Evaluating Recovery Services: The California Drug and Alcohol Treatment Assessment (CALDATA)

General Report

Submitted to the
State of California
Department of Alcohol and Drug Programs

by
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at the University of Chicago
and
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TABLE OF CONTENTS

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Summary

PURPOSE

Under the leadership of Governor Pete Wilson, the California Department of Alcohol and Drug Programs (CADP) launched an initiative, in 1992, to determine the epidemiology of substance abuse and the outcomes of substance abuse treatment. The California Drug and Alcohol Treatment Assessment (CALDATA) is the first product of this initiative. CALDATA is a pioneering large-scale study of the effectiveness, benefits, and costs of alcohol and drug treatment in California, using state data bases, provider records, and follow-up interviews with participants in treatment. CALDATA's primary source of information is a voluntary survey of publicly supported participants. CALDATA is the first follow-up interview study to use random sampling techniques with this population.

The purpose of CALDATA was to study:

- the effects of treatment on participant behavior;
- the costs of treatment; and
- the economic value of treatment to society.

The **effects of treatment** are the differences in behavior and experience reported by respondents before and after treatment. The **costs of treatment** were calculated from financial records collected directly from the providers involved in CALDATA. These cost figures have been verified for consistency with other data about these programs and are quite consistent with other study results on treatment costs. The **economic value of treatment** was based largely on the costs avoided due to reductions in the burden of crime and illness, as well as a careful review of shifts in income sources.

The California Department of Alcohol and Drug Programs in partnership with the National Opinion Research Center (NORC) at the University of Chicago and Lewin-VHI, Inc., conducted the study during the period of September, 1992 through March, 1994.

METHODS

Phase One

CALDATA gathered information in two phases. The first phase involved sampling counties, providers, and participants in four types of treatment programs in California. The treatment types include:

- Residential programs
- Residential "social model" programs in particular
- Outpatient programs
- Outpatient methadone

Participants were selected at random from discharge (or in-treatment) lists developed on site at cooperating providers. Sixteen counties, 97 providers, and approximately 3,000 participants who were in treatment or were discharged between October 1, 1991 and September 30, 1992 were selected into the study sample. The random sample was specifically designed to represent the nearly 150,000 participants in treatment.

The number of programs involved in CALDATA is larger than any prior treatment follow-up study. Further, these programs were systematically selected with known probabilities from a rigorously developed sampling framework, so that those individuals followed up are representative of all participants in treatment in the selected modalities throughout California.

As authorized by federal and state law and permitted by consent obtained routinely on admission to treatment, the program records of participants selected for the follow-up sample were read and abstracted to determine additional important research information and to verify the self-reported data[1]. Using a combination of methods including letters, postcards, telephone calls, visits to last known addresses, contacting relatives or institutional connections, and searching various accessible public records, CALDATA staff sought to locate members of the sample and seek their participation in the study.

In order to protect the privacy of respondents, strict confidentiality was maintained throughout the data collection period. The methods used to protect confidentiality were approved by the California Health and Welfare Protection of Human Subjects Committee.

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[1]Studies of the reliability and validity of responses to surveys by drug abusers show that addicts provide generally truthful and accurate information (Hubbard, R.L., et .al., 1989, *Drug Abuse Treatment: A National Study of Effectiveness*, Chapel Hill: The University of North Carolina Press, p. 31).

Phase Two

In the second phase, more than 1,850 individuals drawn from 83 cooperating providers were successfully contacted and interviewed in 9 months. The participant follow-up interview was developed for CALDATA based on extensive work with previous research studies. The questionnaire took approximately one hour and fifteen minutes to administer on average. Follow-up interviews occurred an average of 15 months after treatment, with the longest interval being 24 months. Part of the sample was comprised of individuals who were in continuing methadone maintenance treatment, since this type of treatment is typically longer term than other services.

The results of this study will fill many of the gaps in the research literature--such as the detailed coverage of social model programs and the side-by-side comparison of cost and effectiveness of treatment for alcohol, cocaine, and heroin abuse.

The major goal of the study was to provide CADP a thorough analysis of the data on which data-driven policy decisions can be made. Public policy based on fact ensures the best return on investment for taxpayers.

KEY FINDINGS

THE COSTS-BENEFITS OF TREATMENT IN CALIFORNIA

Taxpaying Citizens

- ***Costs and benefits to taxpaying citizens***[2]: The cost of treating approximately 150,000 participants represented by the CALDATA study sample in 1992 was $209 million, while the benefits received during treatment and in the first year afterwards were worth approximately $1.5 billion in savings to taxpaying citizens, due mostly to reductions in crime.

- ***Daily trade-off***: Each day of treatment paid for itself (the benefits to taxpaying citizens equaled or exceeded the costs) on the day it was received, primarily through an avoidance of crime.

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[2]The economic benefits of treatment were calculated two ways: benefits to *taxpaying citizens* and benefits to the *total society*. The major difference is that taxpaying citizens benefit when there is less theft and other crime and when the State makes fewer drug-related disability payments and other welfare-type transfers. However, these transfers of income and property are considered economically neutral to the total society, since one person's loss equals another's gain.

• ***Cost-benefit ratios for taxpaying citizens***: The benefits of alcohol and other drug treatment outweighed the costs of treatment by ratios from 4:1 to greater than 12:1 depending on the type of treatment.

• ***Differences by treatment types***: The cost-benefit ratio for taxpaying citizens was highest for discharged methadone participants, lowest—but still clearly economically favorable—for participants in residential programs, including social model recovery houses.

Total Society: Economic Benefits

• ***Cost-benefit ratios for the total society***: Findings differed when cost-benefit ratios for the total society were calculated. The cost-benefit ratios ranged from 2:1 to more than 4:1 for all treatment types, except methadone treatment episodes ending in discharge. For methadone episodes ending in discharge, there were net losses—mainly from earnings losses to the treatment participants themselves.

Benefits Projection

• ***Benefits projection***: Benefits after treatment persisted through the second year of follow-up for the limited number of participants followed for as long as two years. This suggests that projected cumulative lifetime benefits of treatment will be substantially higher than the shorter-term figures. An additional phase of follow-up interviews and analyses would permit a more valid projection of lifetime treatment costs and benefits.

TREATMENT EFFECTIVENESS

• ***Crime***: The level of criminal activity declined by two-thirds from before treatment to after treatment. The greater the length of time spent in treatment, the greater the percent reduction in criminal activity.

• ***Alcohol/Drug Use:*** Declines of approximately two-fifths also occurred in the use of alcohol and other drugs from before treatment to after treatment.

• ***Health Care:*** About one-third reductions in hospitalizations were reported from before treatment to after treatment. There were corresponding significant improvements in other health indicators.

• ***Differences by substance***: There has been concern that stimulants, and crack cocaine especially, might be much more resistant to treatment than more familiar drugs such as alcohol or heroin. However, treatment for problems with the major stimulant drugs (crack cocaine, powdered cocaine, and methamphetamine), which were all in widespread use, was found to be just as effective as treatment for alcohol problems, and somewhat more effective than treatment for heroin problems.

- ***No gender, age, or ethnic differences***: For each type of treatment studied, there were slight or no differences in effectiveness between men and women, younger and older participants, or among African-Americans, Hispanics, and Whites.

- ***Ethnic differences in selecting treatments***: There were ethnic differences in the selection of treatment types and in reported main drugs of use. Hispanics were disproportionately in methadone programs for heroin addiction and African-Americans were disproportionately in residential programs (primarily for alcohol and cocaine) compared with non-Hispanic Whites and with African-Americans in other types of treatment.

- ***Employment and economic situation***: Overall, treatment did not have a positive effect on the economic situation of the participants during the study period. However, the data indicate that longer lengths of stay in treatment have a positive effect on employment. This finding is greater for those in social model or other residential programs than for the other treatment types. The largest gains in employment occur with those individuals staying in treatment beyond the first month.

- ***Disability and Medi-Cal***: In every type of treatment there were greater levels of enrollment and payments received from disability and Medi-Cal after treatment; these increases ranged from one-sixth to one-half. The study analyses indicated that treatment increased the eligibility to receive disability payments even though it actually led to overall improvements in health status.

1 The Purpose and Nature of the Study

The California Drug and Alcohol Treatment Assessment (CALDATA) is at the leading edge of a new wave of research into the effectiveness, costs, and benefits of recovery services for substance abuse. There have been limited studies of the recovery of participants in one or another sort of substance abuse program, but no broad and solid set of statistics for recovery services overall in the 1990's, either in the state of California or in the nation.

Under the leadership of Governor Pete Wilson, the California Department of Alcohol and Drug Programs (CADP) launched an initiative, in 1992, to determine the epidemiology of substance abuse and the outcomes of substance abuse treatment. CALDATA is the first product of this initiative. CALDATA is a pioneering large-scale study of the effectiveness, benefits, and costs of alcohol and other drug treatment in California, using state data bases, provider records, and follow-up interviews with participants in treatment. CALDATA's primary source of information is a voluntary survey of publicly supported participants. CALDATA is the first follow-up interview study to use random sampling techniques with this population.

The California Department of Alcohol and Drug Programs contracted with the National Opinion Research Center (NORC) at the University of Chicago to develop technical specifications for CALDATA, to perform the data collection, and to analyze the data in association with Lewin-VHI, Inc., a health policy consulting and analysis firm based in Fairfax, Virginia and Corte Madera, California.

CALDATA gathered outcome data in two phases. The first phase involved systematic selection by random sampling of counties, providers, and participants in four types of treatment programs in California specified by ADP: residential programs, residential "social model" programs in particular, outpatient programs in general, and outpatient-methadone. Participants were selected by NORC from discharge (or in-treatment) lists developed on site at cooperating providers using state-of-the art statistical procedures. Sixteen counties, 110 providers, and approximately 3000 participants who received treatment or were discharged between October 1, 1991, and September 30, 1992 were included in the study sample. The number of programs involved in CALDATA was larger than any prior treatment follow-up study; but more significantly, these programs were systematically selected with known probabilities from a rigorously developed sampling framework, so that those followed up were representative of all participants in treatment in the selected modalities in California.

As authorized by federal and State law and permitted by consent obtained routinely on admission to treatment, the program records of participants selected for the follow-up sample were abstracted to determine important research information such as admission and discharge

dates, specific services received, and information that would enable CALDATA staff to locate and interview respondents about their behavior and experience before, during, and after treatment. Using a combination of methods including recruitment letters and postcards, telephone calls, visits to last known addresses, contacting relatives or institutional connections, and searching various accessible public records, CALDATA staff sought to locate members of the sample and seek their participation in the study. In order to protect the privacy of respondents, strict confidentiality was maintained throughout the data collection period concerning the precise nature of the research and reasons why individuals were part of the sample. Details concerning the statutory authority for the study, including prior consent on the part of participants, and the methods used to locate respondents, elicit cooperation, guarantee privacy and confidentiality, and otherwise perform the field data collection are provided in the CALDATA Methodological Report. The methods used to protect confidentiality were approved by the California Health and Welfare Protection of Human Subjects Committee.

More than 1,800 individuals were successfully contacted, agreed to participate, and were interviewed. The participant follow-up interview was developed for CALDATA based on extensive work with previous treatment effectiveness studies. The questionnaire took approximately one hour and fifteen minutes to administer on average, and employed a variety of memory aids, including a large-format calendar and colored markers to identify specific time periods such as before, during, and after treatment as well as significant life events; and a series of show cards listing specific categories for responding to questions about quantities and time periods. Follow-up interviews occurred an average of 15 months after treatment, with the longest interval being 24 months. Part of the sample, however, was comprised of individuals who were in continuing methadone maintenance treatment, since this type of treatment is meant to continue indefinitely for a significant proportion of those enrolled in it.

The analysis of CALDATA results is based on changes in respondent behavior and experience over time—particularly before treatment, during treatment, and after treatment. While a large number of outcome studies focus on the day, week, or month before admission and after discharge, CALDATA uses one-year baseline and post-treatment periods as standards, in accord with the findings of earlier important substance abuse treatment outcome studies (Sells and Simpson, 1976; Hubbard et al., 1989; Ball and Ross, 1991).

CALDATA was designed to reveal three major elements: the effects of treatment on participant behavior, the costs of treatment, and the economic value of treatment to society. The effects of treatment are the differences in behavior and experience reported by respondents before and after (and for some items, during) treatment, controlled statistically for other possible sources of variation. Some of the results of this study are reported here for the first time in the literature—such as the detailed coverage of social model programs and the systematic side-by-side comparisons of results for alcohol, stimulants, and heroin. Even for more familiar statistics, such as the effects of methadone and residential programs on criminal activity, the particular measures and the sampling approach used provide new and more representative numbers than were previously available. The broad outlines of our results on the effectiveness of treatment,

however, are quite consistent with those of important earlier studies using prospective and retrospective designs.

The costs of treatment are calculated from financial information collected directly from the providers involved in CALDATA. These cost figures have been checked for consistency with other data about these programs and are quite consistent with other study results on treatment costs. The economic valuation of the benefits of treatment was based largely on calculating the "costs avoided" due to reductions in the burden of crime and illness, as well as a careful review of shifts in income sources as reported by the respondents. The cost-benefit methodologies are described in the section of the report that details these results.

CALDATA has built on the foundations of previous large-scale studies or treatment, extended the methods of research in significant new directions, and responded to the needs of government for information that addresses major public policy issues regarding alcohol and drug treatment.

2 Who was Studied

The Sample of Providers

CALDATA took as its population for study all those receiving any of four types of recovery services (referred to as "the treatment modalities") from California-based treatment providers known to the California Alcohol and Drug Data System (CADDS) as of September, 1992. The CADDS reporting programs include all providers who received any type of public funding for treatment or recovery services, including grants, contracts, MediCal reimbursements during the current or previous fiscal years or who are required to report to CADDS as a condition of state licensing. The primary objective was to ensure that each participant in the four designated types of recovery services would be given a comparable chance with every other participant to be chosen for the follow-up sample, and to carefully document every step of the process to ensure that those actually interviewed could be related using strict statistical principles to this original population of participants.

There were three stages in selecting the sample of participants. (The sampling approach is summarized here; full details are provided in the CALDATA Methodological Report). First, 16 of California's 58 counties were selected for inclusion, using as criteria geographic diversity and numbers of participants in alcohol and drug recovery services in each county according to CADDS. To ensure appropriate coverage, four geographic strata were identified (Bay Area, Southern Urban, Central Valley, and Mountain/Rim). Because of their size, six counties (Los Angeles, San Francisco, San Diego, Orange, Alameda, and San Bernardino) were selected with certainty (probability equals 1.00). The smallest counties were clustered based on geography to provide sufficiently large sampling units, so that every county had at least a one in eight chance of being picked. A randomized procedure, with selection chances weighted by the number of participants, was then used to select ten more counties: San Mateo, Santa Clara, Tehama, Riverside, Solano, Sacramento, Stanislaus, Fresno, and Kern counties. These 16 counties include approximately five-sixths of the state's population and participants in treatment. The county administrators responsible for public funding of alcohol and drug treatment in each county were consulted about the study and gave full support to it.

The second stage of sampling was to select providers within these counties, using similar principles of geographically balanced, size-weighted random selection. Since CALDATA was intended to consider results for each of the four modalities separately, we sought to roughly equalize the numbers of participants to be chosen in each. Statistical power considerations suggested that at least 400 participants should in the end be interviewed, and sufficient numbers of providers would need to be chosen to reach this goal, taking into account expected sample attrition from a variety of causes. Since there were wide variations in the size of provider units,

including differences in average size by type of treatment, and in the numbers of providers of each type, the final count of providers differed somewhat from modality to modality, and as with the smallest counties, the smallest providers were clustered together to provide adequate sized sampling units. The results of the selection process among modalities were as follows:

- Residential Treatment in general (21 providers selected). A variety of recovery service approaches are employed in residential settings, which can provide heavily structured and controlled environments. Some residential programs are oriented more towards individual counseling and a classical staff/therapist model, others stress group interaction or a gradual climb through successive roles and responsibilities as a milieu for assimilating new ideas, norms, and behaviors.

- Social Model Recovery Houses (23 providers selected). These are a particular type of residential program seen more in California than other States, which focus on recovering alcoholics, stressing peer support and communal sober living.

- Outpatient Nonmethadone (29 providers selected). Outpatient programs, exclusive of those providing daily methadone doses, encompass great variety, from one hour/week one-to-one counseling that may be focused on practical, emotional, spiritual, or other issues; to daily or multiple weekly individual or group sessions that may focus on these matters or on the 12 Steps (as in Alcoholics Anonymous or Narcotics Anonymous). Some programs include substantial medical or psychiatric elements, others none at all.

Methadone Programs--two subtypes:

- Methadone Maintenance Outpatient (18 providers selected). In maintenance, a stable daily oral dose of methadone hydrochloride, accompanied by other available non-residential services such as counseling, is provided to formerly heroin-dependent participants on a long-term basis. Maintenance is open only to those who have either a two year history of use and two withdrawal treatment failures, or are pregnant. Methadone in appropriate doses prevents withdrawal symptoms and maintains a level baseline of physical comfort and functioning with virtually no psychological or physiological impairment.

- Detoxification (19 providers selected). Methadone detoxification means support for planned withdrawal from heroin (sometimes other opiate) dependence using a gradually tapering dose of methadone hydrochloride, lasting a maximum of 21 days.

The two methadone provider groups were selected separately but the samples in fact overlapped, since most methadone providers offer both detoxification and maintenance treatment using the same facility and staffing. There were 7 dually sampled methadone providers, so the methadone stratum actually comprised 30 distinct providers. Two providers outside of the methadone group were dually sampled (selected in two different strata); each provided both residential and outpatient services. Consequently, the total number of unique providers in the sample was 101. All of these 101 providers were contacted and recruited for the study. Four

of these providers proved to have no eligible treatment cases during the focal year of eligibility for the study, and were therefore deemed ineligible for inclusion. Of the remaining 97 eligible providers, 83 agreed to be part of the study. This entailed completion of a Director Questionnaire and giving CALDATA permission to enumerate their discharged cases from on-site records, select a sample of participants for follow up, and abstract specific information from this sample's records. One of these providers withdrew from the study after the sample records and abstracts were completed, and several providers did not complete the Director Questionnaire. Therefore, 82 providers were directly represented by participants in the CALDATA follow-up sample, and 76 provided Director Questionnaires.

The Director Questionnaires covered various clinical and financial dimensions of the programs. These questionnaires verified and quantified differences among modalities and among providers within modalities. As indicated in Table 1, there were moderate differences in staff stability, with social model and methadone programs evincing the highest stability. There were much more clearly marked differences in staffing patterns. Participants in residential programs were exposed to by far the heaviest concentration of clinical staffing. Residents in social model programs were exposed to much less clinical staffing, but an usually high level of volunteers, many of them program alumni. The social model emphasis on peer support also presumably accounts for its lower level of clinical staffing. Participants in outpatient programs had access to higher clinical and administrative staffing than in social model programs, and especially compared to methadone programs; however, the latter were marked by their high levels of medical professionals, particularly nurses.

In terms of physical plant, residents of residential and social model programs were twice as likely as in outpatient and methadone programs to be in owned rather than leased premises; and the premises were generally much more spacious than in outpatient or methadone facilities; the latter were the least roomy in terms of square feet per patient. We also observed that participants in methadone programs were least likely to be subject to follow-up efforts on the part of their treatment providers.

In addition to the Director Questionnaires, more than half of the cooperating providers supplied financial statements or auditors' reports, and a number of them supplied evaluation reports as well, mostly reports based on records or on in-treatment data. A more detailed study of Director Questionnaire data is included in the CALDATA Methodological report.

The Sample of Participants

In addition to securing Director Questionnaires, CALDATA staff completed two major operations at each of the 83 provider sites which became part of CALDATA. First, they created an on-site listing of all participants in treatment who were eligible for sampling. These master eligibility lists (identified only by program ID numbers) were of two types. The first type, by far the major component, was the list at every site of all those who were discharged from an episode of treatment during the 12 calendar months beginning October 1, 1991. A much smaller component was a list at methadone maintenance sites only of those currently enrolled in a long-

Table 1. Organizational characteristics of the four types of providers (participant weighted)

Organizational Characteristics	TYPE OF TREATMENT			
	Resid	Soc Model	Outpt nonmet	Methad
Staff stability				
Change in owner/administration during 1991-1992	29%	22%	29%	23%
Average annual staff turnover rate	30%	26%	37%	17%
Average tenure of key personnel, in months	82.4	90.5	76.5	110.6
Staffing patterns— average staff hours/week per 100 participants				
Medical: Physicians, psychiatrists, and nurses	7.2	0	0.9	33.4
Clinical (nonmedical) Professionals	245.7	93.4	141.4	50.8
Administrative and support	103.8	107.0	130.3	33.1
Volunteers	6.9	65.6	6.5	0.7
TOTAL	363.6	266	279	118.1
Physical Plant				
Percent owning their own space	41%	52%	25%	22%
Participant Crowding: sq. ft./participant load	64.7	122.6	22.8	9.9
Staff Crowding: sq. ft./staff hrs	222.7	255.6	37.2	30.7
Orientation to Outcome Goals				
Participants set own goals to a great extent	53%	77%	43%	82%
Sponsor voluntary alumni groups	78%	89%	18%	29%
Collect follow-up data	92%	72%	88%	58%
Generally make reports on follow-up data available	42%	31%	41%	5%
Follow-up report provided to CALDATA	25%	19%	12%	0

term course of treatment. These second lists were the basis for a *continuing methadone maintenance* (CMM) sample.

Once these lists were made, samples were chosen at random at each site, with the number chosen varying depending on the size of the provider and the extent to which the on-site listing matched the number expected based on the CADDS data for that provider. The CADDS system was relatively new and included less than one year's data, so some deviations due to the need to extrapolate the numbers expected and due to start-up bugs in procedures could be expected. At most providers a sample of approximately 31 cases was needed. Generally, at the smaller sites CALDATA took higher sampling fractions (up to the limit of choosing every eligible case), while at larger providers the fraction was lower. In a few of the larger sites, double samples (that is, about 62 cases) were taken; in one large provider which was the major provider for a multi-county area, a quadruple-sample was specified.

After these samples were chosen, CALDATA staff abstracted the records of these participants. This information had two uses: as one source of information about certain characteristics of the entire sample, and as the base on which individuals were identified and efforts to locate and interview them were begun. The field data collection period for CALDATA was approximately 9 months. The base sample was comprised of 3,055 individuals, some of which proved to be duplicates; more of them--approximately 2% of the total--were found to have been deceased since the time of discharge.

CALDATA ascertained locations for all but about 500 members of the sample during the 9 months of the data collection. Approximately 7% refused to participate in the study for various reasons; this number is commensurate with survey efforts on a wide variety of subjects and samples. Among the remainder, language problems, physical incapacitation, inaccessible locations (even by telephone), and other reasons accounted for no interviews being recorded. Some of the cases were located too late in the field period for the full set of recruitment efforts--starting with mail and telephone and moving on to more personal contact--to be undertaken. CALDATA recorded 1,859 interviews at the time data collection ceased, and the final 33 were completed too late for the paper and pencil questionnaires to be reviewed, keyed in, and added to the data analyzed in this report.

Some key characteristics of the follow-up interview sample are summarized in Table 2, which indicates the number of respondents in each modality, the total number of individuals (adjusted for multiple admissions) in that modality, whom the sample respondents represent; the percentages of actual interviews falling into various categories and the weighted percentages, that is, the percentages adjusted to reflect the differences in weights attached to each sample member as a result of the multistage probability sampling process. The weighted percentages apply to the total number of individuals represented. The differences between weighted and unweighted percentages are generally within a few percentage points.

