A Proposal for a Study of the Persistent Effects of Treatment in Chicago, Illinois

Prepared for the:

Center for Substance Abuse Treatment
Substance Abuse and Mental Health Services Administration

SAMHSA Contract No. 270-97-7011
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September 16, 1999
(Revised January 2001)

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Background

The Persistent Effects of Treatment Studies (PETS) is a family of coordinated studies that will evaluate the outcomes of drug and alcohol treatment received through a wide range of publicly funded programs employing a varied mix of treatment methods. Populations to be studied are diverse in the nature and severity of their substance abuse, and in their personal characteristics and circumstances. The conceptual underpinning of the PETS studies is a recognition that substance abuse disorders, while variable in their manifestations, are often chronic and prone to relapse. PETS focuses on the longer-term course of substance abuse and treatment. While most previous outcome studies in the field have examined changes taking place for only several months after a particular treatment episode, PETS will look at outcomes over a longer time period of 3 years or more. In the context of the client's life history, careful attention will be given to the stage in his or her experience of substance abuse and treatment to what has preceded their current treatment episode, and to any sequence of aftercare, relapse, and subsequent treatment that may follow.

The PETS team is building a "family of studies" on the longer-term course of treatment and outcomes, primarily by linking with States or other units of local governments. Units of government will be sought that have favorable combinations of:

- Universal or widespread standardized client intake assessment data available in electronic form;
- Sound and comprehensive treatment information systems;
- On-going systems for client follow-up interviewing; or
- Strong capabilities for linking to collateral information systems.

In every state, the single state agency (SSA) responsible for administering the Substance Abuse Prevention and Treatment Block Grant (SAPTBG) maintains an information system on client treatment episodes. These alcohol and other drug (AOD) information systems vary widely in their scope, sophistication, accuracy, and currency. Some states and counties have richly detailed information systems that provide a wealth of information about clients and the services they receive. Standardized client assessment protocols may be required at intake, and those data may be submitted to the State or county agency. Others have treatment information systems that provide a rich portrayal of the mix of specific treatment services provided. These information systems are used to prepare required reports on the services provided with SAPTBG funds

and, more importantly, as a key source of the performance indicator data, state or county directors need to manage and improve the quality of their service delivery systems.

The PETS staff plans to use these AOD treatment information systems, as well as collateral databases compiled by other state or county agencies (e.g., criminal justice) to examine the longer-term effects of treatment. These systems have a number of potentially important roles to play in the PETS studies.

By combining treatment process information with client outcome data—either from collateral information systems or from client interviews—it becomes possible to investigate the linkages among client baseline characteristics, treatment processes, and longer term effects on clients' lives. It is the investigation of these issues that is the central purpose of the PETS research. The efforts to accomplish those goals can assist states and localities to develop and refine meaningful longer term performance indicators that can characterize the effectiveness of the service delivery system and support their efforts at continuous quality improvement.

Chicago, Illinois

As part of its Persistent Effects of Treatment Studies (PETS) project, the Center for Substance Abuse Treatment (CSAT) proposed to continue data collection activities under a sub-study to be conducted in Chicago, Illinois.

The PETS-Chicago study will continue data collection activities initiated under a grant to local investigators as part of CSAT's Target Cities project. "Target Chicago," as it has been called, was an exceptionally well designed and executed Target Cities project that presented unique opportunities for long-term follow-up of a substance abuse treatment population. The PETS-Chicago study will collect two- to five-year treatment follow-up data on a sample of approximately 1300 clients who were originally assessed for treatment services at any of 22 service delivery units on Chicago's West side. More than 93% of these clients have been re-interviewed on at least two occasions since their enrollment in the original study more than two years ago. The study uses a comprehensive battery of data collection instruments, including the Addiction Severity Index (ASI) as well as personality and motivational questionnaires. Substantial data on treatment services received during the initial treatment episode are also available.

The PETS-Chicago study promises to provide the longest period of client tracking data available from any of the studies currently conducted under PETS. It is also unlikely that any other study will be able to match the outstanding response rates achieved by the Chicago investigative team. PETS will provide resources to permit continued client interviews for up to 5 years after the initial study entry. In addition, data are

available from the Illinois Department of Alcoholism and Substance Abuse (DASA) for up to 11 years on each client, and data from other administrative information systems are being sought. Given these factors, the PETS-Chicago study will be a rich source of information about the longer-term course of substance abuse and treatment.

Research Questions

The primary research questions of the proposed PETS-Chicago study are as follows:

1. To what extent are improvements in client functioning observed 24, 36, 48, and 60 months after admission to treatment? How do these improvements vary by different populations, drug(s) of abuse at admission, and modality and duration of treatment?

2. How do clients change in their use of drugs, criminal behavior, and other outcome measures as they interact with the publicly funded treatment system over the 4 to 5-year study interval?

3. What best characterizes the relationship between patterns of treatment services received, and longer-term outcome course? Do treatment outcome improvements occur in a cumulative fashion across multiple treatment episodes? Must a threshold level of treatment services be received before improvements occur? Is there an alternate model that best characterizes the relationship?

4. How sensitive are the findings to alternate operational definitions of key conceptual variables and methods of analysis?

5. To the extent acceptable data are available, how do objective client outcomes obtained from treatment MIS and collateral databases (e.g., criminal justice, Medicaid) relate to self-reported data?

