-substance users.	Only 29 individuals completed treatment. Completing treatment was not related to substance use outcomes 5 years post-treatment after correcting for psychopathology and other baseline measures.

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
Treatment completion	McKay, J.R., Alterman, A.I., McLellan, A.T., & Snider, E.C. (1994). Treatment goals, continuity of care, and outcome in a day hospital substance abuse rehabilitation program. <i>American Journal of Psychiatry</i> , 115 (2), 254-259.	<ol style="list-style-type: none"> <li>1. What are the treatment goals (i.e., decreased denial, adopting 12-step beliefs, and self-help group participation during treatment) and other factors associated with better outcomes (alcohol or cocaine use) in a day hospital rehab program?</li> <li>2. Does progress towards treatment goals predict more participation in post-treatment self-help groups?</li> <li>3. What is the relationship between post-treatment self-help group participation and substance use outcomes?</li> </ol>	<p>Pre-post design. Alcohol or cocaine dependent male veterans comprised the study group. More than 80% were African American. One site. Clients participated in 4 weeks of treatment. Those who completed were referred to aftercare for up to 5 months. Follow-up interviews were conducted at 4 and 7 months post-intake.</p>	<p>78% of alcohol clients and 55% of cocaine clients completed treatment. Approximately 88% of each group went on to aftercare. Those who completed treatment had fewer days of alcohol and cocaine use and lower ASI scores. Time (follow-up period) did not have a significant main effect. Treatment completion by time was significant for alcohol users for days of alcohol use; that is, the differences between completers and non-completers was greatest at the 4 month follow-up. Treatment completion by time was also significant for cocaine users for days of use and ASI scores. Alcohol completers had significantly more self-help participation at 4 months than non-completers. Self-help participation at 4 months was associated with less use at 4 and 7 month follow-ups for all clients, and lower ASI scores at 7 months for alcohol clients.</p>

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
Satisfaction, Treatment completion	McLellan, A.T., & Hunkeler, E. (1998). Patient satisfaction and outcomes in alcohol and drug abuse treatment. <i>Psychiatric Services</i> , 40 (5), 573-75.	Comparing 3 measures of effectiveness – number of sessions attended, post-treatment status (days of alcohol or drug use, number/type of psychiatric symptoms experienced), and satisfaction with 6 aspects of treatment – among 4 treatment programs.	Prospective study of 4 treatment programs within Kaiser Permanente system. Clients were re-interviewed at 1, 3, and 6 months after intake (N=344 at 6-month follow-up). Approximately 75% were male, and 50% were white. Most common addiction was alcohol, followed by alcohol and cocaine or marijuana.	There was an overall significant improvement for drug/alcohol use (number of days abstinent) and psychiatric symptoms at the 6-month follow-up. Completers had better 6-month outcomes than those who completed 10 days of treatment. There was a significant correlation between sessions attended and post-treatment status (days of use, etc.). Satisfaction was NOT correlated to either of the other 2 types of measures. "...satisfaction measures may be a separate domain that should not be considered a proxy for improvement in symptoms or functioning." (pg 575)
LOS, Treatment completion	Simpson, D.D. (1981). Treatment for drug abuse: Follow-up outcomes and length of time spent. <i>Archive of General Psychiatry</i> , 38, 875-880.	What are the drug use, criminality and employment outcomes in the year after DARP treatment for opioid-addicted and non-addicted clients by type of treatment?	The Drug Abuse Reporting Program (DARP) constituted a study of more than 16,700 individuals admitted to treatment (4 modalities and 26 sites). Follow-up was conducted on a stratified random sample of nearly 1,500. The follow-up group included a comparison group of those who completed intake but never received treatment. More than half were male and race was almost evenly divided between African American and Caucasian.	Overall, longer LOS (more than 90 days) was associated with better outcomes. This finding was also true across the different types of clients (opioid-addicted vs. non-addicted). Type of termination (AMA, etc.) was not a significant factor in this equation for methadone clients, but was significant for therapeutic community and drug-free outpatient clients (i.e., those who completed TC or drug-free outpatient had better outcomes than those who did not).