Women comprised more than one-third of the sample (36.4%, to be precise) and the population (38.0%) in these treatment modalities, with the highest proportion in methadone

Table 2. Characteristics of the participant sample, unweighted and *weighted,* by type of treatment

Variable	Residential	Social Model	Outpatient Nonmeth	Methadone discharge	Continuing Methadone	Total Sample
Number of cases	337 *21,409*	392 *6,698*	395 *50,963*	520 *57,795*	183 *9,741*	1,826 *146,608*
All values below are percentages of the number of cases in each column						
Female	34.1 *34.7*	30.6 *29.0*	41.4 *42.4*	36.0 *35.8*	43.2 *42.5*	36.4 *38.0*
Age						
<30 yrs	36.8 *37.5*	32.4 *30.7*	45.9 *43.1*	18.3 *20.2*	10.4 *8.9*	29.9 *30.4*
30-39 yrs	42.4 *44.7*	43.4 *43.5*	33.5 *33.3*	45.4 *44.9*	50.8 *47.9*	42.4 *41.0*
>39 yrs	20.8 *17.8*	24.3 *25.8*	20.6 *23.4*	36.3 *34.9*	38.9 *43.3*	27.7 *28.6*
Ethnicity						
African Am	24.9 *34.4*	32.4 *31.7*	11.9 *10.6*	9.4 *7.8*	6.0 *5.3*	17.4 *13.6*
Hispanic	13.4 *12.8*	8.7 *9.2*	32.2 *33.3*	44.0 *46.0*	39.3 *37.5*	27.8 *34.5*
White NonH	53.7 *45.4*	53.0 *53.7*	49.5 *49.5*	39.4 *39.8*	49.7 *51.4*	48.2 *45.4*
Other	6.4 *7.4*	5.9 *5.4*	6.4 *6.6*	7.1 *6.4*	4.9 *5.8*	6.6 *6.5*
Length of Stay (months) 0-1	59.6 *56.2*	41.1 *38.9*	23.9 *22.2*	62.1 *87.1*	0.0 *0.0*	42.7 *52.0*
2-3	25.2 *24.2*	37.0 *39.6*	32.5 *32.7*	10.0 *3.8*	0.0 *0.0*	22.4 *18.2*
>3	15.1 *19.6*	21.9 *21.6*	43.6 *45.3*	27.9 *9.2*	100. *0.0*	34.9 *29.8*
Main drug at intake						
heroin	7.1 *7.0*	1.8 *1.6*	3.3 *2.9*	72.9 *73.1*	79.3 *83.2*	31.1 *30.0*
alcohol	29.4 *24.0*	35.5 *37.2*	27.4 *31.5*	0.4 *0.3*	0.0 *0.0*	19.1 *19.8*
stimulant	29.4 *33.0*	19.9 *21.2*	31.7 *26.4*	1.1 *1.5*	0.0 *0.0*	16.9 *17.4*
alc & stim	25.5 *27.6*	34.2 *31.7*	13.5 *13.3*	0.0 *0.0*	0.6 *0.2*	15.0 *15.0*

programs (about 43%), the lowest in social model programs (at about 30%). The median age of the sample was early mid-thirties, with about 30% under 30 years old and the same proportion 40 years or older. The outpatient group was the youngest, with about 45% under 30 years old, while only one in ten continuing methadone participants were that young. The ethnicity was just under half non-Hispanic white, one-third Hispanic, less than one-seventh African-American, and about one-sixteenth other ethnic categories, including Asian-American and Native American.

More than half the sample stayed in treatment less than one month, but these proportions varied dramatically by modality. These differences cannot be directly evaluated, since modalities differ in how long a typical treatment episode is meant to last, and in the case of methadone, there are two quite distinct treatment plans, short-term detoxification and long-term maintenance. The clinical procedures for individuals on maintenance and detoxification differ only subtly on a day-to-day basis. The general treatment plan and the accumulation of treatment costs and effectiveness over time mainly distinguishes them. On inspection of their pre-treatment and later profiles, individuals who began maintenance but left treatment, particularly after a short period, resembled those in detoxification much more than those who remained in long-term maintenance. We therefore reclassified and analyzed the methadone participant sample in two groups: those discharged (who were further stratified in the analysis by length of stay, with all detoxification patients falling into the "less than one month" group) and continuing (all of whom were in treatment at least 4 months at the time of the follow-up interview).

Most of the methadone cases were very short term, less than one month; but methadone involves daily visits. The other outpatient program participants stayed much longer, nearly half for longer than three months; but many outpatient programs involve visits only once per week. About one-fifth or social model and residential participants remained in treatment for longer than three months. All the continuing patients sampled were in treatment for more than three months.

Every participant reported a main drug or combination of main drugs that were the reasons for entering the sampled treatment episode. About five-sixths of the time, the main drug fell into one of four categories: heroin only, alcohol only, a stimulant drug only (crack, cocaine, or amphetamine—and although there was not much individual overlap between use of these three drugs in the sample, the behaviors of the respective groups were quite similar), or a combination of alcohol and a stimulant drug. Just under one-third of the sampled cases and represented treatment population were in treatment for heroin only, and these were largely in the methadone programs. About one-fifth were in treatment for alcohol only, another sixth for a stimulant drug, and another sixth for a combination of alcohol and a stimulant drug. The social model programs were lighter on stimulant-only participants, and the outpatient programs enrolled relatively small proportions of alcohol/cocaine combinations, but generally these partially overlapping drug problems were seen commonly in all treatment modalities except methadone.

Survey Response and Nonresponse

The CALDATA design permits a full accounting and review of response rates and assessment of the extent to which the conclusions of this report may be subject to inaccuracy or bias because of nonresponse. This analysis comprises four sections. First, we provide an assessment of overall response based on analyzing nonresponse due to two sources: a) provider noncooperation and b) participant nonresponse in cooperating providers. This section also discusses the weights, adjusted for provider and participant nonresponse, that we use in this report to make inferences about the California population of treatment participants. The second section assesses bias due to the first source of nonresponse by comparing CALDATA information on characteristics of responding providers in each modality to data collected in California by ADP for the National Drug and Alcohol Treatment Unit Survey (NDATUS) on the corresponding target population of providers. The third section assesses bias due to the second source of nonresponse by comparing characteristics of responding and nonresponding sample participants which we abstracted from the administrative records of cooperating providers. The final section summarizes our findings about the impact of nonresponse and outlines a program of further research on this topic.

Response Rates

The overall CALDATA participant response rate equals approximately 50% for the discharge sample (weighted or unweighted) and approximately 46% for the CMM sample (weighted or unweighted). In CALDATA, there were two sources of participant nonresponse:

- *Provider noncooperation.* Sample participants whose sample episodes took place in providers that did not cooperate in the survey were nonrespondents. To estimate nonresponse due to this source, we assumed CADDS undercount/overcount, ineligibles, duplicates, and changes in participant sampling rates during the field period would have had the same proportionate effects in noncooperating as in cooperating providers. We made these assumptions separately within each modality of the discharge sample and also assumed that these factors had the same proportionate effect in methadone maintenance discharge sample and the continuing methadone maintenance sample. To adjust for provider noncooperation in our analyses, we multiplied the sampling weight of each respondent (i.e., the inverse of the probability of selection) by the inverse of the weighted provider response rate in the modality.

- *Participant nonresponse in cooperating providers.* Sample participants in cooperating providers were nonrespondents either because they could not be located or because they refused to be interviewed. Participant nonresponse adjustment factors were computed at the level of individual cooperating sample providers. To adjust for participant nonresponse, we multiplied the sampling weight of each respondent in each cooperating sample provider by the inverse of the response rate within the provider.

In summary, the final nonresponse-adjusted weights of respondents as employed in our analyses were the product of a) the selection probability of the respondent, b) the provider

nonresponse adjustment factor of the modality (or CMM sample) and c) the participant nonresponse adjustment factor of the provider.

Table 3 presents response rates separately by modality. The response rates of each modality were weighted to take into account the differing probabilities of selection of sample providers and participants. Each overall response rate (third panel) is the product of a response rate based on provider cooperation (first panel) and a response rate based on participant response within cooperating providers (second panel). More detailed information on the sample design, weights, and nonresponse adjustments to the weights is given in the CALDATA Methodological Report.

Bias due to noncooperating providers

As shown in the first panel of Table 3, participant response rates based strictly on provider cooperation were greater than 90% in the residential and social model strata, greater than 75% in nonmethadone outpatient (even though 85% of the sampled providers did cooperate; the difference being attributable to the high weights of the noncooperating providers), and less than 75% in both methadone detoxification and methadone maintenance. The lower provider cooperation rate among methadone programs was due very largely to blanket noncooperation by owners of two large chains of proprietary (for-profit) methadone facilities.

To quantitatively assess the bias due to provider noncooperation, we compared survey response distributions on a number of participant and provider characteristics to corresponding distributions computed using the California subfile of the Fiscal Year 90-91 National Drug and Alcoholism Treatment Unit Survey (NDATUS). Table 4 shows the results of comparisons of three participant-level characteristics, i.e., age (less than 25, 25-34, 35 and over), sex, and ethnicity (African-American, Hispanic), and one provider-level characteristic, i.e., average weekly staff hours of physicians, psychiatrists, and registered nurses per 100 participants.

Since CALDATA modalities cannot be as precisely identified using NDATUS information as was possible with CADDS, each comparison in Table 4 is presented separately for two broad modalities that can be comparably defined using the two data sources: residential (including social model and other residential programs) and methadone (including both detoxification and maintenance programs). The results for NDATUS were based on population totals for California of 423 residential programs and 87 methadone programs. The results for CALDATA were based on samples of 38 cooperating residential programs and 20 cooperating methadone programs.

Table 4 shows that, for both residential and methadone providers, the CALDATA and NDATUS distributions of participants by age, sex, and ethnicity were broadly similar. The two data sources agree that methadone participants tended to be older than residential participants, more likely to be female (especially in CALDATA), more likely to Hispanic, and less likely to be African-American. The two data sources also lead to similar conclusions about the degree of staffing of physicians, psychiatrists, and registered nurses in the two kinds of programs. Both data sources estimate the level of staffing of these highly trained professionals to have been approximately 6-7 times higher in methadone programs than in residential programs. These

Table 3. Response Rates by modality

Indicator	Discharge sample modality:					Total Discharge sample	Total CMM sample[1]
	Residential	Social model	Outpt. Nonmet.	Meth. detox	Meth. maint.		
Panel 1. Provider cooperation							
Sample providers	19	23	27	19	18	106	18
Participants in target pop.	21,409	6,699	50,963	49,500	8,296	136,867	9,741
Cooperating Providers	18	21	23	13	12	87	12
Participants represented in cooperating providers	20,370	6,079	40,034	32,940	5,916	105,338	6,946
Response rate based on cooperating providers	95.1%	90.7%	78.6%	66.5%	71.3%	77.0%	71.3%
Panel 2. Participant response in cooperating providers							
Sample clients in cooperating providers	609	700	637	503	297	2746	309
Respondents	337	392	394	293	227	1643	183
Participants rep. by coop. providers	20,370	6,079	40,034	32,940	5,916	105,338	6,946
Participants rep. by respondents	11,648	3,389	24,389	19,057	4,528	63,010	4,231
Response rate based on participant response	57.2%	55.7%	60.9%	57.9%	76.5%	59.8%	60.9%
Panel 3. Overall nonresponse rates							
Product of rates in Panels 1 and 2	54.4%	50.5%	47.9%	38.5%	54.5%	46.0%	43.4%

Table 4. Comparisons of CALDATA and NDATUS for California programs

Variable	Statistic	Modality			
		Residential		Methadone	
		CALDATA	NDATUS	CALDATA	NDATUS
Age of participants	< 25	13%	21%	5%	7%
	25-34	51%	40%	33%	32%
	>= 35	36%	39%	62%	61%
Sex	Female	33%	28%	37%	43%
Ethnicity	African Am	34%	28%	7%	13%
	Hisp.	12%	15%	45%	37%
Av. weekly staff hrs. of physicians, psychiatrists, RN's per 100 participants		5	6	33	44

results suggest that bias in the CALDATA results due to provider noncooperation may not be severe in the residential and methadone modalities.

Bias due to participant nonresponse within cooperating providers

The second panel of Table 3 shows that the response rate based on participant nonresponse in cooperating providers equals 61% or lower in every modality with the exception of methadone maintenance discharge (76.5%). Information on detailed interview dispositions that were collected as part of the field effort indicate that more than 60% of the participant nonresponses in every modality were attributable to failure to locate the sample participant rather than to the sample participant's refusal to participate in the survey.

Table 5 presents comparisons of the characteristics of responding and nonresponding sample participants using data that were abstracted from the administrative records of cooperating providers. Panel 1 of Table 5 presents comparisons of the means of continuous variables, and Panel 2 presents comparisons of percentages. Participant abstraction records were successfully merged to data on interview dispositions for 3001 sample participants, 1821 CALDATA respondents and 1180 CALDATA nonrespondents. The total of successfully merged abstraction records is very close to the total of 3055 CALDATA sample participants. The base n's shown in parenthesis in Table 5 refer to the numbers of CALDATA respondents and nonrespondents who had nonmissing data for the administrative record variable being compared.

The main conclusion from Table 5 is that few continuous or categorical variables evidence substantial differences between respondents and nonrespondents. Even statistically significant differences, as gauged by two-sample t tests for comparisons of continuous variables (Panel 1) and chi-square tests for comparisons of percentages (Panel 2), tend to be substantively small. The large sample sizes available for most of these comparisons portend that even small differences will attain statistical significance at conventional levels.

The few differences in Table 5 that were substantively as well as statistically significant results tended to occur when there was substantial item nonresponse in one or both comparison groups. For example, the percent Hispanic was estimated to equal 37% for CALDATA unit respondents and only 30% for CALDATA unit nonrespondents. However, the item nonresponse for this variable was greater than 20% in both comparison groups, i.e., 100 x (1821 - 1319)/1821 = 28% among unit respondents and 100 x (1180 - 929)/1180 = 21% among unit nonrespondents. This suggests the difference in percent Hispanic might be due to item nonresponse bias rather than to any systematic difference between unit respondents and unit nonrespondents. The overall concordance of means and percentages between comparison groups suggests that the conclusions of this report are not severely biased by participant nonresponse within cooperating providers.

Table 5. Comparisons of sample respondents and nonrespondents using data from administrative records of cooperating providers.

Statistic	Respondents (Base n, max = 1821)	Nonrespondents (Base n, max = 1180)
Panel 1. Means of continuous variables.		
Length of sample episode (months)	2.8 (1570)	2.7 (1108)
Age at admission (years)	33.3 (1523)	33.5 (1068)
Education (1 = did not complete high school, 2 = HS grad or CED, 3 = Beyond HS)*	1.8 (1531)	1.9 (1090)
# Treatment services received	2.9 (1025)	2.8 (733)
# Medications prescribed during treatment	1.8 (1580)	1.9 (1114)
Panel 2. Percentages.		
% with physician notes at admission	48% (1585)	50% (1116)
% with physician notes at discharge	13% (1580)	12% (1115)
% with physician notes any other time	29% (1576)	29% (1114)
% with planned treatment > 25 days**	34% (1821)	35% (1183)
% with self as primary referral source	46% (1410)	46% (1015)
% with legal system as primary referral	22% (1410)	23% (1015)
% with public as primary payment source**	50% (1316)	45% (871)
% female**	38% (1585)	33% (1116)
% Black (African-American)	15% (1578)	15% (1115)
% Native American	1.5% (1578)	1.1% (1115)
% White	76% (1578)	78% (1115)
% Hispanic or Latino**	37% (1319)	30% (929)
% with psychiatric history at admission	12% (803)	12% (609)
% employed at admission**	21% (1515)	27% (1068)
% with chronic med. condition at admission**	35% (923)	31% (700)
% with cocaine as primary drug at admission**	15% (1471)	17% (1046)
% with heroin as primary drug at admission**	42% (1471)	40% (1046)
% with alcohol as primary drug at admission**	27% (1471)	29% (1046)
% who ever used needles to inject drugs**	72% (1060)	71% (707)
% with length of treatment > 25 days	58% (1576)	58% (1107)
% tested for drug or alcohol abuse during sample episode**	65% (1066)	64% (759)
% completing treatment plan before discharge**	32% (1821)	31% (1180)

Statistic	Respondents (Base n, max = 1821)	Nonrespondents (Base n, max = 1180)
% with aftercare plan stated in record	35% (1821)	35% (1180)

(Base n's in parentheses are the numbers of unit respondents and unit nonrespondents who had nonmissing data for the variable. The maxima are 1821 for respondents and 1180 for nonrespondents, the total numbers of unit respondents with matching dispositions and abstraction records.)

* Significant difference between respondents and nonrespondents based on two-sample t test, two tail, $\alpha = .05$.
** Significant difference between respondents and nonrespondents based on chi-square test of independence, $\alpha = .05$.

Summary of findings on nonresponse and recommendations for further analysis

Neither of the two analyses of this section, the analysis of provider noncooperation (Part 2) and the analysis of participant nonresponse in cooperating providers (Part 3), produced strong evidence of biases in the conclusions of this report due to nonresponse. Both the comparisons of CALDATA to NDATUS (Part 2) and the comparisons of CALDATA respondents and nonrespondents using administrative records (Part 3) suggest respondents and nonrespondents were similar in demographic characteristics. The results of Part 3 are more compelling because of the wide variety of participant characteristics, including measures of pre-treatment and within-treatment substance use and treatment services, that could be comparably measured using administrative records. We are planning additional comparisons between CALDATA and comparable data from CADDS and NDATUS, comparisons that may strengthen or modify the results on the effects of provider noncooperation presented in Part 2.

Our leading hypotheses to account for the generally small differences between respondents and nonrespondents in Part 3 are that nonresponse at the level of individual participants resulted primarily from poor-quality address and other locating information (criminal justice, hospital, social security, etc.) obtained from the provider; and the quality of locating information available from providers was largely independent of the attributes and treatment outcomes of individual participants. In future research, we plan to employ measures of the quality of locating information obtained from cooperating sample providers as independent variables in multivariate models designed to more fully explain the causes and consequences of participant nonresponse.

3 Treatment Effectiveness

Research Design, Measurement, and Statistical Methods

The following four sections evaluate the effects of treatment on drug and alcohol use, criminal activity, health and health care utilization, and sources of income, respectively. Each of these sections employs a research design commonly known as the "before-after" or "pre/post" design. The basic idea is to measure and compare the same behaviors/ characteristics of the same subjects before and after treatment.

Relative to the "independent-samples" or "repeated cross-section" design, a design in which two different samples of individuals are used to estimate the before-treatment and after-treatment distributions of characteristics, the before-after design has two major advantages:

- *Control for individual differences* The before-after design allows each subject to serve as his or her "own control." This means behaviors/characteristics which tend to be permanent or semi-permanent in the life cycles of individuals (e.g., gender, ethnicity, personal appearance, early experience and upbringing, and many aspects of character, life-style, and personality) can be eliminated as possible causes of apparent treatment effects. For example, since sample treatment participants have exactly the same distribution by ethnicity before and after treatment, i.e., the same percentages are African-American, Hispanic, Native American; we can dismiss the possibility that treatment effects are attributable to differences in ethnic composition rather than to the effects of treatment, and we can evaluate the extent to which treatment effects differ among these groups.

- *Detailed analysis of change* The before-after design offers the opportunity to analyze "gross changes" at the individual level. This means it is possible to identify the particular individuals who have changed their behaviors or characteristics between the before-treatment and after-treatment reference periods, to establish the nature of the individual changes, and to determine in what ways certain kinds of changers differ from each other and from non-changers.

Each of the following four sections uses these advantages of the before-after design. Each section begins with a "global analysis" of a variety of measures of the class of outcomes that is the focus of the section. By "global analysis," we mean an analysis of "overall" or "net" before-after differences. That is, each global analysis combines the data for all individuals and subclasses of the sample. This combining of data affords the single most powerful and discriminating test of the hypothesis of a "treatment effect," i.e., the hypothesis that drug or alcohol treatment caused a before-after change in a mean or a percentage summarizing information for the entire sample. For example, the next section tests for overall before-after

changes in the mean number of different drugs used, in the percent using heroin, and in about 20 additional measures of drug and alcohol use.

Each section then presents a series of more "detailed analyses" aimed at identifying subclasses of the sample where before-after changes were especially large or small. Each section looks successively at changes within subclasses defined by the following control variables: treatment modality (residential, social model, nonmethadone outpatient, methadone discharged, methadone continuing), length of treatment (1 month or less, 2-3 months, 4 months or more), treatment modality crossed by length of treatment, main drug at peak usage (alcohol, heroin, other), sex and age, and ethnicity and sex. The detailed analyses result in more precise characterizations of the subclasses of the treatment population where before-after changes did and did not occur and in more refined hypotheses about the nature of changes that occurred at the individual level.

The key feature of our measurement strategy in the following sections is *retrospective reporting*. This means we depended upon the retrospective recall abilities of sample respondents to measure the presence or absence and the levels of behaviors/characteristics during the before-treatment and after-treatment reference periods, e.g., whether or not the respondent used heroin and, if so, the level of usage.

In each section, the "before" measurements are retrospective reports of behaviors/characteristics during the 12 months immediately preceding the beginning of the sample treatment episode. The "after" measurements are retrospective reports of behaviors/characteristics during the interval of time between discharge from the sample episode and the CALDATA interview. The analysis of changes in criminal activity also presents statistics based on "during" measurements, i.e., retrospective reports of behaviors/ characteristics during the sample treatment episode. To enhance comparability with the before-treatment period, which always lasted exactly 12 months, we adjust estimated means for the during-treatment and after-treatment periods in the following sections to a per annum basis. In cases of behaviors or characteristics that can be assumed to be relatively rare or infrequent, we also adjust percentages to a per annum basis.