Four covariate domains (population groups, drugs of abuse, and methods and amounts of treatment) will be considered in the analysis of all research questions. There are a large number of more specific research questions and hypotheses that will be articulated to elaborate each of these broad research questions.

Sample

The Target Chicago study was a grant project designed to study the effects of channeling clients through a central intake unit where they could be assessed and referred to an appropriate treatment agency. The study compared clients entering the publicly funded treatment system in one of two ways. The first cohort of clients (hereafter, Cohort 1) was recruited from among those presenting for treatment at any of 22 service

delivery units (SDUs) on Chicago's West side.[1] The second cohort of clients (Cohort 2) was recruited from among those presenting for assessment at a newly established Central Intake Unit covering the same geographic area. Clients in both cohorts were interviewed at study entry as well as at multiple intervals subsequent to study entry.

Sample selection and recruitment strategies particular to each of the two cohorts are summarized as follows:

Cohort 1. This cohort was recruited prior to the establishment of a centralized intake unit (CIU). These persons presented to one of the 22 service delivery units (SDUs) in the Westside network and were given a standard substance abuse treatment assessment by the clinic staff. They were then scheduled for an initial treatment session. The SDUs contacted the Target Chicago study team whenever an eligible client was identified. Target Chicago staff would then arrive at the designated treatment program at the time of the client's first session, and would recruit them for the study at that time. In other words, Cohort 1 did not follow an intent-to-treat design. Roughly 77 percent of all potential Cohort 1 clients who were assessed in the SDUs actually showed at their initial scheduled treatment session. Target Chicago staff could only recruit from among these clients. However, among those presenting for treatment, the study team succeeded in recruiting and interviewing 98.1 percent for the study.

Cohort 2. Clients recruited in Cohort 2 were those who met eligibility criteria, completed an assessment at the CIU, and were referred to treatment at an SDU within the Westside network. Clients were recruited into the study at the time of their assessment and were interviewed immediately thereafter. Actually following through on the treatment referral was not a condition of eligibility for this cohort (in fact, about 27 percent of the clients did not appear at the treatment program to which they were initially referred). In other words, Cohort 2 followed an intent-to-treat design.

Both Cohorts. The sample was stratified to ensure sufficient numbers in each modality for meaningful comparative analyses. Specifically, the study sought to recruit the first 100 clients from each modality in each cohort to participate in the Target Chicago study. Power estimates suggested that the post-attrition sample sizes would need to be at least 68 clients per modality to evaluate the intervention effects. Once 100 clients were recruited in a given modality in each cohort, no further study participants were recruited. In effect, this meant that outpatient admissions were under sampled and all other modalities were over

[1] A parallel evaluation was conducted among the clinics on Chicago's North side, but data collection for that group was suspended at the end of the core Target Chicago study and will not be part of the PETS effort.

sampled relative to the distribution of treatment clients in the city. As shown below, the recruitment period was terminated before the target of 100 clients could be reached in three of the cells. (This was in part because intake patterns were such that the quotas would not be reached without extending the recruitment period far beyond a timeframe that would allow for follow-up within the study-funding period.) Table 1 shows the distribution of clients across the treatment modalities to which they presented at study entry.

Table 1. Distribution of Target Chicago Baseline Sample across Treatment Modalities

	Number of Clients (% of total)	
Modality	**Cohort 1**	**Cohort 2**
Outpatient	104 (18.1%)	154 (20.5%)
Intensive Outpatient	117 (20.3%)	123 (16.3%)
Methadone	115 (20.0%)	138 (18.3%)
Short-term inpatient	115 (20.0%)	153 (20.3%)
Long-term inpatient	71 (12.3%)	104 (13.8%)
Halfway house	53 (9.2%)	81 (10.8%)
Total	575	753

The distinction between the two client cohorts was critical to the Target Chicago study because it permitted an assessment of the impact of establishing a central intake unit. The CIU is largely irrelevant to the PETS project, but the sample itself is a suitable match for the objectives of PETS. To a large extent, the two client cohorts will be pooled for analyses in the PETS-Chicago effort. Table 2 presents many of the key baseline characteristics of the clients in each cohort. Of note is the relatively high proportion of women in the sample, attributable to the study design, which specifically included several women-only facilities in the Westside network. This design feature will permit more detailed analyses of women's involvement and success in treatment – a feature not available in other PETS studies. As shown in Table 2, the two cohorts do not differ significantly on any of the key variables, which makes the sample suitable for pooling. The two cohorts will continue to be tracked separately for follow-up purposes, but the same data collection instruments have been and will continue to be used for each cohort, allowing the data to be combined for analysis. The combination of the two cohorts also bolsters the analytic power of the resulting data set.