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
LOS, Satisfaction	Holcomb, W.R., Parker, J.C., & Leong, G.B. (1997). Outcomes of inpatients treated on a VA psychiatric unit and a substance abuse treatment unit. <i>Psychiatric Services</i> , 48 (5), 699-704.	<ol style="list-style-type: none"> <li>1. Do clients in psych and substance abuse treatment improve on quality of life, symptoms and level of functioning?</li> <li>2. Are there differences between the two types of services in terms of outcomes?</li> <li>3. Can satisfaction with these services greater than 75% be obtained?</li> <li>4. How does satisfaction with these services compare with other industries?</li> <li>5. Is satisfaction related to outcomes?</li> </ol>	Pre-post design comparing two treatment programs (1 psych unit and substance abuse unit) using the Treatment Outcome Profile (TOP), which measures quality of life, symptomatology, level of functioning and satisfaction. 154 clients admitted to two units at a VA. Nearly all were male and nearly 75% were white.	LOS was not related to gains made by clients in either type of service. Substance abuse clients reported higher overall satisfaction with treatment. Both groups reported very high satisfaction overall—higher than other service industries. After controlling for baseline level of impairment, overall satisfaction was highly correlated with outcomes (quality of life, symptoms and level of functioning).
LOS	Hser, Y-I., Joshi, V., Anglin, M.D., & Fletcher, B. (1999). Predicting post-treatment cocaine abstinence for first-time admissions and treatment repeaters. <i>American Journal of Public Health</i> , 89, 666-671.	What are the program and client factors that predict cocaine abstinence after residential treatment for first-timers and those with previous treatment histories?	From Drug Abuse Treatment Outcome Study (DATOS) – 2774 residential clients in 18 sites interviewed at intake and a data were collected on a stratified sample of 676 at 12 months post-treatment.	Overall, longer LOS was related with greater abstinence. Those with prior treatment were less likely to be abstinent post-treatment. Those who stayed in treatment 5 months or longer (first timers or not) were more likely to be abstinent at follow-up. Of those in treatment less than 5 months, first-timers had better outcomes.

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
LOS	Hoffman, J.A., Caudill, B.D., Koman, J.J., Luckey, J.W., Flynn, P.M., & Mayo, D.W. (1996). Psychosocial treatment for cocaine abuse: 12-month treatment outcomes. <i>Journal of Substance Abuse Treatment, 13</i> , 3-11.	Do enhancements to standard treatment improve treatment retention and exposure, and improve outcomes (substance use and illegal behavior) 12 months after discharge?	Randomized clinical trial of six 4-month psychosocial treatment interventions for cocaine users. Pre-post test. 12 month follow-up interview. 95% African American, 93% used primarily crack.	There were no group differences by condition for LOS. There was a significant positive change in regular cocaine use, other drug use, alcohol use, illegal activity, and drug sales for all clients. Longer LOS was associated with positive changes in all the above outcomes, except drug sales. In addition, longer LOS was associated with a decrease in non-drug related illegal activity. Those who attended more sessions were also more likely to have better outcomes in terms of cocaine use, other drug use, any illegal activity and non-drug related activity. “Those who used cocaine regularly during the year after treatment were more likely to have attended fewer treatment sessions, to be female, to be less educated, to have been regular cocaine users prior to treatment, and to have spent fewer days incarcerated during the 12 months after treatment.”

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
LOS	French, M.T., Zarkin, G.A., Hubbard, R.L., & Rachal, J.V., (1993). The effects of time in drug abuse treatment and employment on post-treatment drug use and criminal activity. <i>American Journal of Drug and Alcohol Abuse</i> , 19 (1), 19-33.	<ol style="list-style-type: none"> <li>1. What are the time-in-treatment effects on 4 drug use/criminality outcome indexes (drug related problems across 6 areas; drug use severity; number of predatory illegal acts; criminal behavior index)</li> <li>2. Does time in treatment work independently or jointly through other variables (e.g., employment) to influence drug use and criminal activity?</li> <li>3. What is the impact of incremental changes in treatment duration on outcomes?</li> <li>4. What are the effects of time in treatment before and after the TOPS treatment episode?</li> </ol>	<p>Treatment Outcome Prospective Study (TOPS).                      Longitudinal prospective cohort design.                      Includes the 2,420 individuals who completed a 12 month follow-up interview. (Original sample was 11,750 individuals admitted to 41 treatment programs in 10 cities, but it is unclear how many sites are represented by the 2,420).                      Demographics not presented in this particular TOPS paper.</p>	<p>Time in treatment was related to each outcome in each modality.                      Residential clients saw the greatest change on all outcome variables from TOPS treatment.                      Prior and subsequent treatment to TOPS did not appear to impact outcomes.                      LOS in TOPS treatment was independent of other variables (e.g., employment) on all outcomes.</p>