The pre-post approach was selected because it has significant methodological strengths in relation to potential sources of error; a proven track record in the evaluation of drug treatment and other types of interventions; and capability to be carried out rapidly and economically compared to other methods. The particular features of the design were shaped to deal as effectively as possible with five issues concerning potential measurement error, issues that every responsible study of behavioral change over time is required to address. These issues are as follows:

- *Recall decay* This refers to reductions in reporting of behaviors due to the respondent's difficulties in remembering events. Generally, one sees greater reductions in the reporting of earlier events, characteristics, and behaviors, i.e., those that are more distant in time from the date of reporting. The data collection procedures of CALDATA were expressly designed to

minimize potential biases due to recall decay. We sought to minimize these sources of inaccuracy by measuring highly salient behaviors/characteristics, i.e., ones likely to be remembered, and by focusing on recent time periods. For almost all sample participants, the earliest reference period i.e., the before-treatment time period, extended no more than three years into the past at the time of the CALDATA interview. For most of the critical comparisons of this report, such as the before-after comparisons of criminal activity, recall decay would tend to work in the opposite direction from the expected direction of a treatment effect. That is, based on recall decay alone, we would expect more reported criminal activity in the after-treatment period than in the before-treatment period. Conversely, based on the hypothesis of a beneficial treatment effect, we would expect *less* reported criminal activity in the after-treatment period. Whenever such measurement biases work in the opposite direction, a finding of beneficial treatment effects is strengthened rather than weakened by the possibility of recall decay. *In other words, if we could completely eliminate rather than simply minimize errors due to recall decay, our results would show treatment to be even more effective.*

- *Telescoping* This is the allocation of events, characteristics, or behaviors to an earlier or later time period than the one in which they actually occurred. We sought to minimize telescoping by designing the interview to repeatedly focus respondents' attention on the reference period of each question and to associate the beginning and end dates of reference periods with memorable events such as the beginning and end of the sample treatment episode. The general effect of telescoping is not to induce bias in one direction or another but rather to raise the overall level of "noise" in the data, making it harder to detect signals such as evidence of treatment effectiveness. *The more that telescoping affects the data, the more difficult it is to get any results, but the results one does get can be considered stronger for having risen above this level of "noise".*

- *Underreporting of sensitive behaviors* The concern here is reduction in the numbers of events, characteristics, or behaviors reported, due to reluctance of persons to reveal socially undesirable traits. We minimized underreporting by carefully selecting and training interviewers in nonjudgemental but probing interviewing techniques; by carefully explaining and repeatedly emphasizing to respondents the confidentiality and purposes of the data collection; by framing questions in ways that have previously been shown to elicit sensitive behavior most readily; and by relying most heavily on analysis of the types of items least subject to underreporting bias. For example, participants are more likely to underreport criminal behavior in the most recent few weeks than in the more distant past; therefore, we have not relied on "current" (last 30 days) criminal activity to assess this range of behavior, but on extended periods of coverage out to 12 months or longer. We know that many of the questions we asked appeared less sensitive to CALDATA respondents, who knew their status as former treatment participants, than the same items would be for participants in a general population survey. *In other studies using these methods, self-report has proven as valid as drug testing.*

- *Reversion to more typical behavior* Previous studies of treatment show that the period immediately prior to admission tends to be higher in drug and alcohol use and associated criminal behaviors relative than earlier or later periods of the same respondent's adult life; these

unusually high levels of substance abuse or other deviance are among the factors that induce respondents to enter treatment. Therefore, lower levels of criminal activity after treatment can to some extent be described to some extent as a reversion to more typical behavior patterns rather an effect of treatment as such. Studies which use short baseline and posttreatment periods, such as the day or week of admission or discharge, are especially vulnerable to these reversion effects. However, in studies which use yearlong periods, as in CALDATA, the longer recall periods smooth out these preadmission "bumps". *Where before/after differences after such smoothing are small (a few percentage points), reversion to more typical behaviors may be all that is at work--where the differences are large, reversion is a negligible issue, and the differences are more likely to be the result of the effects of treatment.*

- *Differential nonresponse* If participants with beneficial treatment effects were more likely to respond to the survey than participants without beneficial treatment effects, this pattern of nonresponse would cause the average treatment effect to be overestimated. However, our analysis of response/nonresponse using data in program records from both groups yielded little evidence of such a differential nonresponse. In fact, those with poorer rather than better outcomes were overrepresented among the respondents. Those with favorable situations were more likely than others to refuse participation in the study, preferring to leave the earlier chapters of their lives firmly closed. *So, although constraints of time and readily available locating information limited our final response rates, our review of nonresponse effects strongly argues that a higher response rate would if anything, cast a more rather than less favorable light on treatment.*

The statistical methods applied in the following four sections are standard methods that are discussed in statistics textbooks. We used paired t-tests to test the significance of before-after changes and ANOVA F-tests to test whether before-after changes differ significantly among subclasses. As discussed in the section on "Evaluation of Response and Nonresponse", the estimates of means and percentages reported in our tables were weighted to take into account the probabilities of sample selection and the response rates at the provider and participant levels.

The standard errors of means and percents that we use to test for statistical significance in the following sections were not fully adjusted to take into account complex sampling. These standard errors do take into account the decrease in precision due to unequal weighting, using an adjustment technique discussed by Potthoff and colleagues, but the standard errors do not take into account the decrease in precision due to the clustering of sample participants within sample providers. This implies the true standard errors are probably somewhat larger than reported and that the true significance levels of tests are somewhat larger than the conventional $\alpha = .05$ level. Due to the generally large sample sizes, however, the attained significance levels of significant before-after changes reported in the following are ordinarily substantially smaller than .05. Preliminary calculations of complex sampling standard errors using the technique of linear approximation suggest the decrease in sample precision due to clustering of sample participants within sample providers is not large for most of the behaviors/ characteristics measured in CALDATA.

Drug and Alcohol Use

This analysis focuses on the main "drugs of choice" in the treatment population represented here: alcohol, heroin, and the stimulant drugs cocaine powder (the hydrochloride salt of cocaine, which is water-soluble and can be injected or snorted), crack cocaine (which is crystalline or "free-base" cocaine best suited for smoking), and methamphetamine (a water-soluble form that is generally injected or taken orally). Alone and in various combinations, these were the main drugs that respondents identified as the primary reason they were going to treatment. The most prevalent "main drugs" which led the CALDATA population to seek treatment—with some of this population citing two such choices rather than one—were heroin and alcohol; about 45% named heroin and 31% alcohol. A smaller proportion, about 25%, cited a stimulant as main drug, dividing (with little overlap) among cocaine powder, crack, and amphetamine in that order. All other main drugs together accounted for about 5% of treatment admissions.

Reductions in use from before to after treatment occurred across the board in the treatment population (Table 6). The overall before/after differences held for every drug and on every measure of use. Our principal measures here were whether a drug was used five times or more during the period, which we call *prevalence*; the number of days used in the month of greatest use (which we call *peak density*), and *percentage of months* in which a drug was used during the period.

There were more five-times-or-more users of alcohol (70%) before treatment than of heroin (42%) or any of the stimulant drugs (20-40%). There was a uniform rate of reduction by one-half in the use of each type of stimulant drug after treatment. Alcohol prevalence declined by about one-third and heroin by one-fourth. When the total number of different types of drugs (up to 13 types) used five times or more was summed up, there was a before/after reduction of about two-fifths in the number used--from an average of 2.8 to 1.6 types.

On the measure of peak density of use (number of days the drug was used during the month of highest use), alcohol and heroin had higher peak densities before treatment, at 40% and 30% of days used in the peak month, while stimulants were at 10-18%. The peak stimulant densities were all reduced by about one-half, with very similar reductions across the three types; alcohol was reduced by somewhat less than one-half and heroin by one-third. The same order of initial levels obtained for the percentage of months using alcohol (60%), heroin (40)%, and stimulants (25-35%) before treatment. But on this measure the order of reductions was scrambled, with methamphetamine least reduced (off by one-fifth), alcohol most reduced (off by one-third), with heroin in between.

When we focused on the main drug (the primary reason for treatment) identified by the individual instead of all drugs he or she may have used, the peak density and average percentage of months yielded nearly identical before/after reductions of two-fifths, which was also virtually identical with the reduction in prevalence of different drug types.

There were clear differences among modalities in their effectiveness with respect to alcohol and drug use (Tables 7-9). The residential modalities generally had greater effects, and these effects increased with the length of stay. The outpatient nonmethadone programs were less effective, and length of stay effects were inconsistent. The methadone discharge participants were least affected, although more so with longer lengths of stay. The continuing methadone patients, those whose "after" treatment period was actually the last 12 months of treatment, were affected most strongly in terms of their reduced density of heroin use, down by two-thirds; in other respects they resembled methadone discharge patients. Overall, heroin use, represented about 85% of the time by methadone patients, was affected less by treatment than alcohol and stimulant drugs (the main component of "other" main drugs), generally being cut by about one-third versus about one-half for the others.

The differences among age, ethnic, and age categories were small (except for the "other ethnicity" category, which was, however, represented by too few cases to be statistically reliable, and generally follows the pattern of Hispanic nonwhites). Close inspection of these small differences within modalities (table not included here) showed that all significant differences vanish when the before-after changes in alcohol and drug use were controlled for the tendency of Hispanics and older participants to be heroin users in methadone programs.

Criminal Activity

Treatment can effect the prevalence and incidence of criminal activity in at least two ways. Treatment can directly effect criminal activity by providing new reference groups and new moral and ethical standards to substitute for reference groups and standards that helped to engender criminal activities in the past. Treatment can indirectly effect criminal activity by reducing the economic motivations for crime. For example, to the extent that treatment reduces drug and alcohol use, it may also reduce crimes committed to obtain money to buy drugs or alcohol.

Table 10 compares self-reported levels of criminal activity of CALDATA sample participants before, during, and after the CALDATA sample treatment episode. The comparisons are presented using each of fourteen different measures of self-reported criminal activity. The "before" measurement pertains to the 12 months preceding the sample treatment episode (i.e., segment 1), the "during" measurement to the sample treatment episode (i.e., segment 2), and the "after" measurement to the interval between discharge from the sample episode and the CALDATA interview (i.e., segment 3). To enhance comparability with segment 1 (12 months), the segment 2 and segment 3 means and percentages were adjusted to a per annum basis.

For example, the first row of Table 10 shows that the annualized average number of times participants sold or helped to sell drugs declined from 28.0 in segment 1 to 10.8 in segment 2 and 7.1 in segment 3. Also shown in Table 10 are the estimated percent changes between segment 1 and segment 2 (during vs. before) and between segment 1 and segment 3 (after vs. before).

Table 6. Drug use before and after treatment

INDICATOR	MEAN OR PERCENT (BASE N)		PERCENT CHANGE
	BEFORE (Pop. = 146,515)	AFTER (Pop. = 146,515)	
Prevalence—percentage using			
crack	29.1% (1748)	15.8% (1658)	-45.7%*
cocaine powder	40.4% (1753)	21.6% (1664)	-46.5%*
heroin	42.4% (1755)	32.7% (1659)	-22.9%*
amphetamines	21.8% (1752)	11.2% (1663)	-48.6%*
alcohol	70.9% (1745)	49.9% (1644)	-29.6%*
Peak Density—percentage of days[1]			
crack	14.5% (1748)	7.0% (1658)	-51.7%*
cocaine powder	18.1% (1753)	9.1% (1664)	-49.7%*
heroin	30.0% (1755)	20.1% (1659)	-33.0%*
amphetamine	10.2% (1752)	4.4 % (1663)	-56.9%*
alcohol	40.1%(1745)	22.2% (1644)	-44.6%*
Percentage of months[2]			
crack	29.7% (1738)	21.6% (1826)	-27.3%*
cocaine powder	34.9% (1739)	23.7% (1826)	-32.1%*
heroin use	40.5% (1751)	30.0% (1826)	-25.9%*
amphetamine	24.6% (1745)	20.0% (1826)	-18.7%*
alcohol	60.1% (1739)	38.8% (1826)	-35.4%*
Multidrug prevalence—number of drugs used (0-13)	**2.8 (1826)**	**1.6 (1826)**	**-42.9%***
Main drug peak density[3]	**63.8% (1754)**	**36.5% (1686)**	**-42.8%***
Main drug percentage of months[3]	**77.2% (1750)**	**45.5% (1826)**	**-41.1%***
Peak daily drinking (0-3)	**1.0 (1826)**	**0.5 (1826)**	**-50.0%***

* Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

[1] Percent of days drug was used during the month of peak usage.

[2] Percent of months drug was used during the segment.

[3] "Main drug" is based on the drug(s) reported as "reasons the participant entered treatment": alcohol (19%), alcohol and heroin (2%), alcohol and stimulant (15%), alcohol, heroin, and stimulant (2%), heroin (31%), heroin and stimulant (8%), stimulant (17%), or other drug or combination (5.5%).

Table 7. Peak density (mean number of drugs used, range 0-13) before and after treatment, for selected subclasses.

CONTROL VAR(S)	SUBCLASS	MEAN NUMBER OF DRUGS (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Resid.	3.1 (337)	1.4 (337)	-55%*	21,409
	Soc. Model	2.8 (392)	1.3 (392)	-54%*	6,698
	Nonmeth Outp	2.4 (394)	1.3 (394)	-46%*	50.963
	Methadone	3.1 (520)	2.1 (520)	-32%*	57,796
	MM continuing	2.7 (183)	1.7 (183)	-37%*	9,741
Length of treatment**	1 mo. or less	2.9 (779)	1.8 (779)	-38%*	76,168
	2-3 mos.	2.7 (410)	1.4 (410)	-48%*	26,688
	4 mos. or more	2.7 (637)	1.4 (637)	-48%*	43,751
Modality and length of treatment**	Resid.: 0-1	3.1 (201)	1.6 (201)	-48%*	12,022
	Resid.: 2-3	2.9 (85)	1.4 (85)	-52%*	5,188
	Resid.: 4-	3.1 (51)	0.9 (51)	-71%*	4,200
	Soc.Mod.: 0-1	2.6 (161)	1.5 (161)	-42%*	2,604
	Soc.Mod.: 2-3	2.8 (145)	1.2 (145)	-57%*	2,649
	Soc.Mod.: 4-	3.1 (86)	1.1 (86)	-65%*	1,445
	NM Out: 0-1	2.5 (94)	1.6 (94)	-36%*	11,220
	NM Out: 2-3	2.4 (128)	1.6 (128)	-33%*	16,682
	NM Out: 4-	2.3 (172)	1.0 (172)	-57%*	23,061
	Meth.: 0-1	3.1 (323)	2.2 (323)	-29%*	50,322
	Meth.: 2-3	3.1 (52)	1.8 (52)	-42%*	2,170
	Meth.: 4-	3.2 (145)	2.0 (145)	-38%*	5,304
	MM cont.: 4-	2.7 (183)	1.7 (183)	-37%*	9,741
Main drug at peak usage**	alcohol	2.8 (699)	1.3 (699)	-54%*	44,705
	heroin	3.0 (719)	2.0 (719)	-33%*	67,234
	other	2.5 (408)	1.3 (408)	-48%*	34,668

Sex and Age**	Fem. < 30	2.9 (223)	1.6 (223)	-45%*	19,727
	Fem. 30-39	2.5 (306)	1.5 (306)	-40%*	23,876
	Fem. > 39	1.9 (135)	1.2 (135)	-37%*	12,158
	Male < 30	3.3 (323)	1.8 (323)	-45%*	24,821
	Male 30-39	3.0 (468)	1.6 (468)	-47%*	36,227
	Male > 39	2.6 (371)	1.6 (371)	-38%*	29,797
Ethnicity and sex**	Af. Am. fem.	2.5 (116)	1.5 (116)	-40%*	6,979
	Af. Am. male	3.0 (202)	1.5 (202)	-50%*	12,918
	W. Hisp. fem.	2.4 (157)	1.6 (157)	-33%*	16,020
	W. Hisp. male	2.9 (350)	1.7 (350)	-41%*	34,576
	W. non-H. f.	2.6 (345)	1.4 (345)	-46%*	29,239
	W. non-H. m.	3.1 (535)	1.6 (535)	-48%*	37,294
	Other fem.	2.3 (46)	1.7 (46)	-26%	3,522
	Other male	2.7 (75)	1.6 (75)	-41%*	6,057

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 8. Peak density of main drug before and after treatment for selected subclasses.

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N) BEFORE	PERCENT (BASE N) AFTER	PERCENT CHANGE	EST. POP. BASE
Treatment modality**	Resid.	65.2% (320)	32.0% (309)	-51%*	21,409
	Soc. Model	67.8% (376)	30.2% (365)	-55%*	6,698
	Nonmeth Outp	47.2% (379)	27.1% (360)	-43%*	50,963
	Methadone	73.8% (504)	58.6% (452)	-21%*	57,796
	MM continuing	63.6% (175)	20.8% (179)	-67%*	9,741
Length of treatment**	1 mo. or less	67.6% (741)	46.2% (706)	-34%*	76,168
	2-3 mos.	61.2% (396)	34.0% (373)	-44%*	26,688
	4 mos. or more	61.1% (617)	26.6% (586)	-56%*	43,751
Modality and length of treatment**	Resid.: 0-1	65.4% (190)	35.0% (182)	-46%*	12,022
	Resid.: 2-3	64.2% (83)	31.1% (80)	-52%*	5,188
	Resid.: 4-	66.5% (47)	24.8% (47)	-63%*	4,200
	Soc.Mod.: 0-1	66.2% (152)	36.0% (148)	-46%*	2,604
	Soc.Mod.: 2-3	67.5% (139)	30.4% (132)	-55%*	2,649
	Soc.Mod.: 4-	71.3% (85)	20.6% (85)	-71%*	1,446
	NM Out: 0-1	52.5% (89)	33.8% (85)	-36%*	11,220
	NM Out: 2-3	47.6% (122)	30.6% (119)	-36%*	16,682
	NM Out: 4-	44.5% (168)	21.4% (156)	-52%*	23,061
	Meth.: 0-1	73.7% (310)	60.4% (291)	-18%*	50,322
	Meth.: 2-3	74.1% (52)	63.2% (42)	-15%*	2,170
	Meth.: 4-	74.0% (142)	51.3% (119)	-31%*	5,304
	MM cont.: 4-	63.6% (175)	20.8% (179)	-67%*	9,741
Main drug at peak usage**	alcohol	66.2% (672)	33.0% (652)	-50%*	44,705
	heroin	71.8% (685)	49.1% (640)	-32%*	67,234
	other	47.5% (397)	22.6% (373)	-52%*	34,668

Sex and Age	Fem. < 30	62.7% (216)	35.0% (206)	-44%*	19,727
	Fem. 30-39	64.7% (294)	38.1% (292)	-41%*	23,876
	Fem. > 39	57.7% (131)	29.8% (130)	-48%*	12,158
	Male < 30	62.3% (313)	36.2% (292)	-42%*	24,821
	Male 30-39	65.0% (444)	34.9% (413)	-46%*	36,227
	Male > 39	65.9% (356)	40.9% (332)	-38%*	29,797
Ethnicity and sex**	Af. Am. fem.	63.4% (113)	33.5% (112)	-47%*	6,979
	Af. Am. male	60.4% (198)	33.6% (178)	-44%*	12,918
	W. Hisp. fem.	60.2% (152)	41.9% (142)	-30%*	16,020
	W. Hisp. male	63.1% (329)	39.9% (303)	-37%*	34,576
	W. non-H. f.	63.0% (333)	33.4% (331)	-47%*	29,239
	W. non-H. m.	67.6% (514)	37.1% (486)	-45%*	37,294
	Other fem.	65.6% (43)	33.8% (43)	-48%*	3,522
	Other male	62.7% (72)	35.1% (70)	-44%*	6,057

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 9. Percentage of months main drug was used during segment, for selected subclasses.

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N) BEFORE	PERCENT (BASE N) AFTER	PERCENT CHANGE	EST. POP. BASE
Treatment modality**	Resid.	81.3% (321)	39.2% (337)	-52%*	21,409
	Soc. Model	82.3% (374)	44.9% (392)	-45%*	6,698
	Nonmeth Outp	67.9% (379)	42.5% (394)	-25%*	50,963
	Methadone	80.2% (502)	53.2% (520)	-34%*	57,796
	MM continuing	70.6% (174)	44.4% (183)	-37%*	9,741
Length of treatment**	1 mo. or less	79.0% (741)	50.6% (779)	-36%*	76,168
	2-3 mos.	78.0% (394)	42.8% (410)	-35%*	26,688
	4 mos. or more	74.4% (615)	41.1% (637)	-45%*	43,751
Modality and length of treatment**	Resid.: 0-1	81.7% (191)	43.1% (201)	-47%	12,022
	Resid.: 2-3	78.2% (83)	37.0% (85)	-53%	5,188
	Resid.: 4-	84.4% (47)	31.0% (51)	-63%	4,200
	Soc.Mod.: 0-1	81.8% (151)	52.7% (161)	-36%	2,604
	Soc.Mod.: 2-3	82.7% (139)	40.1% (145)	-52%	2,649
	Soc.Mod.: 4-	82.3% (84)	39.8% (86)	-52%	1,446
	NM Out: 0-1	72.5% (90)	40.4% (94)	-44%	11,220
	NM Out: 2-3	71.2% (121)	47.1% (128)	-34%	16,682
	NM Out: 4-	63.4% (168)	40.1% (172)	-37%	23,061
	Meth.: 0-1	77.9% (309)	57.0% (323)	-27%	50,322
	Meth.: 2-3	81.7% (51)	48.8% (52)	-40%	2,170
	Meth.: 4-	85.8% (142)	44.7% (145)	-48%	5,303
	MM cont.: 4-	70.6% (174)	44.4% (183)	-37%	9,741
Main drug at peak usage**	alcohol	83.3% (672)	46.3% (699)	-44%*	44,705
	heroin	77.9% (682)	50.0% (719)	-36%*	67,234
	other	65.7% (396)	37.0% (408)	-44%*	34,668

Sex and Age**	Fem. < 30	80.7% (216)	45.6% (223)	-43%*	19,727
	Fem. 30-39	75.2% (294)	42.0% (306)	-44%*	23,876
	Fem. > 39	71.1% (132)	45.1% (135)	-37%*	12,158
	Male < 30	76.9% (311)	44.7% (323)	-42%*	24,821
	Male 30-39	78.2% (443)	42.7% (468)	-45%*	36,227
	Male > 39	77.7% (354)	52.8% (371)	-32%*	29,797
Ethnicity and sex	Af. Am. fem.	80.1% (113)	49.0% (116)	-39%*	6,979
	Af. Am. male	77.6% (196)	44.1% (202)	-43%*	12,918
	W. Hisp. fem.	71.8% (152)	43.3% (157)	-40%*	16,020
	W. Hisp. male	78.6% (326)	49.1% (350)	-35%*	34,576
	W. non-H. f.	77.1% (334)	42.4% (345)	-45%*	29,239
	W. non-H. m.	78.0% (514)	46.3% (535)	-41%*	37,294
	Other fem.	74.2% (43)	43.2% (46)	-42%*	3,522
	Other male	72.1% (72)	41.1% (75)	-43%*	6,057

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 10 suggests two conclusions:

- Reported criminal activity declined between segment 1 (before) and segment 2 (during) for 8 of 13 measures of criminal activity. (One of the 14 indicators in Table 10, namely the percent arrested or taken into custody," was not measured in segment 2.) Four measures evidenced declines that were both substantively large and statistically significant: mean number of times sold or helped to sell drugs (-61%), mean number of times used weapon/physical force (-71%), percent committing any illegal activity (-20%), and mean months involved in criminal activity (-77%).

- Regardless of the measure used, the lowest level of criminal activity was reported for segment 3. Percent changes between segment 1 and segment 3 range between -33% and -93%. With one exception, these declines in criminal activity were statistically significant based on a two-tail paired-t test with significance level $\alpha = .05$.

The finding that self-reported levels of criminal activity were generally lower during and after treatment than before treatment is consistent with the hypothesis of a beneficial treatment effect. There are at least three other possible explanations for this pattern of results:

- *Reversion to more typical behavior* Segment 1, the 12-month period before the participant enters treatment, may have been high in substance use and other deviant behaviors relative to earlier periods of the same participant's adult life. This is because high levels of deviance were necessary to induce the participant to enter treatment. If so, lower levels of deviance in segments 2 and 3 could represent a reversion to typical behavior patterns rather a treatment effect.

- *Underreporting of deviant behavior in segment 3* Some participants may have been more likely to underreport deviant behaviors that occurred in the recent past. This may have been especially true of recent crimes that have so far escaped detection or prosecution.

- *Non-ignorable nonresponse* is termed "non-ignorable" when nonrespondents differ from respondents in ways that affect the results of an analysis. For example, sample participants with beneficial treatment effects may have been more likely to respond to the survey than participants without beneficial treatment effects. This might have happened either because participants who had more beneficial treatment effects were less likely to move, hence more likely to be located by interviewers, than participants with less beneficial treatment effects or because participants with more beneficial treatment effects were more willing to be interviewed once they are located. Such a pattern of nonresponse would cause the average treatment effect to be overestimated.