Table 2. Baseline Characteristics of Target Chicago Clients (by cohort and combined)

	Cohort 1	Cohort 2	Combined
Sample size	575	753	1328
Gender			
Male	39.3%	42.1%	40.9%
Female	60.7%	57.9%	59.1%
Age			
18-20	2.8%	4.5%	3.8%
21-29	27.0%	21.1%	23.6%
30-39	47.7%	47.9%	47.8%
40-49	17.9%	23.1%	20.9%
50+	4.7%	3.3%	3.9%
Race/Ethnicity[2]			
Black / African American	86.6%	88.0%	87.4%
Hispanic/Spanish	8.9%	6.0%	7.2%
White / Caucasian	3.8%	5.6%	4.8%
Other	0.7%	0.4%	0.5%
Education (highest grade completed)			
6th grade	2.1%	1.5%	1.7%
7th – 11th grade	50.0%	49.5%	49.7%
12th grade	29.3%	28.8%	29.0%
> 12th grade	18.8%	20.2%	19.6%
Marital Status			
Never married	63.5%	66.7%	65.3%
Separated	13.4%	10.0%	11.4%
Divorced	10.1%	11.4%	10.8%
Married	10.3%	9.2%	9.6%
Employment Status			
Unemployed, looking for work	64.9%	74.0%	70.0%
Unemployed, not looking for work	20.0%	12.2%	15.6%
Employed, part-time	4.7%	3.8%	4.2%
Employed, full-time	3.5%	4.2%	3.9%
Employed but not currently working	2.8%	0.1%	1.3%
Homemaker	0.3%	0.1%	0.2%
Seasonal Worker	0.2%	1.8%	1.0%
Student / Retired / Other	2.8%	3.5%	3.1%
Not Applicable (incarcerated, etc.)	0.9%	0.1%	0.5%

[2] Race and ethnicity data will be re-collected during the PETS interviews in a manner consistent with standard OMB categories.

Table 2, continued

	Cohort 1	Cohort 2	Combined
Living Arrangements, past 30 days *(multiple responses permitted)*			
Own home / apartment	59.0%	59.1%	59.0%
Group home	48.3%	16.3%	30.2%
With someone else	24.6%	23.6%	24.0%
Medical treatment facility	8.2%	16.6%	13.0%
Jail / prison / detention	7.9%	10.4%	9.3%
Homeless shelter	4.7%	4.5%	4.6%
Vacant building/street/car	3.8%	2.7%	3.2%
Hotel or motel	3.7%	1.2%	2.2%
Psychiatric treatment facility	1.7%	1.2%	1.4%
Other	0.4%	3.5%	2.1%
Substance Use (past 30 days)			
Alcohol	53.7%	52.7%	53.2%
Heroin	34.4%	36.5%	35.6%
Crack cocaine	29.9%	48.9%	40.7%
Cannabis	25.2%	24.6%	24.8%
Other cocaine	5.8%	3.3%	4.4%
Other opiates	3.5%	0.3%	1.7%
Other sedatives, hypnotics, tranquilizers	2.3%	1.2%	1.7%
Hallucinogens	0.9%	0.8%	0.8%
Barbiturates	0.7%	0.4%	0.5%
Amphetamines	0.2%	0.0%	0.1%
Inhalants	0.0%	0.5%	0.3%
Number of prior treatment episodes			
None	48.4%	43.5%	45.6%
1	23.8%	29.8%	27.2%
2	15.1%	12.8%	13.8%
3	6.2%	6.3%	6.2%
4	2.6%	3.4%	3.1%
5 or more	3.9%	4.2%	4.1%

Clients in each of the two cohorts have been re-interviewed at least twice since their enrollment in the Target Chicago study. Clients in Cohort 1 were interviewed at study entry, and at 6 and 24 months post study entry. A 36-month follow-up is underway, and the LI/CHS team will conduct 48- and 60-month follow-

ups with support from PETS. Clients in Cohort 2 were interviewed at study entry, and at 6- and 18-months post study entry. The 18-month follow-ups will be completed by December 1999. A 24-month follow-up with this cohort is also underway, and PETS will support 36- and 48-month follow-ups of this cohort.

Table 3 below shows the response rates that have been achieved for each completed wave of data collection. The LI/CHS team makes considerable efforts to trace, locate, and interview clients. Their efforts in achieving better than a 93 percent follow-up rate with Cohort 1 at 24 months is particularly notable, as there had been a gap of 18 months since the previous interview wave. Note also that clients remain eligible for interviewing in each round of the study, without regard to whether they were interviewed in the prior rounds. For example, if a client were in a prison facility that will not allow interviews at the time of the 18-month round of interviews, that client would still be eligible to be interviewed at the 24-, 36-, and 48-month rounds of the study.

Table 3. Response Rates for Target Chicago Study Data Collection

	Cohort 1		Cohort 2	
Study Entry	Eligible *(assessed for treatment)*	755	Eligible	788
	Enrolled in treatment	586		
	Enrolled in study	575	Enrolled in study	753
	Participation rate *(enrolled in study/assessed for tx)*	76.1%		
	Response rate *(enrolled in study/enrolled in treatment)*	98.1%	Response rate	95.6%
6 months	Eligible *(enrolled in study minus deaths)*	574	Eligible *(enrolled in study minus deaths)*	750
	Interviewed	567	Interviewed	724
	Response rate	98.8%	Response rate	96.5%
18 months	**No data collected**		**Still underway**	
			Response rate to date*	99.7%
24 months	Eligible *(enrolled in study minus deaths)*	564	**Just underway**	
	Interviewed	527		
	Response rate	93.4%		

**Response rate to date computed as number of clients interviewed divided by number of eligibles whose target interview date had passed as of 08/30/1999 (approximately 675 clients). Interviewing will continue through December 1999 for this wave.*

Instruments

Data collection consists of administering the three components of the follow-up interview. Interviews generally take about 90 minutes to complete. The data collection procedures apply to all follow-up interviews to be conducted as part of PETS (24, 36, 48 and 60-month). The three components of the follow-up interview are:

Augmented Addiction Severity Index (ASI). The ASI is a semi-structured interview that is designed to assess lifetime and past-month problem severity in several areas: medical, legal, alcohol abuse, drug abuse, employment, family, and psychiatric functioning. The instrument has been used extensively in substance abuse treatment research, and its components will be common across studies within PETS. The reliability and validity of this instrument are well-documented, and it is commonly used in studies of this type. The Chicago research team consulted with the developers of the ASI to augment the standard instrument to address the research goals of the study. Specifically, the ASI was augmented to include additional questions about services received in each of the seven domain areas listed above, and to include more detailed questions in each of the subsections (e.g., needle risk, abstinence behaviors, sexual risk, illegal activities, more detailed information on drugs used and crimes committed, job seeking activities, living arrangements, impact of drug use on relationships, and mental distress). These augmentations to the ASI were structured in such a way that the core ASI items, the order in which they are administered, and the manner in which clinician ratings of addiction severity are made were not changed, thereby preserving the reliability and validity of the core instrument.

NEO Personality Inventory. The NEO measures five broad dimensions of personality including neuroticism, extraversion, openness, agreeableness, and conscientiousness. These data may be important predictors of treatment seeking and/or treatment success. The reliability and validity of this instrument have been tested, found to be acceptable, and are well-documented (Costa & McRae 1997; Kurtz et al. 1999; Saucier 1998).

Coping Responses Inventory (CRI-Adult Form). This form measures eight different types of coping responses to stressful life circumstances and is suitable for use with healthy adults, psychiatric patients, and substance abuse clients. Individuals' coping responses are important predictors of substance use, and may be important predictors of treatment outcomes. The CRI has a history of use in studies of group differences in coping responses between problem and non-problem drinking adults. As with the ASI and the NEO, the reliability and validity of the CRI have been tested and are well-documented (e.g., Mertens et al. 1996; Moos et al. 1990; Roberts et al. 1987).

Procedures

Target Chicago employed a quasi-experimental sequential cohort design with replication. Eligible clients were recruited from all participating programs in the Westside network. The network included 22 SDUs in 12

substance abuse treatment facilities operated by 10 different public agencies.[3] These included 10 outpatient (non-methadone) units, 5 intensive outpatient units, 3 methadone units, 1 halfway house (men only), 2 short-term inpatient programs for women, and 1 long-term inpatient program for women. To be eligible for participation in the study, clients had to be at least 18 years of age, present for treatment at one of the Westside providers or the new CIU, and have used alcohol or drugs in the past 6 months. Consistent with the Target Cities study design, they were excluded from the study if (1) their treatment was being paid for by private insurance or a private HMO; (2) they had used alcohol or drugs only a few times in their life; or (3) they were seeking treatment because of a DUI Level 2 or higher conviction (these are individuals determined via court evaluation to present a moderate to high threat of risk to public safety).

Data collection consists of administering the three components of the follow-up interview specified in the Instruments section. Interviews generally take about 90 minutes to complete. The data collection procedures described here apply to all follow-up interviews to be conducted as part of PETS (24, 36, 48 and 60-month). An interviewer protocol and the data collection instruments are provided in Appendix 5.

The use of administrative was not previously part of the Target Chicago evaluation study. However, specifically for the purposes of conducting a PETS follow-on, Chestnut Health Systems entered into a data sharing agreement with the Illinois Department of Human Services – Office of Alcoholism and Substance Abuse (DHS-OASA) in June 1999. This agreement provides Chestnut with data from the Department's Automated Reporting and Tracking System (DARTS) for FY 1991 through FY 2002 (July 1, 1990 through June 30, 2002). DHS-OASA has agreed to provide available data on the Target Chicago clients in the Westside cohort, whom CHS will identify by name and social security number.[4]

Information available from DARTS includes the following for each admission to publicly-funded treatment services (including the agencies participating in Target Chicago):

- Assessment Information (Assessment date; Medicaid & SSI eligibility; injection drug use; involvement with Department of Child & Family Services; involvement with TASC; current criminal justice system involvement [other than DUI]; disabled; dual diagnosis);

- Waiting List Information (number of days between initial contact and assessment/admission date; reason removed from waiting list [including reasons other than admitted to treatment]);

[3] A "service delivery unit" defines a physical location where treatment services are provided. This term is more precise than either "facility" (a physical structure that may house multiple SDUs) or "program" (often used synonymously with "organization").

[4] The Chestnut/DHS-OASA data sharing agreement covers all pertinent client confidentiality issues. Identifying information will be used only to link Target Chicago evaluation data with DARTS data. Client identifiers will not appear in data files.

- Demographic Information (in addition to demographics, includes employment status, insurance coverage, number of arrests, number of prior treatment episodes, referral source);
- Drug/Alcohol Problem Area (includes Treatment Episodes Data Sets [TEDS] items on substance(s) abused, frequency/route of use);
- "Closing" Information (date and reason for "closing" patient's record in DARTS); and
- Services information (nature, length, and agency location of treatment services provided; recorded on a transaction basis throughout treatment episode).

In addition to the DARTS data, the CHS research team is in the process of obtaining access to Illinois State Police data, and to Cook County criminal justice data. This information would provide a complete criminal justice history for each client, including days incarcerated and number of days in a psychiatric ward or substance abuse ward during incarceration.