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
LOS	Hubbard, R.L., Marsden, M.E., Rachal, J.V., Harwood, H.J., Cavanaugh, E.R., & Ginzburg, H.M. (1989). <i>Drug abuse treatment: A national study of effectiveness</i> . Chapel Hill: University of North Carolina.	<ol style="list-style-type: none"> <li>1. What is the impact of treatment on outcomes?</li> <li>2. What are the factors that contribute to these outcomes?</li> </ol>	Treatment Outcome Prospective Study (TOPS). Longitudinal prospective cohort design. 11,750 individuals admitted to 41 treatment programs in 10 cities. Along with during treatment interviews, samples were interviewed 3 months, 1 year, 2 years, and 3 to 5 years after discharge. More than two-thirds were male, and slightly more than half were White (non-Hispanic).	Treatment reduces drug use, but abstinence is not often achieved. Length of stay was a major predictor of substance use outcomes. Crime and suicidal symptoms were also reduced. Irregular employment and heavy alcohol use were relatively unchanged.
LOS	Hubbard, R.L., Craddock, S.G., Flynn, P.M., Anderson, J., Etheridge, R.M. (1997). Overview of 1-year follow-up outcomes in the Drug Abuse Treatment Outcome Study (DATOS). <i>Psychology of Addictive Behaviors</i> , 11(4), 261-278.	<ol style="list-style-type: none"> <li>1. Do clients change their drug use and their behavior after treatment?</li> <li>2. Is treatment duration associated with outcomes?</li> </ol>	From Drug Abuse Treatment Outcome Study (DATOS): 2,966 clients who completed follow-up interviews. Prospective epidemiological design. 10,010 clients from 96 programs in 11 cities. Interviews conducted at 1, 3 and 6 months while client in treatment. Follow-up interview conducted 1 year after termination (except for Outpatient Methadone clients who remained in treatment during the follow-up year. These individuals were interviewed 2 years post-admission.	Drug use generally declined for clients in all modalities during the follow-up year. Those in treatment for 3 months or more in long term residential and outpatient drug-free had greater reductions in substance use at follow-up. Multivariate analysis indicated that a length of stay of 6 months or more in outpatient drug-free and long term residential was associated with reduced substance use at follow-up. Additionally, enrollment in outpatient methadone was also associated with reduced use.

**APPENDIX A (CONT.):  
LITERATURE REVIEW SUMMARY**

Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
LOS	Koenig, L, Harwood, H.J., Sullivan, K, & Sen, N. (2000). <i>Do the benefits of more intensive substance abuse treatment offset the costs?</i> Prepared for the Center for Substance Abuse Treatment, U.S. Department of Health and Human Services. The Lewin Group: Falls Church, VA.	What is the relationship between treatment intensity and post-treatment societal costs associated with substance abuse treatment clients?	From the National Treatment Improvement Evaluation Study (NTIES). Longitudinal data from a purposive samples of more than 6,500 clients from service delivery units. Data were collected at intake, discharge, and 12 months after discharge. More than 3,600 clients were included in this particular analysis.	Longer lengths of stay is associated with reduced post-treatment societal costs.
LOS	Evenson, R.C., Binner, P.R., Cho, D.W., Schicht, W.W., & Topolski, J.M. (1998). An outcome study of Missouri's CSTAR alcohol and drug abuse programs. <i>Journal of Substance Abuse Treatment, 15</i> , 143-150.	Study was carried out to develop a comprehensive method of evaluating Missouri's CSTAR programs	Retrospective analysis of 10 "mature" CSTAR programs. Stratified random sample of 280 CSTAR clients (includes adults and adolescent) based on length of stay levels. Well over 50% were female (varied by program). 2 additional studies were carried out: 1) examined 3 categories of LOS for the general adult program to determine if LOS had an impact on outcomes; 2) followed-up after 90 days with all clients who stayed in one of the programs less than 45 days in order to do a sample prospective study.	Abstinence rates improved significantly for all three program types, except for cocaine within the adolescent group. Those who were in treatment longer showed better outcomes. "It can be seen that specific gains in instrumental areas such as abstinence and less spending on alcohol and drugs, are achieved very early." Those who remained in treatment for less than 45 days were re-interviewed after 90 days and were found to continue making gains in all areas (abstinence, psychological distress, etc.)