To investigate these different explanations, we looked at changes in three indicators of criminal activity within subclasses. Tables 11, 12, and 13 present the results of the analyses of change within subclasses. Table 11 shows changes (before vs. after) within subclasses in the percent who engaged in criminal activity, Table 12 shows changes within subclasses in the percent who sold or helped to sell drugs, and Table 13 shows changes within subclasses in the

Table 10. Criminal activity before, during, and after treatment[1]

INDICATOR	PER ANNUM MEAN OR PERCENT (BASE N)			PERCENT CHANGE	
	BEFORE (POP. = 146,515)	DURING[2] (POP. = 80,399)	AFTER (POP. = 146,515)	DURING - BEFORE	AFTER - BEFORE
Number of times[3]					
sold or helped to sell drugs	28.0 (1723)	10.8 (983)	7.1 (1666)	-61.4%*	-74.6%*
had sex for money or drugs	5.9 (1745)	5.4 (984)	2.9 (1669)	- 8.5%	-50.8%*
broke into houseorvehicle	1.5 (1750)	1.0 (984)	1.0 (1668)	-33.3%	-33.3%*
used weapon/physical force	0.7 (1749)	0.2 (984)	0.05 (1673)	-71.4%*	-92.9%*
Percentage who					
sold or helped to sell drugs	30.0% (1723)	25.7% (983)	9.5% (1666)	-14.3%	-68.3%*
had sex for money or drugs	10.5% (1745)	10.8% (984)	4.9% (1669)	2.9%	-53.3%*
broke into house or vehicle	7.8% (1750)	7.6% (984)	3.0% (1668)	- 2.6%	-61.5%*
used weapon/ physical force	4.7% (1749)	6.6% (984)	1.2% (1673)	40.4%	-74.5%*
Mean number of above crimes committed (0-4)	**0.5 (1753)**	**0.5 (985)**	**0.2 (1673)**	**0.0%**	**-60.0%***
Percentage committing any illegal activity	**73.6% (1761)**	**59.1% (1006)**	**20.3% (1684)**	**-19.7%***	**-72.4%***
Percentage arrested or taken into custody	**33.2% (1745)**	**NA**	**13.1% (1683)**	**NA**	**-60.5%***
Mean months involved in illegal activity (0-12 months)	**5.6 (1708)**	**1.3 (1001)**	**1.1 (1667)**	**-76.8%***	**-80.4%***

1. Means and percents are adjusted to a per annum basis for each segment.
2. Measurements for Segment 2 (i.e., during treatment) were restricted to persons who were in treatment for one month or longer.
3. Respondents who reported having committed more than 100 such acts during the reference period were assumed to have committed 200 such acts.

*Statistically significant change based on two-tail paired t-test, $\alpha = .05$.

percent who were arrested/booked or taken into custody. Each table presents changes within subclasses defined by each of five control variables: treatment modality, length of treatment, main drug at peak usage, sex-age, and ethnicity-sex.

The following conclusions seem to follow from each of Tables 11, 12, and 13:

- *Treatment modality* Regardless of modality, reductions in criminal activity between segment 1 and segment 3 were substantial and statistically significant. Reductions were largest among discharged participants of social model recovery programs and smallest among discharged participants of methadone programs.

- *Length of treatment* The magnitude of the treatment effect, as gauged by percent reduction in criminal activity, increased with the length of time spent in treatment.

- *Main drug at peak usage* The percent reduction in criminal activity was larger for participants whose main drug was alcohol than for participants whose main drug was heroin.

- *Sex and age* Levels of criminal activity were higher among male participants than among female participants and higher among younger participants than among older participants. The percent decline in criminal activity between segment 1 and segment 3 does not vary substantially by age and sex.

- *Ethnicity and sex* The percent decline in criminal activity was roughly equal among the major ethnicity-sex groups. There was a suggestion that white Hispanic males experienced larger percent declines than white Hispanic females.

Table 11. Criminal activity before and after treatment for selected subclasses[1]

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N) BEFORE	PERCENT (BASE N) AFTER	PERCENT CHANGE	EST. POP. BASE
Treatment modality**	Methadone	78.9% (505)	31.0% (452)	-61%*	57,796
	Resid.	75.7% (323)	19.9% (313)	-74%*	21,409
	Nonmeth Outp	61.0% (380)	16.4% (367)	-73%*	50.963
	Soc. Model	76.2% (378)	15.2% (369)	-80%*	6,698
	MM continuing	78.9% (175)	12.6% (183)	-84%*	9,741
Length of treatment**	1 mo. or less	76.3% (748)	26.3% (721)	-66%*	76,168
	2-3 mos.	70.4% (396)	19.3% (377)	-73%*	26,688
	4 mos. or more	72.4% (617)	13.5% (586)	-81%*	43,751
Modality and length of treatment**	Meth.: 0-1	79.0% (311)	32.1% (297)	-59%*	50,322
	Meth.: 2-3	87.9% (52)	44.4% (41)	-49%*	2,169
	Meth.: 4-	74.6% (142)	21.9% (114)	-71%*	5,303
	Resid.: 0-1	73.0% (193)	22.0% (186)	-70%*	12,022
	Resid.: 2-3	77.8% (83)	18.6% (81)	-76%*	5,187
	Resid.: 4-	80.8% (47)	15.5% (46)	-81%*	4,199
	NM Out: 0-1	75.3% (90)	18.8% (88)	-75%*	11,220
	NM Out: 2-3	55.1% (122)	20.7% (120)	-62%*	16,681
	NM Out: 4-	58.4% (168)	12.1% (159)	-79%*	23,061
	Soc.Mod.: 0-1	75.4% (154)	23.6% (150)	-69%*	2,604
	Soc.Mod.: 2-3	73.9% (139)	11.6% (135)	-84%*	2,649
	Soc.Mod.: 4-	81.8% (85)	7.2% (84)	-91%*	1,446
	MM cont.: 4-	78.9% (175)	12.6% (183)	-84%*	9,741
Main drug at peak usage**	alcohol	72.1% (677)	16.6% (662)	-77%*	44,705
	heroin	79.2% (686)	27.0% (642)	-66%*	67,234
	other	67.3% (398)	16.1% (380)	-76%*	34,668

Sex and Age	Fem. < 30	74.1% (217)	19.3% (209)	-74%*	19,727
	Fem. 30-39	72.0% (294)	27.5% (291)	-62%*	23,876
	Fem. > 39	56.2% (133)	12.1% (133)	-78%*	12,158
	Male < 30	82.6% (313)	26.6% (300)	-68%*	24,821
	Male 30-39	75.7% (446)	17.3% (411)	-77%*	36,227
	Male > 39	70.6% (358)	15.9% (340)	-77%*	29,797
Ethnicity and sex**	Af. Am. fem.	74.1% (114)	20.7% (111)	-72%*	6,979
	Af. Am. male	70.3% (198)	19.1% (176)	-73%*	12,918
	W. Hisp. fem.	66.0% (152)	25.5% (143)	-61%*	16,020
	W. Hisp. male	74.9% (329)	18.6% (309)	-75%*	34,576
	W. non-H. f.	70.0% (334)	18.4% (334)	-74%*	29,239
	W. non-H. m.	79.6% (518)	19.9% (493)	-75%*	37,294
	Other fem.	66.3% (44)	34.5% (45)	-48%*	3,522
	Other male	73.2% (72)	21.9% (73)	-70%*	6,057

1. Percents adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 12. Percent who sold or helped sell drugs before and after treatment for selected subclasses.[1]

CONTROL VARS	SUBCLASS	PERCENT (BASE N) BEFORE	PERCENT (BASE N) AFTER	PERCENT CHANGE	EST. POP. BASE
Treatment modality**	Methadone	31.7% (495)	14.2% (445)	-55%*	57,796
	Resid.	35.1% (319)	9.0% (310)	-74%*	21,409
	Nonmeth Outp	19.9% (371)	8.6% (363)	-57%*	50.963
	Soc. Model	32.9% (369)	7.5% (366)	-77%*	6,698
	MM continuing	33.3% (169)	4.8% (182)	-86%*	9,741
Length of treatment**	1 mo. or less	29.8% (729)	12.9% (712)	-57%*	76,168
	2-3 mos.	28.4% (389)	7.8% (374)	-73%*	26,688
	4 mos. or more	31.3% (605)	6.5% (580)	-79%*	43,751
Modality and length of treatment**	Meth.: 0-1	33.0% (306)	16.8% (293)	-49%*	50,322
	Meth.: 2-3	26.2% (51)	8.9% (41)	-66%*	2,170
	Meth.: 4-	30.3% (138)	7.8% (111)	-74%*	5,304
	Resid.: 0-1	31.3% (190)	10.7% (183)	-66%*	12,022
	Resid.: 2-3	40.8% (82)	6.3% (81)	-85%*	5,187
	Resid.: 4-	38.7% (47)	7.8% (46)	-80%*	4,200
	NM Out: 0-1	15.2% (85)	9.4% (87)	-38%	11,220
	NM Out: 2-3	18.6% (120)	9.9% (119)	-47%*	16,682
	NM Out: 4-	22.9% (166)	7.3% (157)	-68%*	23,061
	Soc.Mod.: 0-1	29.4% (148)	9.5% (149)	-68%*	2,604
	Soc.Mod.: 2-3	30.9% (136)	6.5% (133)	-79%*	2,649
	Soc.Mod.: 4-	42.1% (85)	6.1% (84)	-86%*	1,445
	MM cont.: 0-1	33.2% (169)	4.8% (182)	-86%*	9,741
Main drug at peak usage**	alcohol	25.6% (665)	7.7% (659)	-70%*	44,705
	heroin	32.5% (672)	12.2% (636)	-62%*	67,234
	other	33.5% (386)	8.6% (371)	-74%*	34,668

Sex and Age**	Fem. < 30	32.6% (213)	7.2% (205)	-78%*	19,727
	Fem. 30-39	25.7% (287)	9.9% (288)	-61%*	23,876
	Fem. > 39	16.1% (131)	4.1% (133)	-75%*	12,158
	Male < 30	41.3% (303)	15.7% (295)	-62%*	24,821
	Male 30-39	30.9% (436)	7.7% (407)	-75%*	36,227
	Male > 39	26.5% (353)	9.7% (338)	-63%*	29,797
Ethnicity and sex	Af. Am. fem.	23.9% (114)	5.8% (110)	-76%*	6,979
	Af. Am. male	37.1% (196)	11.8% (176)	-68%*	12,918
	W. Hisp. fem.	22.8% (150)	8.8% (141)	-61%*	16,020
	W. Hisp. male	31.5% (321)	9.3% (306)	-70%*	34,576
	W. non-H. f.	28.5% (325)	7.4% (331)	-74%*	29,239
	W. non-H. m.	32.2% (503)	11.1% (485)	-65%*	37,294
	Other fem.	23.8% (42)	12.3% (44)	-48%	3,522
	Other male	23.5% (72)	10.4% (73)	-56%*	6,057

1. Percents adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 13. Percent arrested/booked or taken into custody before and after treatment for selected subclasses[1]

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Resid.	39.3% (320)	12.6% (313)	-68%*	21,409
	Soc. Model	34.2% (373)	11.2% (369)	-67%*	6,698
	Nonmeth Outp	28.5% (379)	9.8% (367)	-66%*	50.963
	Methadone	33.9% (502)	20.9% (452)	-38%*	57,796
	MM continuing	27.3% (171)	4.8% (182)	-82%*	9,741
Length of treatment**	1 mo. or less	34.4% (738)	17.9% (721)	-48%*	76,168
	2-3 mos.	35.9% (395)	12.9% (377)	-64%*	26,688
	4 mos. or more	27.8% (612)	7.2% (585)	-74%*	43,751
Modality and length of treatment**	Resid.: 0-1	35.3% (190)	12.4% (186)	-65%*	12,022
	Resid.: 2-3	45.2% (83)	11.9% (81)	-56%*	5,187
	Resid.: 4-	43.4% (47)	14.2% (46)	-67%*	4,199
	Soc.Mod.: 0-1	34.9% (151)	19.8% (150)	-43%*	2,604
	Soc.Mod.: 2-3	36.4% (138)	7.7% (135)	-79%*	2,649
	Soc.Mod.: 4-	29.0% (84)	2.8% (84)	-90%*	1,445
	NM Out: 0-1	35.0% (89)	13.2% (88)	-62%*	11,220
	NM Out: 2-3	24.5% (122)	13.3% (120)	-46%	16,681
	NM Out: 4-	28.2% (168)	5.5% (159)	-80%*	23,061
	Meth.: 0-1	33.5% (308)	21.5% (297)	-36%*	50.322
	Meth.: 2-3	48.8% (52)	32.9% (41)	-32%	2,170
	Meth.: 4-	28.6% (142)	13.6% (114)	-52%*	5,303
	MM cont.: 4-	27.3% (171)	4.8% (182)	-82%*	9,741
Main drug at peak usage**	alcohol	33.7% (670)	10.0% (662)	-70%*	44,705
	heroin	34.1% (678)	17.1% (641)	-50%*	67,234
	other	30.9% (397)	12.1% (380)	-61%*	34,668

Sex and Age**	Fem. < 30	33.0% (216)	13.6% (209)	-59%*	19,727
	Fem. 30-39	31.9% (292)	13.3% (291)	-58%*	23,876
	Fem. > 39	12.2% (132)	8.6% (133)	-30%	12,158
	Male < 30	46.2% (309)	18.9% (300)	-59%*	24,821
	Male 30-39	37.5% (445)	12.0% (411)	-68%*	36,227
	Male > 39	25.4% (351)	10.4% (339)	-59%*	29,797
Ethnicity and sex	Af. Am. fem.	28.8% (113)	8.6% (111)	-70%*	6,979
	Af. Am. male	34.6% (196)	14.0% (176)	-60%*	12,918
	W. Hisp. fem.	26.5% (152)	16.3% (143)	-38%*	16,020
	W. Hisp. male	30.0% (328)	11.1% (309)	-63%*	34,576
	W. non-H. f.	28.6% (331)	11.5% (334)	-60%*	29,239
	W. non-H. m.	40.5% (511)	15.0% (492)	-63%*	37,294
	Other fem.	28.2% (44)	16.8% (45)	-40%	3,522
	Other male	40.5% (70)	12.3% (73)	-70%*	6,057

1. Percents adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Health and Health Care Utilization

Table 14 presents before-after comparisons of eight indicators of respondents' health and health care utilization. The eight measures were

1) mean self-reported health (1 = poor, ..., 4 = excellent);
2) percentage hospitalized for physical health;
3) percentage hospitalized for drug overdose;
4) percentage hospitalized for mental health;
5) mean number of doctor visits;
6) mean number of emergency room visits;
7) mean number of hospital days; and
8) mean number of mental health visits.

To enhance comparability between the before-treatment and after-treatment reference periods, the last four indicators were adjusted to a per annum basis for each reference period being compared.

The first seven of the eight health indicators presented in Table 14 evidenced statistically significant before-after changes based on paired t-tests (two tail, $\alpha = .05$). The single indicator with no significant before-after change was the mean number of mental health visits.

Without exception, the seven significant changes in Table 14 were consistent with the hypotheses that treatment improved health and reduced health care utilization. Mean self-reported health (1 = poor, ..., 4 = excellent) increased from 2.4 to 2.8, a 17 percent increase. The percentages hospitalized for physical health, drug overdose, and mental health declined from 15.9%, 6.4%, and 8.6% in the pre-treatment reference period to 10.2%, 2.7%, and 4.8% in the post-treatment reference period, declines of 36%, 58%, and 44%, respectively. The mean number of hospital days per annum declined from 1.2 to 0.9, a 25 percent decline.

Tables 15-18 present more detailed analyses of before-after trends in four health indicators: percent hospitalized for any reason (combining data from the three measures of hospitalization prevalence in Table 14), mean self-reported health, mean number of medical visits (combining data from the three measures of the incidence of medical visits in Table 14), and mean number of hospital days, respectively. Each detailed analysis compares the directions and magnitudes of before-after changes across subclasses of six control variables: modality, length of treatment, modality crossed by length of treatment, main drug at peak usage, sex crossed by age, and ethnicity crossed by sex.

The main conclusion from Tables 15-18 is that increases in health and reductions in health care utilization associated with treatment were not restricted to any particular modality of treatment, length of treatment, category of drug user, or demographic category. The same patterns of improved health and reduced health care utilization appeared in essentially every subclass of every control variable. For example, Table 15 shows that the percent hospitalized

declined by at least 38% in every treatment modality (first panel), by at least 24% in every subclass of length of treatment (second panel), by at least 34% in every subclass of main drug at peak usage (fourth panel), and by at least 25% in every sex-age category (fifth panel).

Those few subclasses in Tables 15-18 with small changes relative to other subclasses tended to have too few sample cases for precise inference (e.g., "other females" in the sixth panel of Table 15. The overall number of such anomalous subclasses was no greater than might be expected to occur by chance in carrying out a large number of statistical tests.

There are few suggestions in Tables 15-18 that the magnitudes of health improvements and reductions in health care utilization associated with treatment varied by subclass. Such variations in the effect of treatment, when they occurred, were not consistent across indicators. For example, the first panels of Tables 17 and 18 suggest residential and social model participants experienced smaller percent reductions in mean medical visits (-14.9% and -3.1%, respectively) and in mean hospital days (-19.6% and -9.2%, respectively) than participants in most other modalities. Yet, as shown in Table 16, residential and social model participants also experienced larger increases in mean self-reported health (+20.9% and +26.5%, respectively) than participants in other modalities. Each of these subclass differences was statistically significant based on ANOVA F tests ($\alpha = .05$).

Perhaps self-reported health (Table 16) can be regarded as a pure measure of health, whereas medical visits and hospital days (Tables 17-18) are best regarded as mixed measures, gauging not only health but also *access* to health care. Then the patterns of results in Tables 16-18 suggest residential and social model participants experienced generally larger improvements in health than participants in other modalities but smaller improvements in access to health care. This interpretation makes some sense because residential and social model programs are expensive relative to other treatment modalities (Table 33). Perhaps residential and social model participants already enjoyed a relatively high level of access to health care services at the time they entered treatment and therefore had less room for improvement in access.

Similarly, Table 15 suggests the percent hospitalized declined *most* among participants who spent 4 or more months in treatment (-50.5%), while Table 18 suggests that mean hospital days declined *least* among participants who spent 4 or more months in treatment (-7.8%). Detailed inspection of the data suggested that the second result may be unreliable since it was largely attributable to a few sample participants with long reported hospital stays. Tables 16 and 17 are consistent with Table 15 rather than with Table 18 so the weight of evidence supports the conclusion that longer treatment durations were associated with larger reductions in health care utilization.

The evidence in Tables 14 that treatment improved health helps us to interpret the post-treatment increases in mean annual disability income and in the percent with disability income that are reported in the next subsection. In particular, it seems likely that the increases in disability income reported in the next subsection resulted from improved information about the

Table 14. Health status and health care before and after treatment for selected subclasses

INDICATOR	MEAN OR PERCENT (BASE N)		PERCENT CHANGE
	BEFORE (Pop. = 146,515)	AFTER (Pop. = 146,515)	
Self-reported health (1 = poor,...,4 = excellent)	2.4 (1819)	2.8 (1821)	17%*
Percent hospitalized for			
physical health	15.9% (1818)	10.2% (1798)	-36%*
drug overdose	6.4% (1755)	2.7% (1677)	-58%*
mental health	8.6% (1757)	4.8% (1673)	-44%*
Number[1] of			
doctor visits	2.1 (1816)	1.8 (1797)	-14%*
emergency room visits	0.8 (1818)	0.5 (1798)	-38%*
hospital days	1.2 (1811)	0.9 (1790)	-25%*
mental health visits	3.3 (1756)	3.2 (1671)	-3%

1. Means are adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 15. Percent hospitalized before and after treatment For selected subclasses[1]

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Resid.	28.4% (322)	17.0% (312)	-40.1%*	21,409
	Soc. Model	27.1% (378)	16.5% (367)	-39.0%*	6,698
	Nonmeth OP	19.3% (379)	11.0% (365)	-43.2%*	50,963
	Methadone	25.2% (502)	15.1% (455)	-39.8%*	57,796
	MM continuing	18.8% (176)	11.5% (181)	-38.6%	9,741
Length of treatment**	1 mo. or less	27.0% (745)	16.1% (717)	-40.3%*	76,168
	2-3 mos.	21.7% (396)	16.3% (377)	-24.8%*	26,688
	4 mos. or more	22.7% (616)	11.2% (586)	-50.5%*	43,751
Modality and length of treatment**	Resid.: 0-1	31.8% (192)	22.8% (184)	-28.3%*	12,022
	Resid.: 2-3	25.6% (83)	12.9% (82)	-49.7%*	5,188
	Resid.: 4-	21.9% (47)	5.6% (46)	-74.6%*	4,200
	Soc.Mod.: 0-1	27.7% (154)	19.7% (150)	-28.8%	2,604
	Soc.Mod.: 2-3	24.1% (139)	19.4% (134)	-19.3%	2,649
	Soc.Mod.: 4-	31.4% (85)	6.0% (83)	-80.9%*	1,446
	NM Out: 0-1	20.3% (91)	13.3% (88)	-34.5%	11,220
	NM Out: 2-3	17.6% (122)	11.4% (119)	-35.3%	16,682
	NM Out: 4-	20.2% (166)	9.6% (158)	-52.3%*	23,061
	Meth.: 0-1	25.7% (308)	11.4% (295)	-55.7%*	50,322
	Meth.: 2-3	19.3% (52)	28.3% (42)	46.4%	2,170
	Meth.: 4-	26.3% (142)	21.6% (118)	-17.7%	5,304
	MM cont.: 4-	18.8% (176)	11.5% (181)	-38.6%	9,741
Main drug at peak use**	alcohol	25.5% (675)	14.4% (663)	-43.6%*	44,705
	heroin	25.3% (687)	15.2% (645)	-40.0%*	67,234
	other	20.5% (395)	13.5% (372)	-34.1%*	34,668

Sex and Age**	Fem. < 30	27.9% (213)	18.4% (206)	-34.2%*	19,727
	Fem. 30-39	30.0% (293)	16.2% (288)	-46.0%*	23,876
	Fem. > 39	18.5% (132)	13.8% (133)	-25.6%	12,158
	Male < 30	15.3% (312)	9.3% (297)	-39.0%*	24,821
	Male 30-39	22.9% (448)	11.9% (410)	-48.3%*	36,227
	Male > 39	29.1% (359)	18.6% (346)	-36.2%*	29,797
Ethnicity and sex**	Af. Am. fem.	36.8% (113)	23.0% (109)	-37.3%*	6,979
	Af. Am. male	20.2% (198)	13.0% (177)	-36.0%*	12,918
	W. Hisp. fem.	25.5% (150)	11.7% (141)	-54.3%*	16,020
	W. Hisp. male	20.9% (330)	11.1% (310)	-46.8%*	34,576
	W. non-H. f.	24.1% (332)	15.3% (334)	-36.3%*	29,239
	W. non-H. m.	24.4% (517)	13.9% (493)	-43.0%*	37,294
	Other fem.	25.8% (43)	22.3% (43)	-13.8%	3,522
	Other male	28.3% (74)	21.1% (73)	-25.3%	6,057

1. Includes hospitalizations for physical health, mental health, and drug overdoses.

*Statistically significant before-after change based on two-tail paired t-test, α = .05.

**Before-after changes differ significantly across subclasses based on ANOVA F test, α=.05.

Table 16. Self-reported health status (from 1 = poor to 4 = excellent) before and after treatment for selected subclasses.