Informed Consent

Beginning with the PETS-funded interviews, a separate consent form will be added for collection of urine samples, and it will likewise explain the confidentiality protections. The consent form explains the purpose of the study and the intended use of information requested in the follow-up interview and also requests the client's consent to be re-contacted at future intervals for additional follow-up. Consent forms were amended to include the provision of urine samples. The LI/CHS research team will review both the interview and urine sample consent forms with the respondents before requesting signatures. As a further protection, respondents' signatures are witnessed by someone other than the interviewer. Consistent with other studies being conducted as part of PETS, a Federal Certificate of Confidentiality has been obtained.

Interviews

At the time of their last interview, each client completed an informed consent form, a consent-for-disclosure form, and information for the Locator Form. The client was also given an appointment card noting the target date for the next interview (which falls on the "anniversary" of their study enrollment date). The locator form includes current information on the client's address, phone number, and other contact information. Clients are also specifically asked for their consent to permit the LI/CHS team to contact agencies listed on the disclosure form for the sole purpose of completing the follow-up interviews.

Standard procedures for data collection will continue to be employed throughout the additional follow-up periods. Beginning about one month prior to the client's target interview date, the LI/CHS research

team begins attempting to locate the client using the information available from the Locator Form. Clients are contacted by telephone to confirm the date and time of the appointment for the follow-up interview. Clients are reminded that their participation is voluntary, and that they will be compensated $35 for completing an interview. Clients are also told that their incentive payment will be increased by an additional $5 if they complete their interview within 14 days of their anniversary date.

Clients are interviewed at the centrally located LI/CHS offices unless special circumstances require that the interview be conducted elsewhere. All efforts are made to conduct the interviews in person, including sending interviewers to a client's home or to the treatment program in which a client may be enrolled. However, if a client has moved out of the Chicago area, or if a client cannot come to the LI/CHS facility and the client's neighborhood is deemed unsafe for the interviewer to enter, the interview will then be done by telephone. Telephone interviews are also conducted with clients who are residing in State correctional facilities at the time of their interview. Telephone interviews have been conducted with about 15% of participants at any given data collection period. Interviews generally take about 90 minutes to complete.

Biological Samples

In addition to conducting the interviews with all eligible clients, LI/CHS staff will also request urine samples from a 25% random sample of eligible clients. Collection of urine samples or other biological specimens was not part of the protocol for the original Target Chicago study, but LI/CHS team has amended their data collection protocol to include collection of urine samples.

The LI/CHS team will select a random sample of 25% of the eligible respondents and ask them to provide a urine sample for testing. The decision to select a 25% sample of respondents was made for pragmatic reasons. LI/CHS has a very small interviewing facility that includes only one restroom; this restroom must be shared by LI/CHS staff, clients, and study respondents. Given the volume of interviews to be conducted as part of PETS and the limited facilities available, LI/CHS staff regard it as logistically impossible to collect, store, and test urine samples for more than 25% of the study's respondents. Because this is not a study of clients currently in treatment or presenting for treatment, there is no clinical reason for conducting urinalysis tests on all clients. That is, LI/CHS staff are not clinicians seeking to diagnose and place clients in treatment, but rather are researchers seeking confirmatory evidence of veracity of self-reported behavior. As such, collection of data from a sub-sample, although not optimal, represents a compromise that fulfills the needs of PETS while working within the physical constraints of the LI/CHS facility.

To ensure that clients have an equal probability of being sampled, random assignment of eligible clients to the "urinalysis" category will be completed prior to implementing a follow-up data collection wave. For the 24-month Cohort 2 interviews and the 36-month Cohort 1 interviews (for which PETS will support the latter 50 percent), a 25% random sample of clients will be selected from all of those eligible for follow-up and remaining to be interviewed at the time PETS funding is in place. The interview type (interview only or interview plus urine) will be indicated to the interviewer on assignment of the case by a note in the client's file.

Incentive Fees

An incentive fee of $35 is offered to each client who agrees to complete an interview. Clients' incentive payment is increased by an additional $5 if they complete their interview within 14 days of their interview anniversary date.

Analyses

Estimation Procedures. In the development of statistical models to explore and analyze the data, a simple random probability sample of observations is not a requirement. In fact, one specific emphasis of PETS is the identification of a variety of component studies that will each contribute a different set of methods or procedures. If consistent results are found across these disparate populations and using these different methods, this lends even further credence to the results obtained. Nevertheless, models that fit the study participants well may not provide a useful fit for the general population or subgroups of the population, perhaps due in part to differences between sample and population characteristics. Caution will therefore be exercised in the process of making generalizations regarding analytic results. Moreover, some secondary analyses of administrative data may include developing estimates for all persons in Chicago's Westside drug treatment programs. If so, the estimation strategy would be to develop sample weights for participants by post-stratifying the sample to population control figures on several key variables (e.g., gender, race, highest grade completed, employment status), and then examine the resulting weighted distribution for other important variables (e.g., most frequently used drug, last time worked full time, items related to treatment history). If important differences still exist, further adjustments to the weights can be made to more closely reflect the population distribution of clients. Thus, taking advantage of Illinois administrative data systems for alcohol and drug abuse clients should permit important reductions of bias that would not otherwise be possible in the study of clients of substance abuse treatment facilities, where response and coverage rates of the target population are important issues of concern.

In the analysis of the PETS-Chicago data, a number of comparisons between estimated parameters are planned. It is of interest to assess the power of hypothesis tests to detect existing differences in the corresponding population parameters. Our calculations indicate that the sample size for this study will be more than adequate to detect substantively and statistically significant changes in the behaviors and characteristics of the individuals being studied. A detailed explanation for this conclusion can be found in the appendix.