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
LOS	Greenfield, L. (2000). <i>The effect of substance abuse treatment on high risk behaviors in the National Treatment Improvement Evaluation Study (NTIES)</i> . Prepared for the Center for Substance Abuse Treatment, U.S. Department of Health and Human Services. Caliber Associates: Fairfax, VA.	<ol style="list-style-type: none"> <li>1. Were significant changes in risk behaviors reported by clients between treatment intake and follow-up?</li> <li>2. What were the relationships among injection drug use, sex exchange, and other risk behaviors and HIV/AIDS diagnosis?</li> <li>3. What variables predicted pre-treatment injection drug use and sex exchange behaviors at intake?</li> <li>4. What were the client and SDU-level variables that predicted injection drug use, sex exchange, or both at follow-up?</li> </ol>	<p>From the National Treatment Improvement Evaluation Study (NTIES):</p> <p>Longitudinal data from a purposive samples of more than 6,500 clients from service delivery units. Data were collected at intake, discharge, and 12 months after discharge.</p> <p>More than 4,400 clients were included in this particular analysis.</p>	For each 1 month increase in length of stay, clients were 9 percent less likely to practice risk behavior during follow-up.
LOS	Condelli, W.S. & Hubbard, R.L. (1994). Relationship between time spent in treatment and client outcomes from therapeutic communities. <i>Journal of Substance Abuse Treatment, 11</i> , 25-33.	<ol style="list-style-type: none"> <li>1. Do clients in TC have different outcomes (drug use, crime and employment) than those in other residential program?</li> <li>2. What is the relationship between LOS and outcomes for clients in TC?</li> </ol>	<p>From Treatment Outcome Prospective Study (TOPS).</p> <p>1 year post-discharge follow-up on a probability sample of clients who had received treatment from a residential program (n=731).</p> <p>More than 3/4 were male and more than half were Caucasian.</p> <p>Number of sites unclear.</p>	<p>LOS in TC was a predictor of post-treatment heroin, cocaine, and marijuana use (but not heavy alcohol use). Additionally, LOS was a predictor of criminal behavior and employment.</p> <p>LOS in other residential treatment was a predictor of post-treatment psychotherapeutic drug use (but no other substances).</p>

APPENDIX A (CONT.): LITERATURE REVIEW SUMMARY				
Relevant Proxy(ies)	Article	Relevant Hypothesis(es)/Research Questions	Design	Relevant Findings
Satisfaction	Chan, M., Sorensen, J.L., Guydish, J., Tajima, B., & Acampora, A. (1997). Client satisfaction with drug abuse day treatment versus residential care. <i>Journal of Drug Issues</i> , 27, 367-377.	<ol style="list-style-type: none"> <li>1. What is the difference in satisfaction levels for day treatment versus residential care clients?</li> <li>2. Are specific aspects of treatment more helpful than others?</li> <li>3. Do clients prefer one treatment type over the other?</li> </ol>	<p>Random assignment to either day or residential treatment. No control groups.</p> <p>216 substance abusers interviewed at baseline and again 6 months later. More than 50% were African American, more than 60% indicated crack/cocaine as their drug of choice.</p>	<p>Clients were very satisfied with both types of treatment (no significant difference between the two).</p> <p>Those still in treatment at 6 months were more satisfied than those who dropped out.</p> <p>“... satisfaction was correlated with ASI drug, alcohol, and legal composite scores, and with social support” at the 6-month follow-up. Day treatment clients were less satisfied with mental health services. More clients originally preferred residential treatment; however, at 6 months fewer said they would prefer residential. At 6 months, the majority indicated they would choose the type of treatment they received.</p>
Satisfaction	Simpson, D.D. , & Lloyd, M.R. (1979). Client evaluations of drug abuse treatment in relation to follow-up outcomes. <i>American Journal of Drug and Alcohol Abuse</i> , 6 (4), 397-411.	What are the client evaluations of the different DARP treatments (methadone, outpatient, etc.)?	The Drug Abuse Reporting Program (DARP) constituted a study of more than 16,700 individuals admitted to treatment (4 modalities). For this article, the analysis on the 5-6 year follow-up interview was restricted to individuals who were represented across the 4 modalities—African American and Caucasian males (2,178). Number of sites unknown. Race was almost evenly divided between African American and Caucasian.	Overall, those who were more satisfied with DARP treatment also had better substance use (but not alcohol), employment, and criminal outcomes. They were also less likely to return to treatment. The above findings were true for clients in methadone, TC and drug-free outpatient treatment, but not for those in detox.