CONTROL VAR(S)	SUBCLASS	MEAN HEALTH STATUS SCORE (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Resid.	2.4 (336)	2.9 (335)	20.9%*	21,409
	Soc. Model	2.4 (391)	3.0 (392)	26.5%*	6,698
	Nonmeth OP	2.6 (391)	3.0 (393)	11.4%*	50,963
	Methadone	2.4 (518)	2.6 (518)	10.3%*	57,796
	MM continuing	2.3 (183)	2.4 (183)	4.2%	9,741
Length of treatment**	1 mo. or less	2.4 (775)	2.8 (775)	15.0%*	76,168
	2-3 mos.	2.5 (409)	2.9 (410)	15.4%*	26,688
	4 mos. or more	2.4 (635)	2.8 (636)	15.9%*	43,751
Modality and length of treatment**	Resid.: 0-1	2.4 (200)	2.9 (199)	20.1%*	12,022
	Resid.: 2-3	2.5 (85)	2.9 (85)	14.1%*	5,188
	Resid.: 4-	2.4 (51)	3.1 (51)	32.4%*	4,200
	Soc.Mod.: 0-1	2.4 (160)	3.0 (161)	25.2%*	2,604
	Soc.Mod.: 2-3	2.4 (145)	2.9 (145)	20.9%*	2,649
	Soc.Mod.: 4-	2.2 (86)	3.0 (86)	40.4%*	1,446
	NM Out: 0-1	2.6 (94)	2.9 (94)	11.1%*	11,220
	NM Out: 2-3	2.8 (127)	3.0 (128)	8.2%*	16,682
	NM Out: 4-	2.6 (170)	3.0 (171)	14.0%*	23,061
	Meth.: 0-1	2.4 (321)	2.6 (321)	8.5%*	50,322
	Meth.: 2-3	2.3 (52)	2.8 (52)	23.3%*	2,170
	Meth.: 4-	2.4 (145)	2.7 (145)	9.8%*	5,304
	MM cont.: 4-	2.3 (183)	2.4 (183)	4.2%	9,741
Main drug at peak usa**	alcohol	2.4 (698)	2.9 (699)	21.2%*	44,705
	heroin	2.4 (719)	2.6 (719)	9.0%*	67,234
	other	2.5 (402)	3.0 (403)	15.8%*	34,668

Sex and Age**	Fem. < 30	2.4 (219)	2.9 (220)	0.7%*	19,727
	Fem. 30-39	2.2 (306)	2.8 (306)	25.2%*	23,876
	Fem. > 39	2.3 (135)	2.7 (135)	16.7%*	12,158
	Male < 30	2.7 (321)	3.1 (321)	14.2%*	24,821
	Male 30-39	2.5 (468)	2.9 (468)	16.3%*	36,227
	Male > 39	2.4 (370)	2.5 (371)	4.1%*	29,797
Ethnicity and sex**	Af. Am. fem.	2.3 (116)	2.8 (116)	24.3%*	6,979
	Af. Am. male	2.6 (201)	2.9 (202)	13.0%*	12,918
	W. Hisp. fem.	2.2 (155)	2.7 (155)	22.6%*	16,020
	W. Hisp. male	2.6 (350)	2.7 (350)	6.1%*	34,576
	W. non-H. f.	2.3 (344)	2.8 (345)	22.4%*	29,239
	W. non-H. m.	2.5 (533)	2.9 (533)	15.4%*	37,294
	Other fem.	2.5 (45)	2.8 (45)	10.1%	3,522
	Other male	2.4 (75)	2.7 (75)	15.4%*	6,057

*Statistically significant before-after change based on two-tail paired t-test, α = .05.

**Before-after changes differ significantly across subclasses based on ANOVA F test, α=.05.

Table 17. Medical visits before and after treatment for selected subclasses[1].

CONTROL VAR(S)	SUBCLASS	MEAN VISITS PER ANNUM (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Resid.	7.0 (336)	6.0 (334)	-14.9%	21,409
	Soc. Model	5.8 (392)	5.6 (390)	-3.1%	6,698
	Nonmeth OP	6.7 (394)	5.1 (390)	-23.4%*	50,963
	Methadone	5.1 (518)	4.7 (506)	-9.2%	57,796
	MM continuing	6.6 (183)	4.9 (183)	-26.3%*	9,741
Length of treatment**	1 mo. or less	5.7 (776)	5.1 (774)	-10.0%	76,168
	2-3 mos.	6.4 (410)	5.4 (407)	-14.6%*	26,688
	4 mos. or more	6.6 (637)	5.3 (622)	-19.1%*	43,751
Modality and length of treatment**	Resid.: 0-1	7.6 (200)	6.8 (199)	-9.6%	12,022
	Resid.: 2-3	7.6 (85)	5.4 (85)	-28.2%	5,188
	Resid.: 4-	4.8 (51)	4.1 (50)	-13.6%	4,200
	Soc.Mod.: 0-1	5.1 (161)	5.5 (161)	7.9%	2,604
	Soc.Mod.: 2-3	6.0 (145)	6.3 (144)	3.9%	2,649
	Soc.Mod.: 4-	6.6 (86)	4.6 (85)	-30.2%	1,446
	NM Out: 0-1	5.6 (94)	4.5 (94)	-20.8%	11,220
	NM Out: 2-3	6.7 (128)	5.2 (127)	-22.1%	16,682
	NM Out: 4-	7.3 (172)	5.4 (169)	-25.2%*	23,061
	Meth.: 0-1	4.8 (321)	4.0 (320)	-15.3%	50,322
	Meth.: 2-3	4.4 (52)	3.5 (51)	-20.9%	2,170
	Meth.: 4-	6.5 (145)	7.1 (135)	8.9%	5,304
	MM cont.: 4-	6.6 (183)	4.9 (183)	-26.3%*	9,741
Main drug at peak usage**	alcohol	6.6 (699)	5.6 (694)	-15.5%*	44,705
	heroin	5.4 (719)	4.5 (707)	-16.3%*	67,234
	other	6.5 (405)	5.9 (402)	-10.5%	34,668

Sex and Age**	Fem. < 30	7.4 (221)	6.1 (217)	-18.1%	19,727
	Fem. 30-39	7.8 (306)	8.1 (301)	3.9%	23,876
	Fem. > 39	7.7 (135)	7.0 (135)	-8.9%	12,158
	Male < 30	4.4 (322)	3.5 (320)	-20.7%*	24,821
	Male 30-39	5.5 (468)	4.0 (463)	-27.6%*	36,227
	Male > 39	5.7 (371)	4.8 (367)	-14.8%*	29,797
Ethnicity and sex**	Af. Am. fem.	7.1 (116)	8.1 (115)	15.0%	6,979
	Af. Am. male	5.0 (202)	3.1 (200)	-38.7%*	12,918
	W. Hisp. fem.	6.7 (156)	5.2 (151)	-22.4%	16,020
	W. Hisp. male	3.5 (350)	3.0 (346)	-12.5%	34,576
	W. non-H. f.	8.0 (345)	7.3 (343)	-8.9%	29,239
	W. non-H. m.	6.3 (534)	5.1 (529)	-19.1%*	37,294
	Other fem.	10.3 (45)	11.4 (44)	10.9%	3,522
	Other male	7.5 (75)	5.8 (75)	-23.1%	6,057

1. Includes doctor visits, emergency room visits, and mental health visits. Means adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, α = .05.

**Before-after changes differ significantly across subclasses based on ANOVA F test, α=.05.

Table 18. Hospital days before and after treatment for selected subclasses[1]

CONTROL VAR(S)	SUBCLASS	MEAN DAYS PER ANNUM (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Resid.	1.1 (335)	0.9 (331)	-19.6%	21,409
	Soc. Model	1.0 (392)	0.9 (389)	-9.2%	6,698
	Nonmeth OP	1.0 (390)	0.6 (388)	-43.9%	50,963
	Methadone	1.7 (513)	1.4 (501)	-17.0%	57,796
	MM continuing	1.3 (181)	0.5 (181)	-57.6%	9,741
Length of treatment**	1 mo. or less	1.4 (771)	0.9 (767)	-38.7%*	76,168
	2-3 mos.	0.9 (408)	0.7 (405)	-20.9%	26,688
	4 mos. or more	1.2 (632)	1.1 (618)	-7.8%	43,751
Modality and length of treatment**	Resid.: 0-1	1.2 (199)	1.1 (197)	-9.0%	12,022
	Resid.: 2-3	0.9 (85)	0.7 (84)	-14.1%	5,188
	Resid.: 4-	1.2 (51)	0.5 (50)	-56.3%	4,200
	Soc.Mod.: 0-1	0.9 (161)	0.7 (161)	-28.4%	2,604
	Soc.Mod.: 2-3	1.0 (145)	1.2 (143)	15.0%	2,649
	Soc.Mod.: 4-	1.0 (86)	0.8 (85)	-23.0%	1,446
	NM Out: 0-1	1.6 (94)	0.8 (93)	-51.4%	11,220
	NM Out: 2-3	0.5 (126)	0.2 (127)	-49.7%	16,682
	NM Out: 4-	1.1 (170)	0.7 (168)	-36.3%	23,061
	Meth.: 0-1	1.7 (317)	0.8 (316)	-50.2%	50,322
	Meth.: 2-3	2.1 (52)	0.8 (51)	-61.1%	2,170
	Meth.: 4-	1.5 (144)	3.3 (134)	123.7%*	5,304
	MM cont.: 4-	1.3 (181)	0.5 (181)	-57.6%	9,741
Main drug at peak usage**	alcohol	1.2 (698)	0.7 (692)	-39.0%*	44,705
	heroin	1.6 (711)	1.2 (698)	-24.8%	67,234
	other	0.6 (402)	0.7 (400)	18.1%	34,668

Sex and Age**	Fem. < 30	0.8 (218)	0.9 (215)	11.9%	19,727
	Fem. 30-39	1.8 (303)	1.4 (298)	-25.1%	23,876
	Fem. > 39	1.2 (134)	1.6 (133)	42.2%	12,158
	Male < 30	0.5 (322)	0.3 (319)	-46.5%	24,821
	Male 30-39	1.1 (466)	0.6 (462)	-47.7%*	36,227
	Male > 39	1.8 (368)	1.3 (363)	-27.8%	29,797
Ethnicity and sex**	Af. Am. fem.	1.2 (115)	1.4 (115)	14.1%	6,979
	Af. Am. male	0.9 (201)	0.7 (198)	-20.1%	12,918
	W. Hisp. fem.	1.0 (152)	0.8 (149)	-20.8%	16,020
	W. Hisp. male	1.1 (348)	0.4 (344)	-62.5%*	34,576
	W. non-H. f.	1.2 (343)	1.3 (339)	6.6%	29,239
	W. non-H. m.	1.2 (532)	0.9 (527)	-29.9%	37,294
	Other fem.	3.8 (45)	2.3 (43)	-39.4%	3,522
	Other male	1.7 (75)	1.2 (75)	-30.2%	6,057

1. Means adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

sources of disability income and/or improved access to disability benefits rather than to any increase in disabilities resulting from treatment.

Employment and Income

Table 19 presents before-after comparisons of thirteen indicators of respondents' income and employment. The thirteen measures are

1) percentage who worked full-time;
2) mean months worked full-time per annum;
3) percent who worked part-time;
4) mean months worked part-time per annum;
5) percent who received employment income;
6) percentage who received nonhousehold income;
7) percentage who received welfare income;
8) percentage who received disability income;
9) percentage who received pension income;
10) percentage who received illegal support;
11) mean annual income from employment;
12) mean annual income from welfare; and
13) mean annual income from disability.

To enhance comparability between the before-treatment period, which was a fixed 12 months, and the after-treatment period, which varied from case to case, the figures for number of months worked and dollars received after treatment in Table 19 were annualized, that is, adjusted to a 12-month basis. For example, if an individual had been out of treatment only 9 months and worked 3 of them, earning $9,000, these numbers were extrapolated to an annual employment rate of 4 months and annual income of $12,000.

Table 19 shows that treatment participants received income form a wide variety of sources. The most common source of income both before and after treatment was full-time employment. The next most common sources of income before treatment were welfare, illegal activities, and disability payments, respectively. After treatment, welfare was hardly changed and disability expanded, but illegal income became much less common. More than 25% of participants reported illegal income before treatment, but only about 10% reported illegal income after treatment. The magnitude of this reduction was similar to the overall decline in illegal activities, as reported in Table 10 (which includes non-income-producing as well as income-producing illegal activities).

Respondents said that the exact dollar value of income form illegal support was difficult for them to report for the reference periods, in contrast to income based on regular payroll or government checks. Illegal receipts are recorded poorly if at all, fluctuate greatly from week to week, and payment is frequently in kind rather than case, and especially in drugs. Therefore, Table 19 does not include a line for illegal income.

Table 19 shows that the reduced prevalence of illegal support was not compensated by an increased prevalence of legal employment. Rates of employment and income from employment were generally lower after treatment than before. The percentage of participants working full time and the total number of months they worked fell by more than one-fifth (21% and 23%). Overall employment earnings declined even more (off 29%), meaning that an appreciable number of respondents either took on different jobs after treatment at lower rates of pay than before or stayed in the same jobs but suffered pay cuts. Both possibilities are consistent with the generally austere economic trend in California over the period 1991-1993, but preliminary inspection of the data suggests that the first pattern was more common--that is, individuals worked in the year before treatment but lost or quit their jobs and then started working again at lower pay after treatment. More painstaking analyses are needed to provide more certainty on this matter.

Tables 20-22 present detailed trends in three indicators: percent working full time, months worked full time, and percent receiving disability income. A close look at the employment picture in Tables 20 and 21 reveals that reductions in full-time employment were especially pronounced among methadone discharge respondents (down 34%) and among older female respondents aged 39 or older (down 36%), but this tendency was reversed among men under 30 years and among African-American women. Longer lengths of stay, especially in social model and other residential programs were positively associated with employment; the largest gains in working time occurred among those who stayed in such programs beyond the first month.

While the percentage of participants receiving welfare payments remained almost unchanged, the percent receiving disability payments increased significantly from about 21% to about 27%. Table 22 shows that the increases in the percent receiving disability income occurred in every type of treatment. The largest increases occurred among discharged methadone and social model participants (+39% and +35%, respectively). The percent receiving disability before treatment increased regularly with age. The percent was higher among men than among women at every age. These patterns were as apparent after treatment as before. Every age/gender group shoed before-after increases in the percent receiving disability, but women 39 years or older showed the most marked increase (+55%).

The before-after increases in disability income are contrary to what one would expect on the basis of the health trends as reported in the preceding section. There were clearly improvements in physical health. Rather than individuals in alcohol or drug treatment becoming more disabled than before, these data support the idea, reported in various anecdotes during the study, that treatment simply increases the eligibility to receive disability payments under current statues by serving as external evidence of the presence of alcohol or drug dependence, which are classified by law as chronic disabilities even when in remission.

Table 19. Employment variables before and after treatment.[1]

INDICATOR	MEAN OR PERCENT (BASE N)		BEFORE ↓ AFTER
	BEFORE (Pop. = 146,515)	AFTER (Pop. = 146,515)	
Percent working full time	41.5% (1739)	32.9% (1635)	-21%*
Months worked full time[1]	3.5 (1739)	2.7 (1635)	-23%*
Percent working part time	21.1% (1745)	19.6% (1640)	-7%
Months worked part time[1]	1.1 (1745)	1.1 (1640)	0
Percentage receiving			
employment income	54.6% (1743)	51.5% (1653)	-6%*
nonhousehold income	15.7% (1736)	12.5% (1647)	-20%*
welfare income	27.8% (1738)	27.0% (1646)	-3%
disability income	21.4% (1739)	27.2% (1657)	27%*
pension income	3.9% (1740)	5.2% (1648)	33%*
Percentage receiving illegal support	26.1% (1747)	10.3% (1662)	-61%*
Annual income[1] from			
employment	$10320.0 (1579)	$7333.6 (1784)	-29%*
welfare	$1134.5 (1672)	$1146.9 (1591)	1%
disability	$963.1 (1701)	$1392.2 (1600)	45%*

1. Means are adjusted to a per annum basis for each segment.

*Statistically significant change based on two-tail paired t-test, $\alpha = .05$.

Table 20. Percent working full-time before and after treatment for selected subclasses

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality	Resid.	45.3% (315)	46.0% (308)	2%	21,409
	Soc. Model	43.2% (376)	47.1% (357)	9%	6,698
	Nonmeth Outp	46.1% (375)	41.1% (356)	-11%	50.963
	Methadone	35.4% (499)	23.4% (445)	-34%*	57,796
	MM continuing	36.2% (174)	34.7% (181)	-4%	9,741
Length of treatment**	1 mo. or less	39.6% (737)	33.5% (703)	-15%*	76,168
	2-3 mos.	42.9% (390)	41.8% (369)	-3%	26,688
	4 mos. or more	42.8% (612)	41.0% (575)	-4%	43,751
Treatment modality and Length of treatment**	Resid. < =1 mo	45.1% (189)	41.0% (183)	-9.3%	12,022
	Resid. 2-3 mo	42.6% (79)	43.2% (80)	1.4%	5,188
	Resid. > =4 mo	49.1% (47)	64.3% (45)	30.9%	4,200
	Soc. Model < =1 mo	46.3% (153)	44.5% (145)	-3.9%	2,604
	Soc. Model 2-3 mo	43.2% (138)	47.8% (133)	10.5%	2,649
	Soc. Model > =4 mo	38.0% (85)	50.3% (79)	32.3%	1,446
	Nonmeth Outp < =1 mo	42.0% (89)	33.1% (87)	-21.2%	11,220
	Nonmeth Outp 2-3 mo	41.6% (121)	40.7% (117)	-2.2%	16,682
	Nonmeth Outp > =4 mo	51.2% (165)	45.3% (152)	-11.5%	23,061
	Methadone < =1 mo	32.6% (306)	24.3% (288)	-25.6%*	50,322
	Methadone 2-3 mo	46.3% (52)	19.7% (39)	-57.5%*	2,170
	Methadone > =4 mo	38.4% (141)	22.1% (118)	-42.4%*	5,304
	MM continuing > =4	36.2% (174)	34.7% (181)	-3.9%	9,741
Main drug at peak usage**	alcohol	46.5% (671)	45.9% (651)	-1%	44,705
	heroin	34.5% (681)	26.0% (634)	-25%*	67,234
	other	44.2% (387)	43.5% (362)	-2%	34,668

Sex and Age	Fem. < 30	27.7% (212)	27.5% (205)	-1%	19,727
	Fem. 30-39	26.9% (290)	25.4% (285)	-6%	23,876
	Fem. > 39	39.7% (131)	25.4% (127)	-36%*	12,158
	Male < 30	49.9% (309)	54.3% (291)	9%	24,821
	Male 30-39	53.6% (442)	46.7% (407)	-13%	36,227
	Male > 39	39.9% (355)	35.3% (332)	-12%	29,797
Ethnicity and sex	Af. Am. fem.	18.5% (112)	25.1% (105)	36%	6,979
	Af. Am. male	41.2% (196)	37.5% (174)	-9%	12,918
	W. Hisp. fem.	25.6% (149)	19.9% (140)	-22%	16,020
	W. Hisp. male	49.8% (326)	47.0% (303)	-5%	34,576
	W. non-H. f.	35.9% (330)	29.5% (329)	-18%	29,239
	W. non-H. m.	50.0% (512)	47.6% (484)	-5%	37,294
	Other fem.	30.9% (42)	22.3% (43)	-28%	3,522
	Other male	49.3% (72)	41.4% (69)	-16%	6,057

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 21. Months worked full-time before and after treatment for selected subclasses[1]

CONTROL VAR(S)	SUBCLASS	MEAN MONTHS PER ANNUM (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality	Resid.	3.5 (315)	4.4 (308)	26%	21,409
	Soc. Model	3.3 (376)	3.9 (357)	18%	6,698
	Nonmeth Outp	4.2 (375)	4.0 (356)	-5%	50.963
	Methadone	3.0 (499)	1.9 (445)	-37%*	57,796
	MM continuing	3.4 (174)	3.5 (181)	3%	9,741
Length of treatment**	1 mo. or less	3.1 (737)	2.7 (703)	-13%*	76,168
	2-3 mos.	3.4 (390)	3.6 (369)	6%	26,688
	4 mos. or more	3.9 (612)	4.3 (575)	10%	43,751
Treatment modality and Length of treatment**	Resid. < =1 mo	3.39 (189)	3.78 (183)	11.4%	12,022
	Resid. 2-3 mo	3.09 (79)	3.94 (80)	27.4%	5,188
	Resid. > =4 mo	4.07 (47)	6.53 (45)	60.5%	4,200
	Soc. Model < =1 mo	3.39 (153)	2.99 (145)	-12.0%	2,604
	Soc. Model 2-3 mo	3.46 (138)	4.06 (133)	17.3%	2,649
	Soc. Model > =4 mo	3.05 (85)	5.19 (79)	70.1%*	1,446
	Nonmeth Outp < =1 mo	3.58 (89)	2.77 (87)	-22.6%	11,220
	Nonmeth Outp 2-3 mo	3.66 (121)	3.42 (117)	-6.7%	16,682
	Nonmeth Outp > =4 mo	4.78 (165)	5.00 (152)	4.6%	23,061
	Methadone < =1 mo	2.67 (306)	1.93 (288)	-27.6%*	50,322
	Methadone 2-3 mo	3.03 (52)	1.27 (39)	-58.2%	2,170
	Methadone > =4 mo	3.74 (141)	2.16 (118)	-42.2%*	5,304
	MM continuing > =4	3.41 (174)	3.50 (181)	2.9%	9,741
Main drug at peak usage**	alcohol	3.9 (671)	4.1 (651)	5%	44,705
	heroin	2.9 (681)	2.3 (634)	-21%*	67,234
	other	3.6 (387)	4.0 (362)	11%	34,668

Sex and Age	Fem. < 30	2.4 (212)	2.7 (205)	13%	19,727
	Fem. 30-39	2.1 (290)	1.9 (285)	-10%	23,876
	Fem. > 39	3.9 (131)	2.6 (127)	-33%*	12,158
	Male < 30	3.8 (309)	4.9 (291)	29%*	24,821
	Male 30-39	4.5 (442)	4.3 (407)	-4%	36,227
	Male > 39	3.5 (355)	3.2 (332)	-9%	29,797
Ethnicity and sex	Af. Am. fem.	1.9 (112)	2.1 (105)	11%	6,979
	Af. Am. male	3.1 (196)	3.2 (174)	3%	12,918
	W. Hisp. fem.	1.9 (149)	1.4 (140)	-26%	16,020
	W. Hisp. male	4.5 (326)	4.7 (303)	4%	34,576
	W. non-H. f.	3.2 (330)	2.8 (329)	-13%	29,239
	W. non-H. m.	4.0 (512)	4.2 (484)	5%	37,294
	Other fem.	2.1 (42)	1.4 (43)	-33%	3,522
	Other male	3.7 (72)	3.7 (69)	0	6,057

1. Means are adjusted to a per annum basis for each segment.

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

Table 22. Receipt of disability income before and after treatment for selected subclasses.

CONTROL VAR(S)	SUBCLASS	PERCENT (BASE N)		PERCENT CHANGE	EST. POP. BASE
		BEFORE	AFTER		
Treatment modality**	Residential	23.5% (317)	27.8% (308)	18.3%	21,409
	Social Model	21.2% (372)	28.6% (359)	34.9%*	6,698
	Outpt NM	18.2% (379)	21.1% (362)	16.2%	50,963
	Methadone	19.9% (498)	27.7% (446)	39.4%*	57,796
	MM continuing	30.5% (173)	36.1% (182)	18.4%	9,741
Length of treatment**	1 mo. or less	22.5% (736)	28.2% (706)	24.9%*	76,168
	2-3 mos.	18.5% (392)	23.6% (373)	27.4%*	26,688
	4 mos. or more	22.0% (611)	28.5% (578)	29.7%*	43,751
Treatment modality and Length of treatment**	Resid. < =1 mo	27.2% (189)	31.9% (184)	17.0%	12,022
	2-3 mo	18.8% (81)	24.8% (80)	31.6%	5,188
	> =4 mo	18.5% (47)	19.6% (44)	5.6%	4,200
	Soc Mod < =1 mo	21.7% (151)	30.0% (146)	38.2%*	2,604
	2-3 mo	25.4% (138)	30.7% (133)	21.0%	2,649
	> =4 mo	12.7% (83)	22.2% (80)	75.1%*	1,446
	NM Outpt < =1 mo	15.6% (90)	23.5% (87)	50.2%	11,220
	2-3 mo	14.3% (122)	16.1% (121)	12.2%	16,682
	> =4 mo	22.2% (167)	23.9% (154)	7.6%	23,061
	Methadone< =1 mo	22.1% (306)	26.4% (289)	19.7%	50,322
	2-3 mo	8.7% (51)	20.2% (39)	132.6%*	2,170
	> =4 mo	18.5% (141)	34.4% (118)	86.2%*	5,304
	MM continuing> =4	30.5% (173)	36.1% (182)	18.4%	9,741
Main drug at peak usage**	alcohol	22.6% (669)	30.0% (654)	32.8%*	44,705
	heroin	22.2% (679)	29.8% (635)	34.1%*	67,234
	other	18.1% (391)	18.3% (368)	0.8%	34,668

Sex and Age**	Fem. < 30	5.8% (213)	8.7% (203)	50.2%	19,727
	Fem. 30-39	17.8% (290)	23.0% (288)	29.2%*	23,876
	Fem. > 39	22.5% (131)	35.0% (129)	55.3%*	12,158
	Male < 30	16.8% (307)	20.8% (292)	23.9%	24,821
	Male 30-39	24.6% (443)	31.3% (408)	27.5%*	36,227
	Male > 39	33.5% (355)	39.4% (337)	17.8%*	29,797
Ethnicity and sex**	Af. Am. fem.	14.1% (112)	19.1% (107)	35.7%	6,979
	Af. Am. male	24.2% (193)	28.3% (174)	16.9%	12,918
	W. Hisp. fem.	11.9% (149)	14.1% (141)	18.9%	16,020
	W.Hisp. male	21.3% (328)	28.0% (309)	31.3%*	34,576
	W. non-H. f.	17.1% (331)	24.7% (329)	44.0%*	29,239
	W. non-H.m.	28.5% (513)	34.1% (484)	19.7%*	37,294
	Other fem.	8.7% (42)	19.0% (43)	118.6*%	3,522
	Other male	25.2% (71)	31.7% (70)	25.8%	6,057

*Statistically significant before-after change based on two-tail paired t-test, $\alpha = .05$.