The analysis plan for PETS-Chicago is the same as that developed for all of the sub-studies within the PETS project. This approach was described in general in CSAT's discussions with OMB which resulted in omnibus clearance for the overall PETS project. A detailed description of the analytic approach is provided below.

The PETS analytic approach will proceed in three phases: the analyses of Phase 1 will be descriptive in nature; Phase 2 will include the basic modeling analyses that address the fundamental research questions; and Phase 3 analyses will be more focused on subgroups and highly specific questions.

Phase 1. This phase (which has already begun) will serve a preliminary analysis function, primarily to characterize the sample of clients who were recruited for the Chicago Target Cities study and who form the sample for the PETS-Chicago study. These descriptive analyses will focus primarily on the demographic makeup of the sample, and their severity of substance abuse and episodes of treatment over the longitudinal time frame. A preliminary description of the sample-population is provided in Table 2.

The analytic focus will then turn to the computation of sample descriptive statistics (e.g., means, proportions) for critical variables. Variables will include substance abuse severity and treatment use over time, broken down by sociodemographic and clinical-historical characteristics, treatment utilization and modality, length of stay, and treatment compliance and completion rates. For example, descriptive data generated at this stage will include key client characteristics by the previously noted clinical and utilization variables.

The following table shell is illustrative of the Phase 1 descriptive analyses:

Average Duration of Treatment by Client Sociodemographics and Type of Care at Study Entry

Average Duration of Treatment (Days)								
	Gender		Race/Ethnicity			Education		
Type of Care	Male	Female	White	Black	Hispanic	< HS	HS or GED	>HS
Outpatient								
Intensive Outpatient								
Methadone Maintenance								
Short-term Inpatient								
Long-term Inpatient								
Halfway House								

Phase 1 will provide a comprehensive picture of the client sample in terms of background, clinical, and treatment variables across assessment waves. Where appropriate, statistical techniques such as chi-square homogeneity of proportions tests (with odds ratios), independent samples *t*-tests, and analysis of variance (ANOVA), with weighting where appropriate, will be used to indicate statistically significant differences or relationships. Phase 1 will illustrate, in a basically static (cross-sectional) fashion, key characteristics of the sample, including the identification of potential confounding variables. This will serve to inform the next level of modeling analyses in Phase 2.

Phase 2. The second stage of our analyses will focus on model development and testing. The ultimate goal in Phase 2 is to take full advantage of the richness of the data on client substance use patterns, addiction severity and treatment episodes, as well as the dynamic inter-relationship of these measures over the multiple interview periods. Models will attempt to explain variation in substance use over time, as a function of individual characteristics and treatment influences. To accomplish this objective, the investigators will capitalize on recent statistical developments in modeling techniques for multi-wave longitudinal data.

Highly sophisticated statistical methods for the analyses of longitudinal data have made substantial advances over the last decade, and user-friendly software packages and documentation have been developed. Latent growth curve modeling (LCM) and multi-level modeling (MLM) provide flexible techniques to address questions related to change ("growth") over repeated measurement occasions, allowing for the complex modeling of growth or change as a function of predictor, moderating, and mediating variables. In general, LCM and MLM represent two different practical applications of the same basic approach. LCM offers some advantages, (e.g., an overall goodness-of-fit-test) and will be highlighted here. LCM will provide the critical statistical tool to approach the complex issues characterizing the interplay of substance abuse and treatment episodes over four to five years of the clients' life course.

Briefly, LCM is based on confirmatory factor analytic methods and developments in covariance analysis more generally. The model builds a developmental growth construct representing the function of repeated observations over time (referred to as growth curves, trajectories, time trends, etc.). LCM utilizes latent factors to estimate the fixed and random components associated with individual differences in changes (outcomes) over time. The flexibility of the LCM approach means that a variety of forms of longitudinal analyses can be conducted. These include the exploration of mediational factors influencing the change process, analysis of multiple change processes for more than one outcome variable, and multi-sample (e.g., gender) comparisons of change trajectories.

The fundamental conceptualization underlying LCM is the notion that each individual has a unique pattern of change, or growth trajectory. For each of these individual growth curves, the intercept (i.e., initial status) and slope (i.e., rate of change) are estimated. This growth curve can be characterized by a linear or nonlinear function. Moreover, the growth trajectory can be modeled as a function of fixed or time-varying covariates or explanatory variables. In this life course trajectory/treatment evaluation context, a goal is to further our understanding of "what works for whom." Since LCM estimates individual differences in change over time, differential treatment response can be examined, in an attempt to identify factors associated with stronger (or weaker) help-seeking, treatment engagement, and treatment responsiveness.