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

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**APPENDIX B:**  
**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: facility type (e.g., hospital, etc.), intensity of care (e.g., 24-hour, etc.), and type of service (e.g., outpatient, etc.). An SDU could be a stand-alone treatment provider or it could be one component of a multitiered 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 facility- (SDU) 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 from 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 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 B-1 below. 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.

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

<sup>2</sup> 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.

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.

As shown in Exhibit B-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.

<b>EXHIBIT B-2</b>					
<b>DISTRIBUTION OF CLIENTS IN THE OUTCOMES ANALYSIS SAMPLE</b>					
<b>Program Title Number of Clients (% of Analysis Sample)</b>	<b>Methadone</b>	<b>Outpatient</b>	<b>Long-Term Residential</b>	<b>Short-Term Residential</b>	<b>Correctional</b>
<b>Target Cities</b> n=2,600 (59%)	377 (89%)	1,214 (78%)	504 (60%)	505 (58%)	0
<b>Critical Populations</b> n=931 (21%)	45 (11%)	220 (14%)	298 (35%)	368 (42%)	0
<b>Criminal Justice</b> n=880 (20%)	0	132 (8%)	39 (5%)	0	709 (100%)
<b>Totals</b> 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 website 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.

**APPENDIX C:  
THE HLM MODEL**

## **APPENDIX C: THE HLM MODEL**

An HLM model was used in order to adjust for the nesting of clients within SDUs. HLM was developed by Bryk and Raudenbush (1992) in order to facilitate the analysis of multilevel data. According to the model, each factor consists of random and fixed effects. In the present study, Level 1 pertains to client factors and Level 2 to SDU variables. The equations for assessing fixed and random effects in the Level 1 and Level 2 models are described below:

### **1. LEVEL 1 MODEL**

Equation 1 presents the simplest Level 1 model, as follows:

$$(1) \quad \gamma_{ij} = B_{0j} + r_{ij}$$

In Equation 1, the outcome  $\gamma$  of client  $i$  in SDU  $j$  is predicted from  $B_{0j} + r_{ij}$ , which is the mean outcome in the  $j^{\text{th}}$  SDU (Fixed Effect), plus the random error term  $r_{ij}$  (Random Effect). Level 1 predictors have yet to be included in the model. Since the predicted variable is dichotomous, a Bernoulli solution will be employed. In employing the Bernoulli solution, Equation 1a replaces Equation 1, and  $\gamma_{ij}$  becomes  $\log[P/(1-P)]$ , and the Level 1 variance= $1/[P(1-P)]$ , as follows:

$$(1a) \quad \log[P/(1-P)] = B_{0j} + [1/[P(1-P)]]$$

Equation 1a was used to calculate the starting variance for evaluating the random effects component of the model. Subsequent reductions in variance were gauged against the latter value.

### **2. LEVEL 2 MODEL**

The simplest Level 2 Model is given in Equation 2:

$$(2) \quad B_{0j} = \gamma_{00} + U_{0j}$$

In Equation 2, the mean outcome in the  $j^{\text{th}}$  SDU is predicted from  $\gamma_{00}$ , which is the grand mean outcome overall SDUs, and  $U_{0j}$  is the random effect (variance) in the  $j^{\text{th}}$  SDU.

With the addition of each Level 1 variable, the model becomes more complex. For example, with the addition of a second Level 1 variable, ( $B_{1j}$ ) the Level 1 model becomes:

$$(3) \quad \log [P/(1-P)] = B_{0j} + B_{1j}X_{1ij} + r_{ij}$$

where:

$B_{1j}$  is a level-1 coefficient;

$X_{1ij}$  is a level-1 predictor for case  $i$  in unit  $j$ ;

$r_{ij}$  is the level-1 random effect.