**Before-after changes differ significantly across subclasses based on ANOVA F test, $\alpha = .05$.

4 *Costs and Benefits of Treatment*

Introduction

This analysis presents findings on the monetary costs and benefits that accrue from providing treatment through the major modalities of treatment to alcohol and drug dependent Californians. The objectives of this analysis were to describe the following:

- dollars spent on treatment,
- economic impacts related to drug and alcohol use before, during, and after treatment,
- economic savings that were related to the provision of treatment, and
- the ratio of benefits to costs of treatment in the major modalities.

As decision makers continue to wrestle with competing demands for limited resources, the data provided here should help by establishing a fact base about the "return on investments" made in alcohol and other drug treatment.

Readers interested in knowing more about economic analyses conducted on drug and alcohol treatment settings should refer to either the Institute of Medicine report entitled *Treating Drug Problems* or the newly published *Socioeconomic Evaluations of Addictions Treatment*. The latter, prepared by the Center of Alcohol Studies at Rutgers University for the President's Commission on Model State Drug Laws, includes thorough descriptions of studies that have been performed in the past thirty years. Of note from these and other reviews of economic analyses of treatment are the methodological virtues or limitations of different undertakings. Among the various methodological challenges presented in these studies are:

- Data provided are based on limited populations, such as enrollers in a particular insurance plan or HMO.
- Study subjects (programs and participants) are not selected using a representative sampling design.
- The study design does not include a non-treatment control group for separating the "unique" contributions of treatment from behaviors that could be observed without treatment.
- Benefit measures are not comprehensive: they present only crime, health, or productivity but seldom all three.

- Benefit measures focus on only a limited duration observation period--either focusing only on the during treatment period, the following treatment period, or some short portion of the observation period that does not represent the total potential period under which participant behaviors may change.

Understanding the Components of Costs and Benefits in CALDATA

The approach used here to assess costs and benefits of treatment is similar to many of the studies that have analyzed the costs of alcohol and drug dependence and the benefits that arise from treating substance abusers. This section outlines the approach used for calculating "benefits" of treatment, describes what treatment cost in the modalities of care that are included in CALDATA, and presents the baseline for understanding changes in economic impacts during and after treatment.

"Avoided Costs" Equal Benefits

Calculating "benefits" entails a comparison of the economic impacts of participants before treatment with their impacts during and after treatment. This study applies the standard "cost of illness" methodology to calculate economic impacts of drug and alcohol abuse for the years before and after treatment and the period during treatment. When economic impacts either during or following treatment are lower than the baseline costs, a "benefit" is said to exist. Conversely, when economic impacts during or following treatment are greater than the baseline, benefits take on a negative value.

This analysis distinguishes between how society versus "taxpaying citizens" view economic impacts of drug and alcohol abuse. *Costs to Society* include losses of society's net productivity or losses in society's net wealth. Thus, earnings by abusers of alcohol and other drugs in the legitimate economy have a value. In operational terms, the difference between what a person earns and what they could have earned is viewed as a loss to society. Also included are the value of resources used or damaged due to substance abuse such as health, police and corrections costs. However, in the cost to society, the value of stolen goods or cash or the amount of money a person receives as welfare or disability are considered to be "transfers" in that payment moves from one pocket (generally taxpaying citizens) to another pocket in society (in this case substance abusers). There is no net loss when such a transfer occurs. This methodology has been employed in most studies of the impact of substance abuse on society, such as Rice et al (1990) and Harwood et al (1984).

In contrast, a measure termed *Costs to Taxpaying Citizens* includes only those losses to individuals who do not engage in any drug taking or related behavior. For these people, loss of earnings for a drug or alcohol dependent person is of less concern, but the value of theft losses or the amount of money expended on welfare and disability for drug and alcohol dependent persons is viewed as a cost to reckon with. While most substance abusers do pay taxes to some extent, the largest part of the tax bill is born by those that are not substance abusers. Figure 1

Figure 1. Definitions of Benefits

	Costs to Society	Costs to Taxpaying Citizens
Criminal Justice System Costs	•	•
Victim Losses	•	•
Theft Losses		•
Health Care Utilization	•	•
Lost Legitimate Earnings	•	
Income Transfers		•

Criminal Justice System Costs: the cost of police protection services, prosecution, adjudication, public defense, and corrections (incarceration and parole/probation).

Victim Losses: victim expenditures on medical care, repairs of damaged property, and lost time from work that result from predatory crimes.

Theft Losses: the estimated value of property or money stolen during a crime, excluding any property damage or other victim losses. There is no net loss to society when theft occurs, only to taxpaying citizens.

Health Care Service Utilization: the economic value of inpatient, outpatient, and emergency medical care and inpatient and outpatient mental health care that could have been avoided.

Lost Legitimate Earnings: the value of legitimate productivity lost because individuals pursue income through crime or live off the resources of friends, families, or others.

Income Transfers: transactions in which resources are moved from non-substance abusing taxpayers to others via gifts, public assistance, or public and private disability insurance.

portrays and defines the components of costs to society and costs to taxpaying citizens, as used in this analysis.

The three major categories of substance abuse-related economic impacts (and benefits) are crime, health, and productivity. This study collected data on participant behaviors during the year prior to treatment, the time when the participant was in treatment, and the time following treatment to the date of interview. This study has calculated the costs associated with criminal behavior, health care utilization, and labor force productivity by assigning average values to each criminal act, health care utilization, earnings, and welfare/disability received as reported by participants. Figures 2 and 3 display the components, sources, methods, and CALDATA sources for calculating crime, health care, and lost productivity costs for the treatment population.

The Cost of Treatment

Assuming that some types of treatment were not included in this study, it must be noted that the cost of treatment presented here is not an estimate of the total system. It is estimated that it costs approximately $209 million for the State of California to treat the nearly 150,000 persons represented in this study (Table 23). For 136,000 participants treated and discharged (e.g., excluding about 9,500 continuing methadone treatment participants), the average treatment lasted 95 days and cost $1,361. As indicated in Table 23, residential treatment was predictably and substantially higher in cost ($61.47 per day, $4,405 per episode) than other modalities of care such as outpatient drug free (which cost $7.87 per day or $990 per episode). California invested $94 million (almost one half of treatment expenditures represented in this study) in treating 28,000 (under 15 percent) of its total participants in residential programs. An estimated 118,000 participants were treated at substantially lower cost in outpatient drug free and outpatient methadone settings.

Baseline Economic Impacts of Drug and Alcohol Abuse

In the year before treatment, participants treated in California's treatment system engaged in crime, health, and productivity-related behaviors that cost taxpaying citizens $3.1 billion and cost society $4.4 billion (Figure 4, Table 24). In the year before entering a treatment program, the average drug and alcohol abuser cost taxpaying citizens almost $23,000 and cost society over $32,000. As seen in Figure 4, lost earnings comprise over half of the costs to society ($2.3 billion). While drug abusers earned just over $10,000 per person in the year before treatment; this amount fell $17,140 short of their age- and gender-adjusted expected earnings for the same period of time.

Crime related costs comprised $2.4 billion (or 70 percent) of the costs to taxpaying citizens (summing police protection, adjudication, corrections, victim losses, and theft losses together). Note that victims lost $1.3 billion from medical costs, damaged property, lost work and stolen money and property. Income transfers (welfare and disability payments) received by this population were $250 million, or about $1,800 per person treated. This was only about 8 percent of costs to taxpaying citizens. Such payments were received by about one quarter of substance

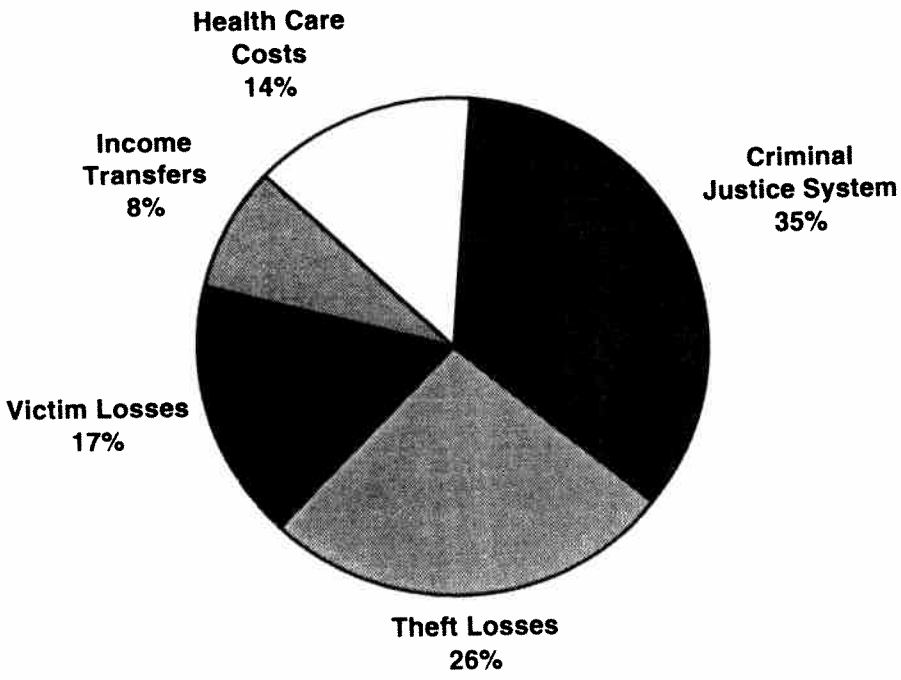
Figure 2. Basis for Key Benefit Calculations: Crime

Components	Sources of Data	Method for calculating average values	Participant Data Employed
Police Protection from Crime	1990 Justice Expenditure and Employment, 1992 Sourcebook of Criminal Justice Statistics	Cost per arrest (police expenditures divided by all arrests) times likelihood of arrest (number arrests divided by number incidents).	Number of crimes, by type of crime
Adjudication and Sentencing	(same as police protection)	Estimated expenditures on crime-related court and legal costs divided by total arrests.	Number of arrests
Corrections	(same as police protection)	Divide expenditures on institutions and probation/parole by inmates and parolees/ probationers, respectively.	Period of time (1) incarcerated or (2) on probation/parole
Victim costs	1991 National Criminal Victimization Survey.	Averages value of medical care, lost work days, and property damage, by type of crime.	Number of crimes, by type of crime
Theft losses	1991 National Criminal Victimization Survey.	Separate averages for value of cash and property stolen, by type of crime, where population base included all victimizations.	Number of crimes, by type of crime

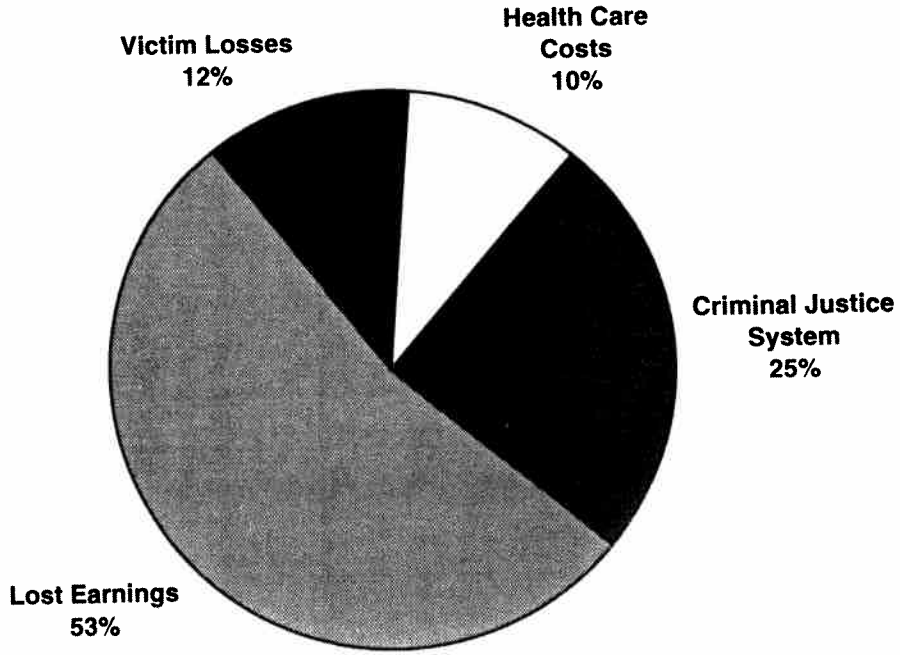
Figure 3. Basis for Key Benefit Calculations: Health and Productivity

	Components	Sources of Data	Method for calculating average values	Participant Data Employed
HEALTH	Outpatient medical care	Analysis conducted by Lewin-VHI of Ambulatory Care Survey	Cost per outpatient visit.	Visits to doctor
	Inpatient medical care	1992 Hospital Statistics and 1987 National Medical Expenditure Survey.	Cost per inpatient day, plus physician fees.	Nights spent in hospital
	Emergency Room use	1992 Hospital Statistics	Emergency department/ outpatient visits divided by revenues, plus physician fees.	Trips to emergency room
	Outpatient mental health care	Mental Health, United States, 1992.	Estimated number of patient days divided by total outpatient revenues	Visits to counselor or professional for mental health
	Inpatient mental health care	Mental Health, United States, 1992.	Estimated number of inpatient days divided by total inpatient psych revenues	Whether admitted to inpatient psychiatric facility
PRODUC -TIVITY	Loss of earnings from legitimate work	Money Income of Households, Families, and Persons in the United States: 1991. Employee Benefits Research Institute Databook, 1992.	Age and gender-controlled mean income (including non-earners), "loaded" for mandatory benefits (e.g., unemployment) and voluntary benefits (e.g., health insurance).	Longest legitimate full- and part-time work, wage rates, and months worked at those rates.
	Welfare and disability "transfers"			Amount of money received from disability and welfare sources.

Figure 4
Economic Impacts of Drug and Alcohol Abusers in Year Before Entering Treatment



Costs to Tax Paying Citizens ($3.1 billion) ($22,786 per person)



Costs to Society ($4.4 billion) ($32,151 per person)

Table 23. What treatment costs in California

	Average Daily Cost of Treatment	Average Length of Treatment (days)	Average Cost per Episode	Number of Persons	Total Cost of Treatment (000s)
Residential	$61.47	68.9	$4,405	21,409	$94,312
Social Model	34.41	79.2	2,712	6,699	18,167
Outpatient	7.87	149.5	990	50,964	50,462
Methadone Discharge	6.79	59.5	404	57,796	23,389
Subtotal	**14.25**	**95.5**	**1,361**	**136,868**	**186,330**
Methadone - Continuing	6.37	(365)	(2,325)	9,741	(22,642)
Total	**$13.73**	**113.4**	**$1,425**	**146,609**	**$208,972**

Source of treatment cost data: analysis of National Drug and Alcohol Treatment Unit Survey (NDATUS) data for the providers involved in this study. Figures in parentheses are based on 1 year's worth of treatment for continuing methadone participants, as opposed to total treatment length for discharged particiapants.

Table 24. Economic impacts of drug abusers in the year before entering treatment for participants discharged in 1991.

		Total (000s)	Per Person	Daily
Police Protection		$609,240	$4,451	$12.20
Adjudication & Corrections		476,804	3,484	9.54
Total Criminal Justice System	•	1,086,044	7,935	21.74
Victim Losses	•	524,727	3,834	10.50
Theft Losses	•	815,738	5,960	10.33
Health Care Costs	•	441,698	3,227	8.84
[Earnings]		[1,378,105]	[10,069]	[26.08]
Lost Earnings	•	2,343,151	17,140	46.96
Income Transfers	•	250,466	1,830	5.01
Costs to Taxpayers	•	**$3,118,672**	**$22,786**	**$62.43**
Costs to Society		**$4,395,447**	**$32,151**	**$88.09**

"Daily" costs are annual, per person costs divided by 365.

abusers entering treatment. Health care costs for this population were $442 million, or $3,200 per person per year. While this was a relatively small component of overall costs to either society or taxpaying citizens, it is worth noting that average annual health expenditures for similar gender and age groups in the U.S. population average about $1,800, or a little over half the pre-treatment per capita expenditure found in this study (Source: Lewin-VHI, Health Benefits Simulation Model). This suggests that as a baseline, health care costs might not be "expected" to be lower than $1800 per year. These analyses treat the full amount of health care utilization as a cost, however.

Comparisons across the major modalities of baseline economic impacts of alcohol and other drug abusers suggested that the populations served by the modalities were very different (Table 25). Residential treatment participants reported that they engaged in more criminal activities before treatment than participants in the other modalities; methadone discharge participants earned relatively less money than participants in other modalities before treatment. Outpatient drug-free participants appear to have engaged in less crime, to have used less health care, and to have had greater earnings than participants in other modalities. It is very likely that these patterns reflected referral and treatment admission patterns: more "severe" participants tended to be referred to residential settings; participants who had less severe addiction careers and fewer prior treatments were likely to be directed into outpatient settings. For this reason, comparisons across the modalities of the relative costs and benefits of treatment were generally inappropriate unless adjustments were first made for their respective participant characteristics.

The above economic impacts and information about the costs of providing care comprise the baseline necessary for portraying the impacts of treatment on participants in California's major treatment modalities. The next sections describe, respectively, the benefits during and in the year following treatment.

Benefits During the Course of Treatment

This study, like most others, estimated benefits of treatment either during or following treatment by examining changes in impacts from the pretreatment period. Thus, in-treatment benefits were estimated by comparing costs (to society or taxpaying citizens) per day before treatment with the same value during treatment. Total benefits during treatment equaled this value times the duration of treatment in days.

This study generally found substantial benefits during treatment, primarily due to reductions in criminal activity. There were more modest -- if any -- changes in other types of costs. Note that most studies focus on benefits following treatment, ignoring benefits during treatment because the post treatment period of observation was generally very short.

Benefits to Taxpaying Citizens

From the view of taxpaying citizens, treatment managed to pay for itself on the day in which it was delivered. This was true for each major modality. As seen in Table 26, this was stronger

Table 25. Per person economic impact for the year before treatment by modality

	Residential	Social Model	Outpatient	Methadone Discharged	Methadone Continuing
Police Protection	$5,397	$4,686	$3,323	$5,069	$3,597
Adjudication & Corrections	3,999	3,127	3,178	3,603	3,048
Total Criminal Justice Sys. •	9,396	7,813	6,501	8,672	6,645
Victim Losses •	4,788	3,839	2,507	4,649	3,624
Theft Losses •	10,208	3,322	4,953	5,580	3,412
Health Care Costs •	3,634	3,319	2,879	3,373	2,974
[Earnings]	[9,088]	[9,702]	[11,763]	[8,981]	[9,986]
Lost Earnings •	18,025	19,696	11,234	21,707	20,381
Income Transfers •	1,720	1,979	1,541	2,114	2,676
Costs to Taxpayers •	**$29,747**	**$20,225**	**$18,381**	**$24,389**	**$19,332**
Costs to Society	**$35,845**	**$34,667**	**$23,154**	**$38,401**	**$33,625**

Table 26. Costs and taxpayer benefits during treatment by modality

	Residential	Social Model	Outpatient	Methadone Discharged	Methadone Continuing
Daily Costs Before	$81.50	$55.41	$50.36	$66.82	$52.97
Daily Costs During	16.28	17.84	32.44	46.23	22.50
Daily Savings	65.22	37.57	17.92	20.59	30.47
Daily Treatment Cost	61.47	34.41	7.87	6.79	6.37
Benefits to Costs During Treatment	**1.06**	**1.09**	**2.28**	**3.03**	**4.78**

Daily savings equals daily costs before minus daily costs during treatment.

Table 27. Costs and benefits to society during treatment by modality

	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Daily Costs Before	$98.20	$94.98	$63.44	$105.21	$92.12
Daily Costs During	76.01	82.19	52.84	91.07	62.44
Daily Savings	22.19	12.79	10.60	14.14	29.68
Daily Treatment Cost	61.47	34.41	7.87	6.79	6.37
Benefits to Costs During Treatment	**.36**	**.37**	**1.35**	**2.05**	**4.66**

Daily savings equals daily costs before minus daily costs during treatment.

in outpatient and methadone treatment settings than residential or social model; every dollar spent during ambulatory treatment (outpatient and methadone) yielded savings of $3 to $4 during the same period. As would be expected, participants enrolled in long term (continuing) methadone treatment exhibited 50 percent greater savings per day of treatment than participants who were discharged -- reflecting the fact that most of the discharged methadone participants were short-term (less than 30 days), detoxification only participants who received minimal services. Inpatient settings achieved benefits roughly equal to the costs of care. Note that the daily savings for both residential and social model settings were greater than the daily savings in ambulatory settings; however, the costs per day of care were higher.

Benefits to Society

From the view of the total society, however, the picture was somewhat different primarily because this measure was dominated by employment rather than crime. By this measure, benefits for residential settings amounted to about one-third of the expenditures for care (Table 27), though the total dollar magnitude of savings from residential care are much higher than found in the other discharge modalities. Outpatient and methadone care settings, though less effective in terms of the magnitude of savings, were nonetheless more cost-beneficial on the day of delivery than either inpatient setting. This was particularly true--again--of continuing methadone treatment, where savings during treatment were twice those of discharged methadone participants and three times that of outpatient drug free participants.

Differences in economic impacts across the modalities, displayed in Table 28, help explain the patterns in benefits to taxpayers and to society that were mentioned above. In inpatient care settings (both Residential and Social Model) for example, costs associated with crime were reduced markedly during treatment. This was expected since inpatient treatment pulls an individual off the street in order to provide focused intervention with little risk of interference from that environment. Another aspect of this "design feature" is evident here: many participants must give up their jobs during an inpatient treatment episode. This apparently raises costs to society for this period, but it is usually part of the therapeutic approach. This finding for inpatient care settings contrasts with outpatient and methadone discharge settings which experienced little change in employment during treatment. Continuing methadone treatment participants both reduced their criminal activities and increased their earnings.

Aggregate Benefits in the Year Following Treatment

Overall, patients who were discharged from treatment improved their relationship with taxpaying citizens (reduced the burden they represented) by 35 percent and with society as a whole by 6.5 percent (Tables 29 and 30). The dramatic benefits to taxpaying citizens mostly reflects a 42 percent drop in the costs of crime (from $2.4 billion in the year before treatment to $1.4 billion in the year following treatment). Reductions in health expenditures were a small part of the total benefits, but still amounted to a 23 percent reduction compared to before treatment.