One of the strengths of LCM is its ability to examine the relationships between multiple levels of data. For example, at Level 1 (within-person), the analysis models growth parameters for each client (i.e., the intercept or initial status and growth trajectory/rate of change/slope over the multiple assessment periods). The Level 2 (between-person) analysis next uses these Level 1 growth parameters as dependent variables ("slope-as-outcome" approach) to model the relationship between growth or change in relation to key predictor (treatment dose as a time-varying covariate at Level 1) and control variables (e.g., baseline case mix variable). Accompanying parameter estimates and tests of statistical significance are provided. In addition to tests of fixed effects on change over time (e.g., treatment dose on rate of change in substance abuse severity), LCM also provides useful variance partitioning estimates (e.g., relative proportion of between-subject variability in substance abuse severity as a function of initial status and rate of change). A sample table shell for such analyses follows:

Treatment Dose, Gender and Addiction Severity Over 36 Months: A Growth Curve Analysis

Fixed Effects			
Predictor	Coeff	SE	t ratio
For base rate (phi)			
Intercept (beta)			
Gender (beta)			
For linear slope (phi)			
Intercept (beta)			
Gender (beta)			
For treatment effect (phi)			
Intercept (phi)			
Gender (beta)			

Variance Components			
Parameter	Estimate	Chi-Square	df
Variance (between-person intercept) (tau)			
Variance (between-person growth) (tau)			
Variance (sampling variance) (sigma-squared)			

These basic Phase 2 modeling strategies will provide rigorous tests of rates of change in substance abuse within and across clients, as well as providing estimates of treatment impacts while controlling for background characteristics and potential confounds. These models will be expanded and fine-tuned to better address questions of: the temporal relationship between treatment episodes and addiction severity, identification of moderating variables (e.g., treatment motivation, comorbidity), and differential relationships by primary substance of abuse and treatment modality.

Phase 3. The major objectives of Phase 3 are to model the course of substance abuse and treatment over time across client subgroups. LCM will be conducted, for example, within type of treatment modality, for substantive impact as well as to prevent modality from confounding analytic results. For example, analyses might include examining the role of the client's primary drug of abuse on treatment responsiveness among those receiving residential services, or the relationship between client sociodemographic characteristics and source of payment in models of the course of treatment utilization in outpatient treatment.

These analyses will also focus on certain groups of special interest such as women, crack cocaine users, injection drug users, and clients in various ethnic groups.

Phase 3 analyses will also allow exploration of the data using several other advanced statistical techniques. For example, Latent Transition Modeling (LTM) is similar to LCM but utilizes discrete or categorical latent variables. This method models transitions over time between discrete variables representing "stages." LTM could be used to identify variables (such as cumulative treatment history, comorbidity, etc.) that predict the transition probabilities between stages such as reduced use, abstinence, and relapse. Questions pertaining to "time-to-event" sorts of hypotheses, such as time to abstinence (and its predictors) can be modeled using life table or survival analytic approaches. Lastly, "person-based" methods, such as Configural Frequency Analysis may be explored in attempts to create typologies or clusters of substance abusing clients, clusters or patterns of treatment response over time, and an examination of their interrelationships.

Publications

It is CSAT's intention to publish the findings from this and other PETS studies in a variety of media and forums. Professional journals such as *Addictions*, *Journal of Substance Abuse Treatment*, *Health Services Research*, *Journal of Addictive Diseases*, and the *Journal of Maintenance in the Addictions* are some of the planned venues. In addition, CSAT reports will be published annually with the earliest planned for December 1999. The PETS team plans to produce a number of publishable analysis reports over the course of the Chicago study. Given the unique character of the combined administrative and clinical interview database, there are a number of significant analytical issues that can be addressed in the near term. At the end of the project, the full analytic database will be made available for public use after careful application of disclosure analysis procedures to preserve confidentiality of client identities.

Project Schedule

As discussed above, Lighthouse Institute / Chestnut Health Systems is presently conducting data collection activities that are now "due" according to their existing schedule (36-month follow-up for Cohort 1 and 24-month follow-up for Cohort 2), using limited funds available from other sources. PETS funding for data collection will commence only after OMB approval of this package. For planning purposes, we have estimated that PETS will assume cost of the data collection effective December 1999. In essence, PETS will cover about half of the projected interviews for each of these waves. Both waves are scheduled to be completed by July 2000. Two subsequent data collection intervals for each cohort will be fully supported by PETS funds, with all data collection to be completed by July 2002. Analyses will be ongoing throughout the

next 3 years, and interim reports and findings will be produced as data become available. Final reports and datafiles will be delivered on or before the PETS contract end date of September 2002. Table 4 shows the PETS-Chicago study timeline.

Table 4. PETS-Chicago Activity Timeline

Activity	Schedule[1]	
	Cohort 1	**Cohort 2**
Study enrollment period	July 1996-July 1997	August 1997-June 1998
6-month follow-up	January 1997-January 1998	N/A[2]
18-month follow-up	N/A[2]	February 1999-December 1999
24-month follow-up (LI/CHS)	July 1998-July 1999	August 1999-December 1999
36-month follow-up (LI/CHS)	July 1999-December 1999	
24-month follow-up (PETS)		December 1999-June 2000
36-month follow-up (PETS)	December 1999-July 2000	August 2000-June 2001
48-month follow-up (PETS)	July 2000-July 2001	August 2001-June 2002
60-month follow-up (PETS)	July 2001-July 2002	N/A[3]
Obtain & merge collateral data	Ongoing, beginning July 1999	
Analysis	Ongoing	
Final report	August 30, 2002	
Public use datafiles	August 30, 2002	

Notes:
1. Cohorts are tracked separately for follow-up purposes, but data will be pooled for analysis.
2. N/A = data not collected.
3. PETS contract timeframe does not allow for 60-month follow-up of Cohort 2.