### 3. EXPANDING THE LEVEL 2 MODEL

The Level 2 model now has two equations, corresponding to each Level 1 coefficient, as follows:

$$(4) \quad B_{0j} = \gamma_{00} + U_{0j}$$

$$(5) \quad B_{1j} = \gamma_{10} + U_{1j}$$

In Equation 4  $B_{0j}$ , the coefficient for the slope of the Level 1 intercept is predicted. In Equation 5  $B_{1j}$ , the coefficient associated with the slope of the Level 1 variable  $X_{1ij}$ , is predicted.

**Non-varying slope terms.** In accord with the recommendation of Bryk and Raudenbush (1992), the error term associated with the slope in Equation 5 may be dropped when the residual is very close to 0. Such was the case in the present model, as the error terms associated with the slopes of the variables included in the model were non-varying. In this instance, Equation 5 would be replaced by Equation 5b, as follows:

$$(5b) \quad B_{1j} = \gamma_{10}$$

**Adding Level 2 predictors.** Level 2 predictors were added to the model in order to account for the unexplained variance. In the present model, such predictors could only be added to intercept term, since the remaining slope terms were assumed to be non-varying. Equation 6 includes such a predictor, as follows:

$$(6) \quad B_{0j} = \gamma_{00} + \gamma_{0j} W_{0j} + U_{0j}$$

where  $\gamma_{0j} W_{0j}$  is a Level 2 predictor, and  $B_{0j}$  is the coefficient of the Level 1 intercept.

**Criteria for building the model.** As recommended by Bryk and Raudenbush (1992), each selected variable must contribute to the reduction in unexplained variance. Accordingly, variables that reduced the percentage of unexplained variance in the model were retained, while those that did not were discarded.

**Variable centering.** Variables which were included in the model were either centered or uncentered. If a variable is uncentered, its raw scores are used in the model. If a variable is centered, the deviation of each raw score either from the grand or group (SDU) mean was used. Level-1 variables may either be centered around their group mean, centered around the grand mean, or uncentered. Level-2 variables may either be centered around the grand mean, or uncentered.

**APPENDIX D:**  
**OTHER POTENTIAL EXPLANATORY VARIABLES USED IN**  
**HIERARCHICAL LINEAR MODELING (HLM)**

**APPENDIX D:  
OTHER POTENTIAL EXPLANATORY VARIABLES USED IN  
HIERARCHICAL LINEAR MODELING (HLM)**

Client Variable	Definition
Did the client help develop the treatment plan?	During the discharge interview, the client was asked if (s)he saw the treatment plan. Then the client was asked if (s)he assisted in the development of the treatment plan, or if someone at the program decided without the client. If the client reported never having seen the treatment plan, it is reasonable to assume that (s)he did not help develop this plan. Consequently, for those cases in which the client indicated (s)he did not see treatment plan, the question regarding whether or not the client helped develop treatment plan was recoded from system missing to "Someone at program decided [treatment plan] without [client]." For these analyses, this variable was treated as a dichotomous variable (did or did not help).
Amount of time the client reported meeting with their primary counselor	During the discharge interview, clients were asked about the length and frequency of sessions with the person that was most important to her/him. This categorical variable on length of session to obtain a continuous variable (minutes per session). Where a range was give (e.g., 10-29), an average was taken (e.g., 20). Where the category was open-ended (2+ hrs), the most conservative value was used (120 minutes). The same procedure was used for frequency of sessions. The results were then multiplied together to produce the total minutes of sessions per month. In those cases with total minutes per month missing, values were imputed based on average minutes per month by SDU within modality. If there were fewer than five occurrences of an SDU within a modality, a modality average was used.
Duration of Post-discharge Period	Length of time between treatment discharge and follow-up interview.
SDU Variables	Definition
Total FTEs	The total FTEs includes all staff providing therapeutic and medical services to clients. The data were provided by the program directors of the 59 service delivery units.
Ratio of clients to clinical FTEs	In computing the ratio, only the clinical staff were included, as they provide clinical services to clients. These staff include psychologists, social workers, counselors, non-degreeed counselors (certified), other therapists or rehabilitation specialists. The data were provided by the program directors of the 59 service delivery units.
Revenues per client for the SDU	Total annual program revenues divided by the number of clients in the program. The data were provided by the program directors of the 59 service delivery units.

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