Table 28. Daily economic impacts of individuals before and during treatment by modality

	Residential		Social Model		Outpatient		Methadone Discharge		Methadone Continuing	
	Before	During	Before	During	Before	During	Before	During	Before	During
Crim. Justice System	$25.72	$3.42	$21.41	$4.62	$17.81	$12.40	$23.76	$19.40	$18.21	$1.65
Victim Losses	13.12	.12	10.52	.44	6.87	2.48	12.74	5.39	9.93	3.28
Theft Losses	27.97	0	9.10	.48	13.57	6.18	15.29	8.06	9.35	.02
Health Care Costs	9.96	7.41	9.09	6.94	7.89	6.87	9.24	7.49	8.15	7.12
[Earnings]	[24.90	9.23]	[26.58	10.35]	[32.23	31.98]	[24.61	25.28]	[27.36	32.81]
Lost Earnings	49.39	65.05	53.96	70.19	30.78	31.02	59.47	58.80	55.84	50.39
Income Transfers	4.71	5.32	5.29	5.36	4.22	4.51	5.79	5.90	7.33	10.44
Costs to Taxpayers	**$81.50**	**$16.28**	**$55.41**	**$17.84**	**$50.36**	**$32.44**	**$66.82**	**$46.23**	**$52.97**	**$22.50**
Costs to Society	**$98.20**	**$76.01**	**$94.98**	**$82.19**	**$63.44**	**$52.84**	**$105.21**	**$91.07**	**$92.12**	**$62.44**

Table 29. Economic impacts during the year before and year after treatment for participants discharged from treatment

	Total (000s)		Per Person	
	Year Before	Year After	Year Before	Year After
Criminal Justice System	$1,086,043	$841,800	$7,935	$6,151
Victim Losses	524,727	310,387	3,834	2,268
Theft Losses	815,738	253,297	5,960	1,851
Health Care Costs	441,698	337,923	3,227	2,469
[Earnings]	[1,378,105	1,101,356]	[10,069	8,047]
Lost Earnings	2,343,151	2,619,912	17,140	19,164
Income Transfers	250,466	275,563	1,830	2,013
Costs to Taxpayers	**$3,118,672**	**$2,018,971**	**$22,786**	**$14,751**
Costs to Society	**$4,395,447**	**$4,109,605**	**$32,151**	**$27,035**

Table 30. Percent changes from year pre-treatment to year after treatment by modality

	Total (%)	Residential (%)	Social Model (%)	Outpatient (%)	Methadone Discharge (%)
Criminal Justice System	-22.5	-53.7	-41.8	-35.8	0.89
Victim Losses	-40.8	-63.0	-66.2	-59.9	-21.0
Theft Losses	-68.9	-84.6	-68.0	-83.5	-47.0
Health	-23.5	-28.2	-16.7	-26.0	-20.6
[Earnings]	[-20.1]	[-1.6]	[-11.3]	[-15.8]	-33.1
Income Transfers	10.2	25.6	2.43	13.8	3.7
Costs to Taxpayers	**-35.3**	**-58.1**	**-42.4**	**-46.3**	**-17.0**
Costs to Society	**-6.5**	**-25.0**	**-15.2**	**-11.8**	**3.6**

Percent change in earnings reflects decreased earnings, or increases in lost earnings.

Comparisons of economic impacts in the years before and following a treatment episode suggest that residential settings achieve either greater benefits or ones that endure longer than found among methadone discharge participants (Table 30). Costs to taxpaying citizens fell by 58 percent in residential and 42 percent in social model settings, but only by 17 percent for methadone discharge participants. Moreover, earnings before and after residential treatment do not differ by much whereas they drop by 33 percent for methadone discharge.

No treatment modality reduces the costs to either society or taxpaying citizens to zero in the period following treatment, though the benefits that accrue relative to the costs are persuasive. Tables 31 and 32 display the costs and benefits of treatment as viewed by taxpaying citizens and society, respectively. While savings in the year following treatment in residential and social model programs were great both in magnitude as well as proportion of pre-treatment costs, the expenditures on treatment were also appreciably greater than other modalities. While residential care saved taxpaying citizens on average $17,283 per person treated, it cost almost one-fourth that to provide that care. On the other hand, savings from methadone treatment discharges amounted to only $4,134 per person treated, but the treatment cost was only a tenth of the benefit.

Reductions in costs to society have already been shown to be affected by the relatively poor employment performance of the sample. This was particularly true in methadone discharge, where earnings declined more and criminality was reduced to a lesser degree than other modalities. The negative values for episode savings and benefits to costs reflects that outcomes for methadone discharge participants were not--nor would they be expected to be--good.

Moreover, greater lengths of stay in treatment were related to greater benefits, but this varies across modalities. Tables 31 and 32 present the percent reductions in cost to taxpaying citizens and costs to society, respectively, and distinguishes between treatment that lasted only a month or less, treatment that lasted 2-3 months, and treatment that lasted 4 months or longer. Participants who stayed in residential and social model treatment for 2-3 months reduced their costs to taxpaying citizens and to society by levels well in excess of the reductions among participants who were treated for up to 1 month. However, staying in residential treatment for four months or longer diminished the effect of the shorter stay, while discharge from methadone treatment that exceeded the detoxification period yielded subsequent increase rather than decreases in cost to taxpayers and to society.

The relationship of length of treatment to outcomes was also examined with multivariate regression analysis. The expectation is that treatment of greater duration generally yields better outcomes than treatment of shorter duration. This result has been found in the previous major drug abuse outcome studies. The regressions yielded results supporting the positive relationship of length of stay to economic outcomes, although this relationship was statistically strongest for social model and outpatient drug free treatment, and equivocal (weaker) for residential and discharge methadone treatment. Further analyses will be required to explore this relationship.

Table 31. Percent changes in costs to taxpayers before and after treatment by length of stay by modality

Length of Time in Treatment	Total	Residential	Social Model	Outpatient	Discharged Methadone
< 1 month	-28.8%	-40.2%	-20.5%	-59.9%	-21.5%
2-3 mos.	-48.4%	-69.3%	-45.6%	-35.7%	2.0%
4+ mos.	-36.7%	-50.3%	-54.3%	-44.8%	17.0%

Table 32. Percent changes in costs to society before and after treatment by length of stay by modality

Length of Time in Treatment	Total	Residential	Social Model	Outpatient	Discharged Methadone
< 1 month	-1.4%	-13.5%	-2.8%	-12.8%	1.5%
2-3 mos.	-15.1%	-30.1%	-14.4%	-12.1%	8.0%
4+ mos.	-10.5%	-33.0%	-24.3%	-11.3%	20.2%

Figure 5
Proportion of Clients Whose Costs to Tax Paying Citizens Improve Is Greater Than Proportion Who Do Not Improve

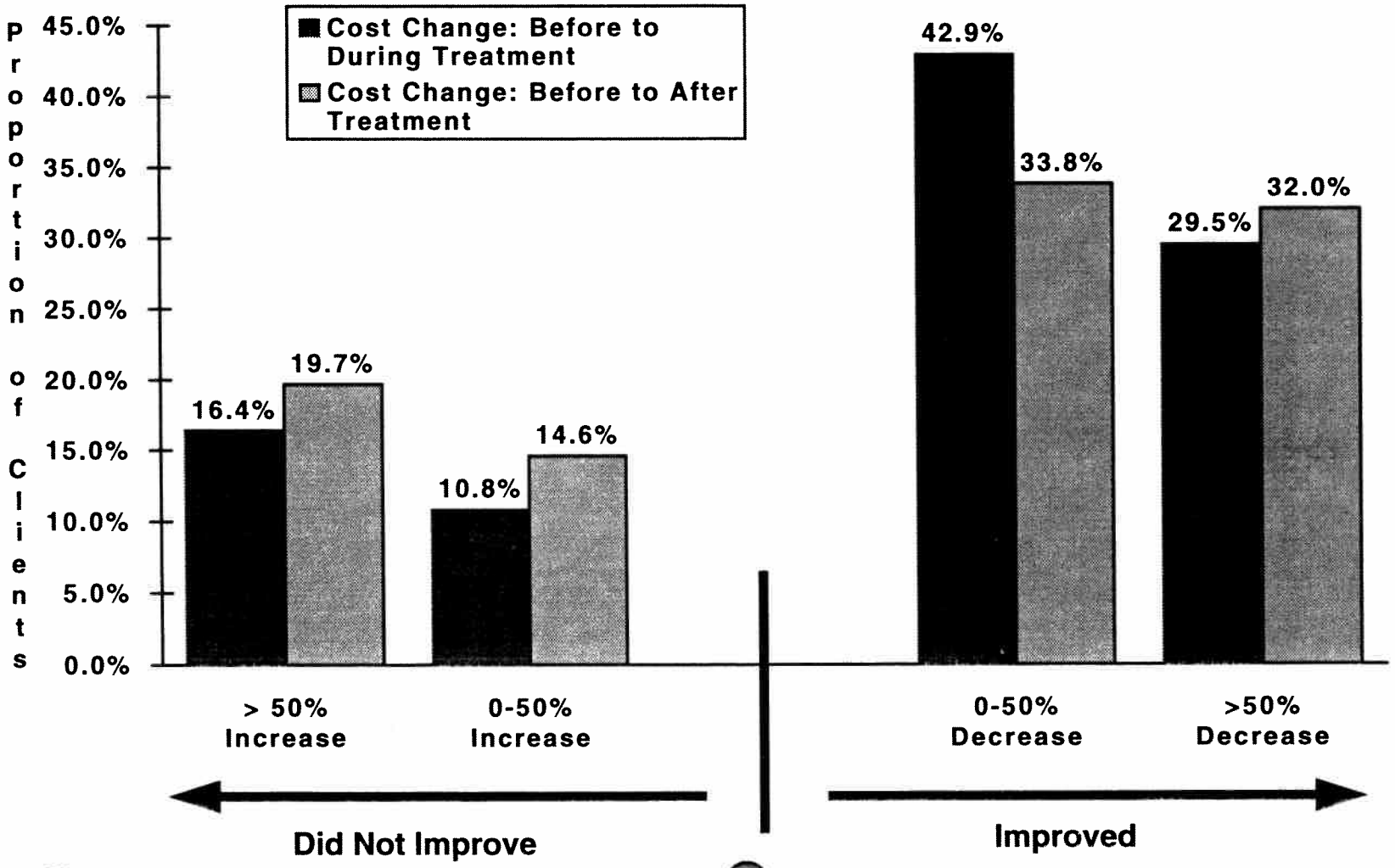


Figure 6
Proportion of Clients Who Reduced Costs to Tax Paying Citizens by at Least 50 Percent in Year Following Treatment Varies by Type of Treatment

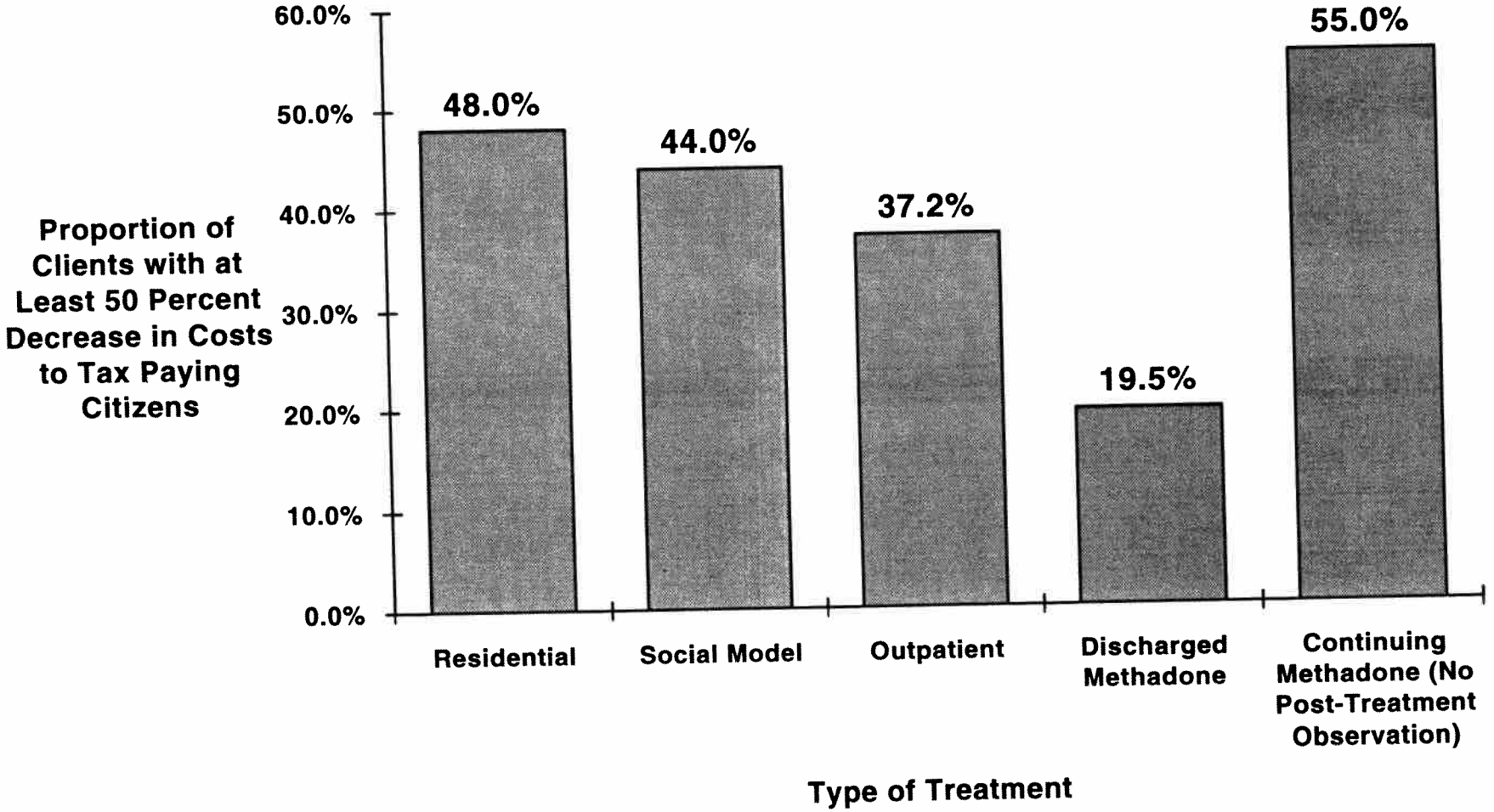


Figure 7
Drug and Alcohol Treatment Results in Net Savings to Tax Paying Citizens

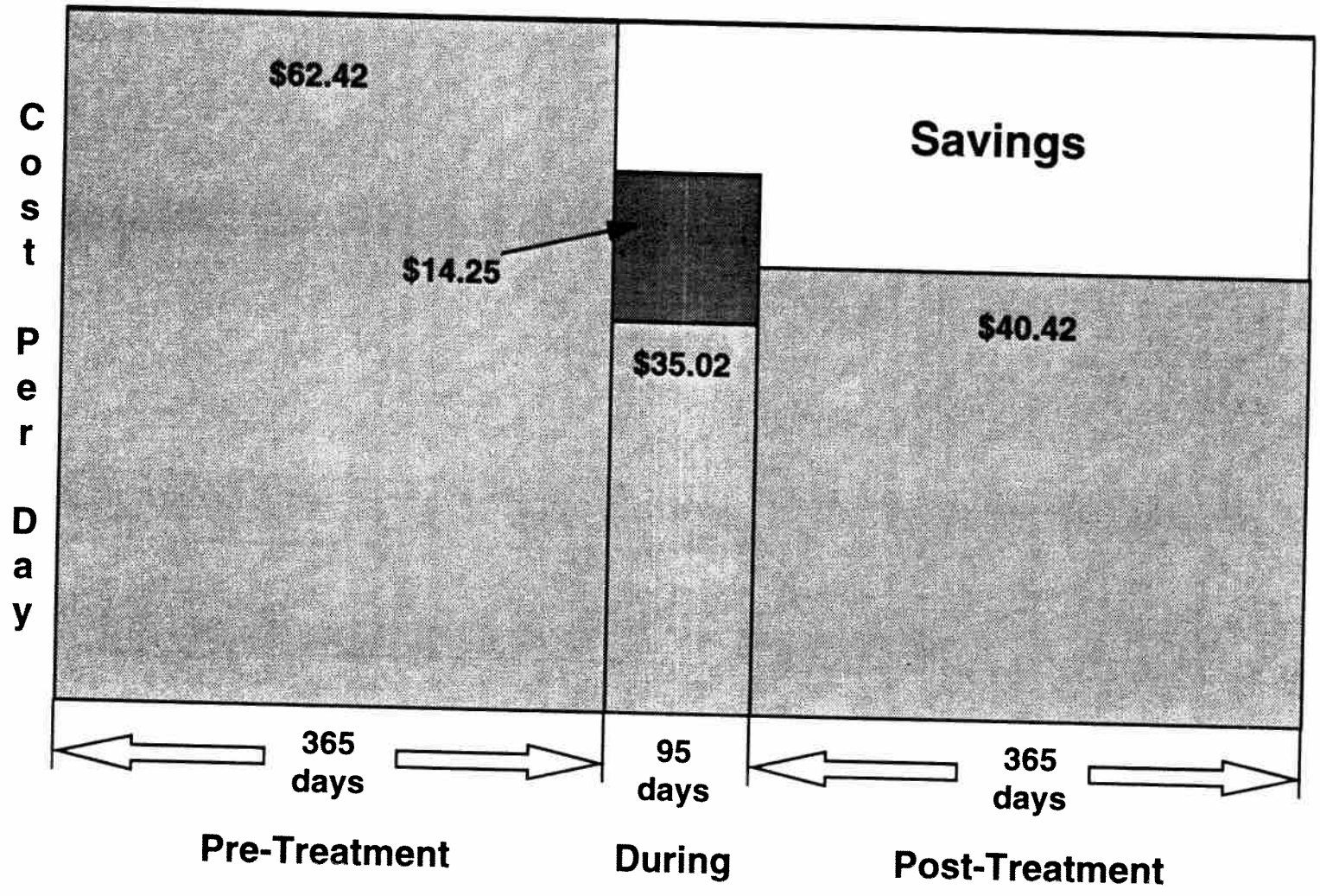
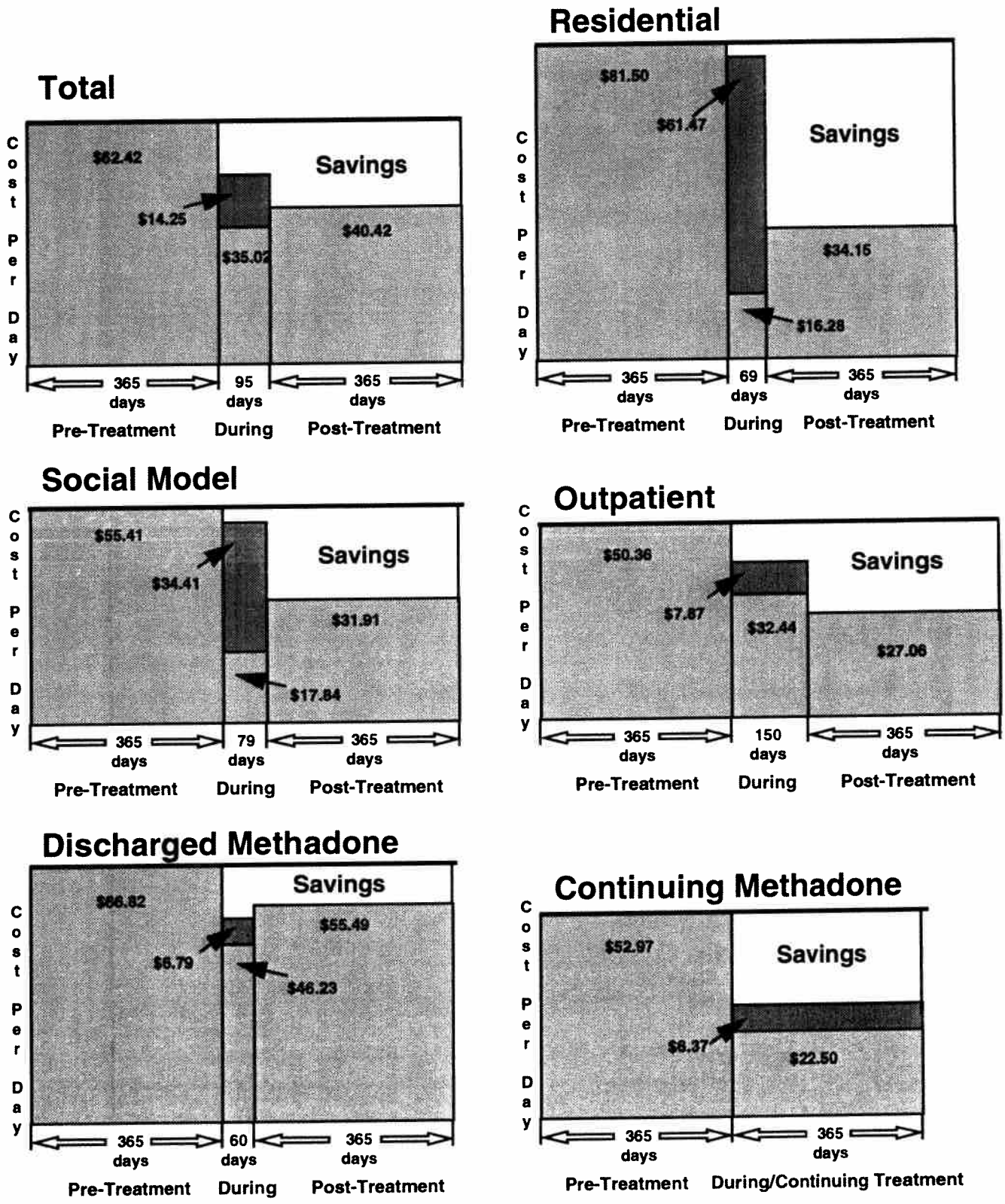


Figure 8
Drug and Alcohol Treatment Results in Net Savings to Tax Paying Citizens



= Costs to Law Abiding Citizens = Cost of Treatment = Savings to Law Abiding Citizens

Costs = Shaded Regions = Cost Per Day * Number of Days

Savings = Clear Regions = Difference between Expected and Observed Costs

Figure 9
Benefits of Substance Abuse Treatment Outweigh the Costs for Tax Paying Citizens and Will Continue to Increase Over Time