Appendix I: Estimation Procedures for PETS - Chicago

In this discussion, we will focus on the ability to detect changes over time based on data collected on a single sample of persons. With an assumed minimum 85 percent follow-up rate (excluding non-responsive and deceased clients) from the initial sample of 1328 Chicago clients, we can expect to have roughly 1,100 participants at a later point in time. Because of the clustered sampling plan with a targeted sample size per modality, the sample distribution is unrepresentative of the total population of clients in the network. To address the issue of clustered sampling when estimating population parameters one must weight the data to matching distribution of the clusters in the population. These weights can be derived from the state treatment records of admissions of all clients in the SDUs' modalities during the intake data collection period. Although this approach allows for estimation of population parameters, it does not come without a cost. There is an increase the variability of sample estimates as it adds a component associated with the variability of the weights effectively reducing sample size for the analyses.

In assessing the power to detect existing differences between population parameters, one also must take into account the expected correlation between a client's measurement at time 1 and the same client's measurement at time 2. For the purpose of the power evaluation here, we will consider a range of correlation from .40-.80. The choice of this range of values was based on estimates from the substance abuse literature documenting high stabilities of alcohol and drug use.

For illustrative purposes, we will evaluate the ability to detect a difference of both 5 percent and 10 percent, with a Type 1 error rate set at alpha = .05. We will consider the parameter of interest to be the proportion of clients with chronic/high intensity substance abuse problems (vs. the remaining clients) who move from this chronic/high intensity category to the other (thus, representing improvement). Given information obtained in the baseline Target Chicago interviews, we assume that the initial proportion of persons entering substance abuse treatment with a chronic/high intensity alcohol or drug problem was about 90 percent. We will then determine the power to detect a lowering of this proportion (over time) to values of 85 percent (a 5 percent difference) and 80 percent (a 10 percent difference). We consider three sample sizes: (1) 1,200 clients, representing the expected full sample yield if response rates continue to exceed 90 percent; (2) 600 clients, the likely subgroup sample size if the two cohorts are being compared; and (3) 200 clients, the likely subgroup sample size when comparing clients across modalities.

We also consider treating the sample as an equal probability sample (a design effect of 1 associated with the variability of the weights) and as a weighted sample (we calculated power based on a design effect of 1.25, or a design effect of 1.5 as values that may be associated with variable weights). The resulting power values appear in Table 5 below.

As shown, a sample size of 1,200 and a design effect of roughly 1.25 associated with variable sample weights provides nearly 100% power to detect a change from 90 to 85 percent, regardless of the correlation of the variables over time. (A design effect of 1.25 has been hypothesized as the value to be associated with the variability resulting from adjusting for nonresponse the weights of those clients who entered the SDUs directly rather than entering through a CIU, and then post stratifying all weights to available population distributions.) Similar results are found if the design effect is increased to 1.5. With a design effect of 1 (an unweighted analysis), the power to detect a change from 90 to 85 percent again approaches 100 percent. To detect a change from 90 to 80 percent, the power can be expected to be essentially 100 percent for all values of the design effect considered.

With a sample size of 600 and a design effect of roughly 1.25, the power to detect a change from 75 to 70 percent ranges from approximately 65 to 97 percent, depending on the correlation. With a design effect of 1, the power to detect a change from 75 to 70 percent ranges from approximately 74 to 99 percent, depending on the correlation. To detect a change from 75 to 65 percent, the power can also be expected to be essentially 100 percent for both values of the design effect considered.

With a sample size of 600 and a design effect of roughly 1.5, the power to detect a change from 90 to 85 percent ranges from approximately 87 to 100 percent, depending on the correlation. With a design effect of 1, the power to detect a change from 90 to 85 percent in this sample size ranges from approximately 96 to 100 percent, depending on the correlation. Across all design effect sizes and correlations, the power to detect a 10% change in a sample size of 600 is 100%.

With a sample size of 200 and a design effect of roughly 1.5, the power to detect a change from 90 to 85 percent ranges from approximately 47 to 85 percent, depending on the correlation. With a design effect of 1, the power to detect a change from 90 to 85 percent ranges from approximately 62 to 95 percent, depending on the correlation. The power to detect a 10% change in a sample size of 200 exceeds 90% across all design effects and correlations.

Table 5. Power Analysis Example

Differences Between the Same Respondents Over Time Table of Power Associated with Detecting Two Changes: From 90 to 85 percent and from 90 to 80 percent							
Sample size	Correlation of variable over time	From 90 to 85%			From 90 to 80%		
		Deff=1	Deff=1.25	Deff=1.5	Deff=1	Deff=1.25	Deff=1.5
1200	0.4	0.999	0.996	0.998	1	1	1
1200	0.5	1	0.999	0.995	1	1	1
1200	0.6	1	1	0.999	1	1	1
1200	0.7	1	1	1	1	1	1
1200	0.8	1	1	1	1	1	1
600	0.4	0.958	0.915	0.866	1	1	1
600	0.5	0.979	0.951	0.914	1	1	1
600	0.6	0.993	0.979	0.956	1	1	1
600	0.7	0.999	0.995	0.986	1	1	1
600	0.8	1	1	0.999	1	1	1
200	0.4	0.619	0.539	0.478	0.975	0.943	0.903
200	0.5	0.686	0.602	0.537	0.989	0.969	0.940
200	0.6	0.766	0.683	0.614	0.997	0.987	0.971
200	0.7	0.859	0.785	0.718	1	0.997	0.992
200	0.8	0.950	0.903	0.852	1	1	0.999

Note: Deff=Design effects.