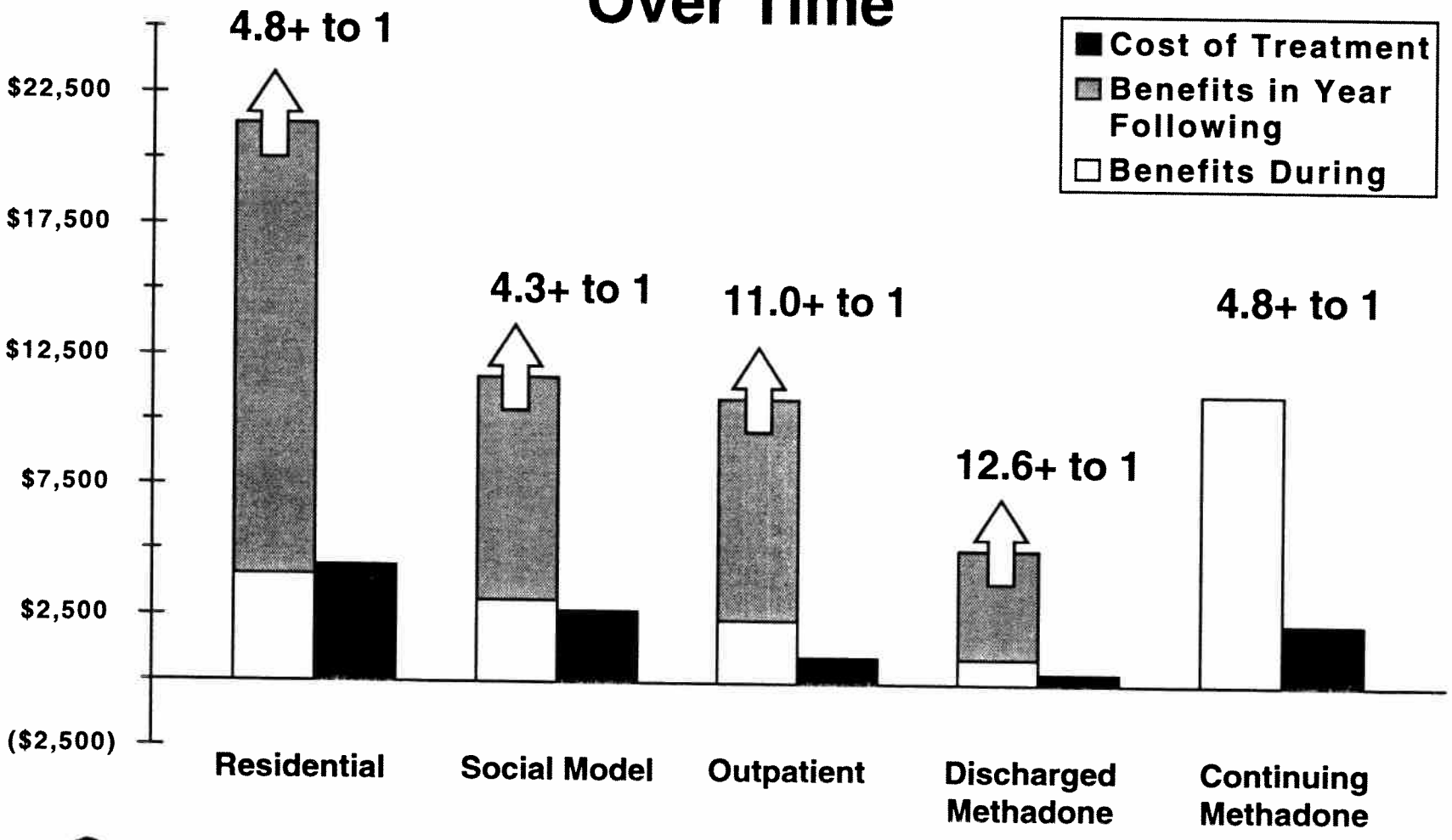
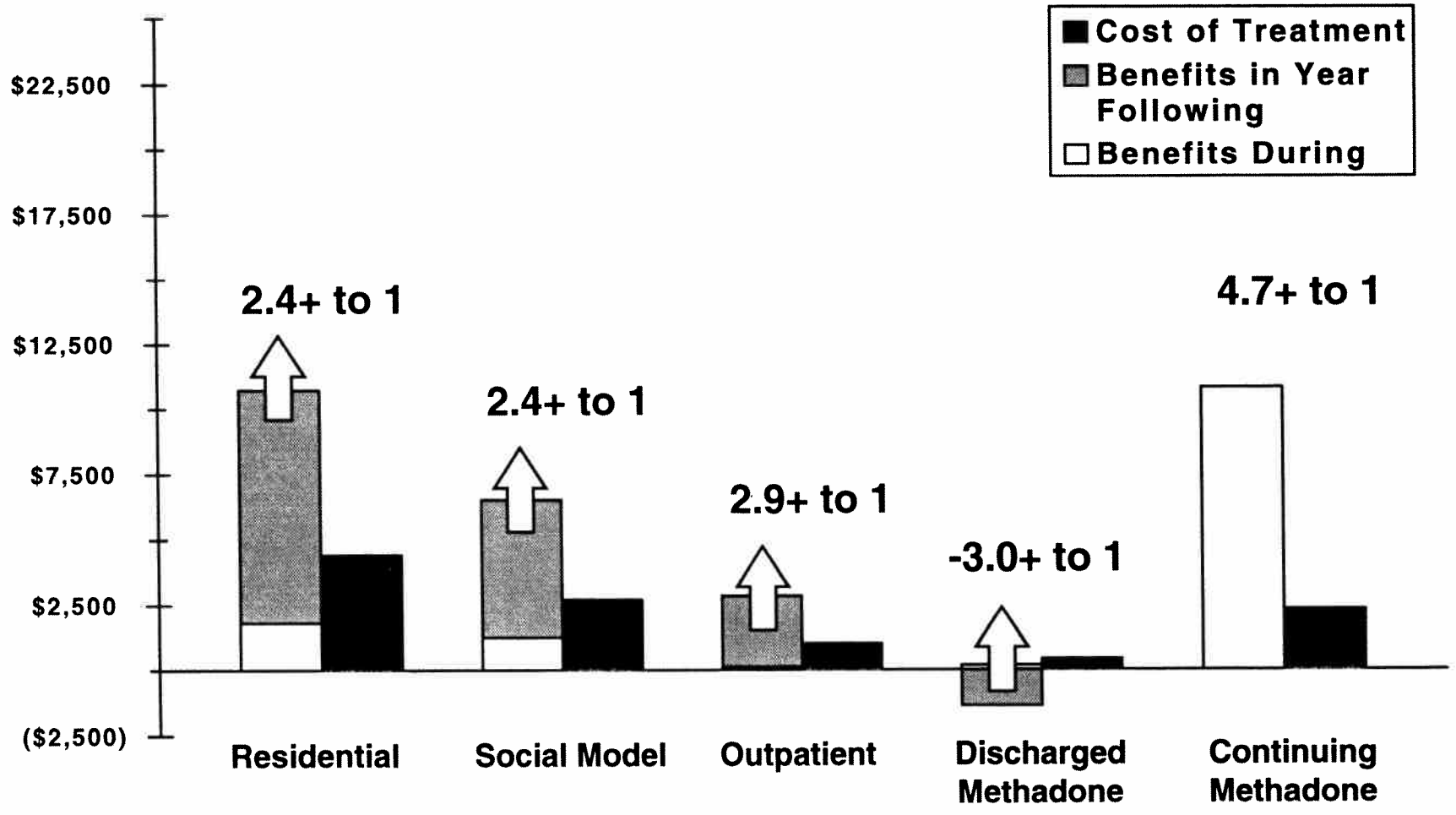


Figure 10
Benefits of Substance Abuse Treatment Outweigh the Costs to Society and Will Continue to Increase Over Time



The Share of Participants Improving

Focusing on average changes in cost (e.g., change in costs to taxpaying citizens from before to after treatment) belies the facts that (1) not all drug abusers improve during a course of treatment and (2) some participants exhibit greater changes than others. Figure 5 shows that on average more participants improved than did not. During treatment, 72.4 percent of participants showed some improvement (reduced their costs to taxpaying citizens relative to the year before treatment) versus 27.2 percent who declined (increased their costs to taxpaying citizens compared to the year before treatment). Around a half a percent showed no change in their economic impacts. Following treatment, 65.8 percent showed reductions in costs compared to before treatment as compared to 34.3 percent who did not. Following discharge from treatment a modest number of additional participants exhibited poorer outcomes. The relative degree of change also shifted somewhat from during to following treatment; some participants who had reduced their economic impacts by 1-50 percent during treatment ended up either further reducing their costs or, disappointingly, moving in the opposite direction.

The magnitude of success varied across modalities, as can be seen in Figure 6. Almost half of the residential and social model treatment participants showed 50 percent or greater improvements (48.0 percent and 44.0 percent of participants respectively) but only a fifth of discharged methadone participants were able to reduce their economic impacts to this degree following their treatment. By contrast, over half of the continuing methadone participants reduced their costs to taxpaying citizens by more than 50 percent.

Combined Findings

When savings realized during treatment are added to savings following treatment, the overall success of treatment provided in California were significant (see Figures 6-10 and Tables 33-38). In all, treatment provided in the State of California and within the scope of this study saved taxpaying citizens $1,493 million during and following treatment, at a cost of $209 million. Savings to society -- the alternative measure -- were lower at $454 million. Figure 7 demonstrates how "savings" have been calculated in this analysis. The height of each segment of the graph indicates the average per-day cost to taxpaying citizens. As defined in this analysis, "savings" is the difference between observed economic impacts during and after treatment, and the baseline or "expected" costs based on participant behavior before treatment. Accordingly, the lower relative height for the during treatment and post treatment periods suggest savings that accrue over the duration of the period (shown in the width of the bar).

In the graph, savings during and after treatment are represented by the white area, while the lightly shaded area represents costs in respective periods (before, during and after treatment), and the dark box is the cost of treatment. Daily savings during treatment are thus equal to the difference between costs to taxpaying citizens per day before treatment ($62.42 per day) minus their costs while in treatment ($35.02 per day) for a daily benefit of $27.40 while in treatment. The total benefit during treatment equals $27.40 times 95 days (the average length of a treatment

Table 33. Costs and taxpayer benefits in the year after treatment by modality

	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Daily Costs Before	$81.50	$55.41	$50.36	$66.82	$52.97
Daily Costs After	34.15	31.91	27.06	55.49	(22.50)
Episode Savings	17,283	8,580	8,503	4,134	(11,122)
Episode Treatment Cost	4,405	2,712	990	405	(2325)
Benefits to Costs During Treatment	**3.92**	**3.16**	**8.59**	**10.21**	**(4.78)**

Figures in parentheses are based on one year of treatment for continuing methadone particpants (CMM). These data are provided for comparison only: there was no "Year After Treatment" for CMM.

Table 34. Costs and benefits to society in the year after treatment;

	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Daily Costs Before	$98.20	$94.98	$63.44	$105.21	$92.12
Daily Costs After	73.70	80.55	55.94	109.00	(62.44)
Episode Savings	8,946	5,266	2,737	-1,384	(10,833)
Episode Treatment Cost	4,405	2,712	990	405	(2,325)
Benefits to Costs During Treatment	**2.03**	**1.94**	**2.76**	**-3.42**	**(4.66)**

Figures in parentheses are based on 1 year's of treatment for continuing participants. Data on continuing participants is provided for comparison only: there is no "Year After Treatment" for participants still enrolled in their reference episode.

Table 35. Total benefits and costs to taxpayers by modality

	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Savings per Day During	$65.22	$37.57	$17.92	$20.59	$30.47
Savings per Day After	47.35	23.51	23.29	11.32	N/A
LOS (average days)	69	79	150	60	(365)
Cost per Day of Treatment	61.47	34.41	7.87	6.79	6.37
Total Cost Per Episode	4,405	2,712	990	405	(2,325)
Total Benefits	**$21,341**	**$11,683**	**$10,891**	**$5,093**	**$(11,122)**
Benefits to Costs	**4.84**	**4.31**	**11.00**	**12.58**	**4.78**

N/A = Not Applicable (post treatment values not applicable for continuing participants).

Table 36. Total benefits and costs to society by modality

	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Savings per Day During	$22.19	$12.79	$10.60	$14.14	$29.68
Savings per Day After	24.51	14.43	7.50	-3.79	N/A
LOS (average)	69	79	150	60	
Cost per Day of Treatment	61.47	34.41	7.87	6.79	6.37
Total Cost Per Episode	4,405	2,712	990	405	(2,325)
Total Benefits	**$10,744**	**$6,509**	**$2,853**	**$-1,206**	**$(10,833)**
Benefits to Cost	**2.44**	**2.40**	**2.88**	**-2.98**	**4.66**

N/A = Not Applicable (post treatment values not applicable for continuing participants).

Table 37. Total system benefits and costs for taxpayers (in thousands of dollars)

	Total (incl.CMM)	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Total Savings During	$393,144	$86,887	$20,787	$121,724	$55,430	($108,316)
Total Savings After	1,099,701	370,012	57,472	433,318	238,899	N/A
Total Savings	1,492,845	456,899	78,259	555,042	294,329	
Costs of Treatment	208,972	94,312	18,167	50,462	23,389	(22,642)
Benefits to Costs	**7.14**	**4.84**	**4.31**	**11.00**	**12.58**	**4.78**

N/A = Not Applicable (post treatment values not applicable for continuing participants).

Table 38. Total system benefits and costs to society (in thousands) of dollars

	Total (incl. CMM)	Residential	Social Model	Outpatient	Methadone Discharge	Methadone Continuing
Total Savings During	$168,558	$38,496	$8,327	$5,895	$10,292	($105,548)
Total Savings After	285,842	191,525	35,272	139,049	-80,004	N/A
Total Savings	454,430	230,021	43,599	144,944	-69,712	(105,548)
Costs of Treatment	208,972	94,312	18,167	50,462	23,389	(22,642)
Benefits to Costs	**2.17**	**2.44**	**2.40**	**2.87**	**-2.98**	**4.66**

N/A = Not Applicable (post treatment values not applicable for continuing participants).

episode), or about $2600 per participant. This was partially offset by the cost of treatment, which averaged $14.25 per day over 95 days for a cost of $1350 per episode. The net benefit during treatment was about $1250 per episode ($2600 minus $1350), indicating that treatment generally paid for itself while it was being delivered.

However, the primary objective of treatment is to reduce costs following treatment. The benefit in the year following treatment equalled $22.00 per day (that is, $62.42 per day minus $40.42 per day) times 365 days, for a value of about $8,000. The graph shows that most of the savings indicated by the white area accrued in the year following treatment

The results for the entire system and each of the treatment modalities studied in this analysis are presented in Figure 8 for comparison purposes. Residential treatment participants had the greatest absolute and proportional benefits (reductions in cost from before treatment to after treatment), at $47.35 per day, for a 58 per cent reduction in costs. Savings were also sizable relative to pre-treatment costs for social model and outpatient treatment, and for participants enrolled in continuing methadone. Discharged methadone participants also exhibit benefits, however, they were smaller in proportion to pre-treatment costs than for the other treatment modalities.

A direct comparison of benefits relative to the costs of treatment is provided by Figure 9. This figure uses a bar chart to compare benefits to costs and calculates the ratio of benefits to costs through the first year after discharge from treatment. It is evident that for each modality of treatment the summed benefits from, during and after the first year after treatment significantly exceeded the cost of delivering the episode of care. For residential treatment the ratio of benefits to costs was 4.8. Comparable ratios were obtained for social model treatment and for continuing methadone. Much higher ratios of 11 to 1 and 12.6 to 1 were estimated for outpatient and discharged methadone participants. These high ratios were achieved primarily because the cost of these latter two modalities were quite low.

Figure 9 again demonstrates that the benefits from residential treatment were greatest (about $22,000), while those for discharged methadone participants were lower (about $5,000) than for other types of treatment. The arrow at the top of the benefits bar for the first four modalities indicates that benefits from treatment will probably continue to accrue into the indefinite future, which will further increase the ratio of benefits to costs. With continuing methadone participants all estimated benefits were from the in-treatment period, which corresponds directly to the period for the costs, thus there is no estimate for post-treatment benefits.

More conservative--but still generally positive--benefit to cost ratios were produced using the cost to society measures Figure 10 presents bar charts comparing benefits and costs for each type of treatment. Recall that cost to society puts a large weight on employment of the participant, while omitting the values of theft and income transfer payments. The treatment with the greatest ratio of benefits to costs was continuing methadone, at 4.7 to one. Residential and social model treatment produced benefits 2.4 times greater than the cost of treatment, and drug free outpatient treatment produced a positive ratio of 2.9 to 1. In strong contrast, discharged methadone

participants had a negative ratio of benefits to costs of (-3) to one. This result appears to have been obtained because discharged methadone participants rarely improve their employment or wage rates during short periods of treatment or after treatment, and generally proceed to have progressively poorer employment.

Continuing methadone and residential treatment yield the greatest absolute benefits to society (about $11,000). Social model and outpatient drug free treatment yield less (about $6,500 and $3,000, respectively). Apart from continuing methadone treatment, the more expensive treatment modalities yield the greatest absolute benefits, and the cheapest modality (discharged methadone) produces no benefits to society at all.

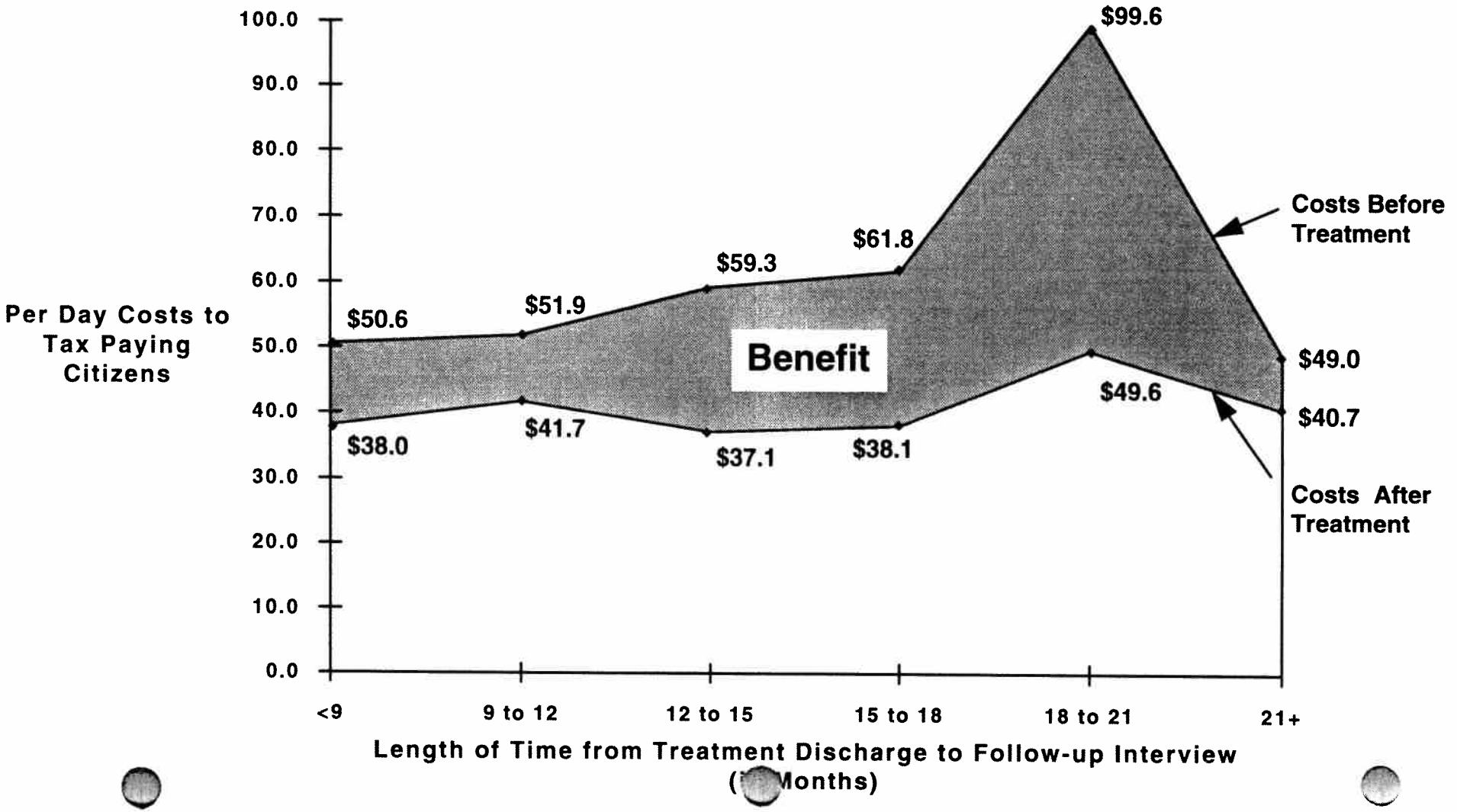
The values in this section are modest overestimates of the net benefits, and underestimates of costs. This is because about 35 percent of participants reenter treatment during the follow-up period. This means that treatment expenses were somewhat higher than estimated here, and that some of the post-treatment benefits estimated here were probably attributable to the subsequent treatment episodes rather than the treatment episode of record. We expect to explore these issues in further analyses.

Lifetime Treatment Benefits

The benefits of a treatment episode may endure across a participant's entire lifetime, or they may not. Even treatment episodes that are followed by relapse are believed by many researchers to contribute to future recovery by building participant knowledge and skills that will ultimately be necessary for them to sustain recovery. This study has not yet followed up either successful or relapsed participants for a sufficient time to develop highly reliable lifetime projections. We have examined both the level of benefits beyond one year after treatment discharge and examined whether benefits were increasing or decreasing. Some of the participants in this study were interviewed as much as two years and as little as 6 months following discharge from treatment. Figure 11 compares the trends in benefits for all participants based on the time since discharge from treatment. Participants are grouped by 3 month intervals from time of discharge. Further breakdown by treatment modality will be carried out in subsequent analyses. For the time being, these data are highly suggestive, but involve sufficient unexplained variation, particularly toward the end of the period, that we are hesitant to extrapolate far beyond the observation period as is required to generate lifetime benefit estimates.

Figure 11 consistently shows treatment benefits being sustained across nearly two years following discharge. The measure of costs per day to taxpaying citizens after treatment was fairly stable across five of the six periods at about $40 ($37.10--41.70/day); only for the group which is 18-21 months post-discharge was this number elevated. The pre-treatment baseline costs per day to taxpayers vary much more, which is not, of course, attributable to treatment but may reflect biases due to modality composition; the longer post-discharge groups have proportionately more participants from modalities which had shorter lengths of stay, namely residential and methadone discharge, and participants in these modalities reported appreciably higher daily baseline costs than outpatient and social model participants. The final group, interviewed more

Figure 11
Benefits from Treatment Do Not Diminish Over the Post-Treatment Period



than 21 months after treatment, is relatively small (N=129, compared to N's of 182 to 387 in the other groups), so the reported daily costs before and after treatment for this group is subject to greater sampling error.

Lifetime benefit estimates would also be affected by whether participants receive future treatment episodes. As noted above, about 35% of participants reentered treatment at least one time during the follow-up period. Clearly the benefits estimates must be adjusted for these participants. However, for the 65% who did not reenter treatment the benefits estimates do not require adjustment. When benefits were examined for these participants across time from discharge it was found that benefits were generally increasing relative to pre-treatment costs until 21 months, at which point they declined. There was no apparent trend in the duration of benefits for participants readmitted to treatment.

Overall, the evidence is good that benefits were sustained following treatment, but the exact trend after the first year is somewhat unclear. Thus the ratios of benefits to costs and the estimates of economic benefits from treatment reported in the prior sections were probably conservative. It is indeed likely that many participants will demonstrate the positive effects of treatment for the rest of their lives. While the follow-up work performed to date is insufficient to project the magnitude of those values with confidence, it is fair to conclude that the net benefits estimated for one year following discharge will continue to grow. To estimate the value of future benefits more refined estimates will adjust for treatment readmissions, and similar data must be collected on participants in future years.

Summary

Substance abusers treated in the California public treatment system in 1991 reduced their criminal activity and health care utilization during and in the year subsequent to treatment by amounts worth well over $1.4 billion. About $209 million was spent providing this treatment, for a ratio of benefits to costs of 7 to 1. These findings were based on analyses of data representative of nearly 150,000 persons treated for alcohol, drug, or combined problems in inpatient (residential and social model) and ambulatory (outpatient and methadone) treatment settings.

For the average person who completed treatment during the reference period, benefits of about $10,000 were realized for a treatment that lasted 95 days and cost about $1360. Also, treatment for participants who remained continuously enrolled in methadone programs realized savings approaching $11,000 per person/year at a cost of $2,325 for that period. These savings included reduced criminal justice expenses (police protection, adjudication, and corrections), reductions in victim losses (stolen and damaged property, injuries, and lost work), and generally lower levels of health care utilization (hospitalizations, emergency room use, outpatient care)--but were offset by modest increases in welfare and disability dependence as well.

This analysis has generally used the method employed in "costs effect" studies of substance abuse treatment. Health-care expenditures were only a small part of total costs in this study. It

was found that annual per capita health-care expenditures declined $758 for discharged participants from $3,227 before treatment to $2,469 after treatment. Therefore, health-care benefits in one year after discharge alone "offset" about 55 percent of the cost of a treatment episode. There appeared to be only minor differences in health-care benefits across the various types of treatment, thus the "offsets" for residential and social model treatments were smaller than for outpatient and discharged methadone participants.

A major finding of this analysis is that, regardless of the modality of care, treatment-related economic savings outweighed costs by at least 4 to 1 (inpatient settings) and appeared to be greater than 10 to 1 for outpatient and discharged methadone participants. For residential and social model care, benefits during treatment barely covered the costs of providing care--however, benefits following treatment were substantial. The types of programs that produced the greatest absolute benefits were also the most expensive. The least expensive treatments yielded the lowest absolute benefits.