
COST EFFECTIVENESS OF SUBSTANCE USE DISORDER TREATMENT IN NEW HAMPSHIRE

Clinically Managed High Intensity
Residential Treatment Services

January 1, 2020



Compiled by the Community Health Institute/Center for Excellence for the NH Governor's Commission on Alcohol and other Drugs with support from the New Hampshire Department of Health and Human Services Bureau of Drug and Alcohol Services

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Cost Effectiveness:
New Hampshire Substance Use Disorder Treatment Services
Clinically Managed High Intensity Residential Treatment Services

Executive Summary

In 2018, New Hampshire House Bill 1626 (HB 1626) was passed into law requiring cost effectiveness reports of certain substance use prevention and treatment programs. This study of Clinically Managed High Intensity Residential Treatment Services in New Hampshire was undertaken in fulfillment of this statutory requirement. Clinically Managed High Intensity Residential Treatment Services (American Society of Addiction Medicine Level 3.5) is a treatment program type with a relatively large number of clients, serves clients with the highest level of substance use disorder acuity, and is a relatively high cost program with respect to state expenditures.

Focus of the Cost Effectiveness Analysis

Cost in this study is defined as actual service costs that were paid by the NH Department of Health and Human Services, Bureau of Drug and Alcohol Services (BDAS) for client services delivered in a American Society of Addiction Medicine (ASAM) Level 3.5 care setting.

Effectiveness in this study is defined by client-level change in indicators of National Outcome Measures as recorded at the point a client is admitted for care that incorporates ASAM Level 3.5 care and following the end of their ASAM Level 3.5 care. The National Outcome Measures for substance use treatment are:

- No use of alcohol
- No use of illicit drugs
- No new criminal justice involvement
- Employment or school participation
- Peer/Community support participation
- Housing stability

The primary data source for cost and effectiveness relies on the New Hampshire Web Information Technology System (WITS) data system, which is used to track patient admission, program enrollment, and activity through the system. The study sample (n=236) was clients who received Level 3.5 care in State Fiscal Year 2019 (July 1, 2018 - June 30, 2019) where 1) the services were paid by BDAS, 2) the majority of costs incurred for a client during the year was for Level 3.5 care, and 3) a record of outcome measures was available at both admission and discharge.

Summary of Findings

The median age of clients included in the study cohort was 35 years at the time of admission, ranging from 21 to 73 years old. Opioids overall were the most commonly cited primary substance of use at admission (“Other Opiates and Synthetics” (28.4%) and Heroin (25.4%)) followed by Alcohol (31.4%).

Costs: The average number of ASAM Level 3.5 days (residential treatment days) was 17.9, with an average cost of about \$3,297.

Outcomes: About 56% of clients who had used alcohol at any point in the 30 days prior to admission had not used alcohol 30 days prior to discharge. A lower proportion of clients (36.5%) who indicated drug use at admission had moved to no drug use in the 30 days prior to discharge from treatment. Among the outcome measures supportive of reduced substance use, no new criminal justice system involvement and peer support participation showed the greatest positive change.

A measure of treatment effect was created by deriving a composite NOMs score at admission and at discharge for 3 groups of clients: those who indicated alcohol use only, those who indicated drug use only, and those who indicated both alcohol and drug use. The observed treatment effect as measured by the change in Composite NOMs Score was positive and statistically significant for each cohort.

Cost Effectiveness: A measure of cost and effect was calculated by dividing the average cost of care associated with Level 3.5 care by the net change in the Composite NOMs scores. The cost / effect ratio for all clients included in the study was \$2,637.57 per unit change in the Composite NOMs Score. The lowest cost / effect ratio was observed for clients reporting alcohol as the primary substance at admission (\$2,272) and the highest cost effect ratio was observed for clients indicating Heroin or Other Opioids as the primary substance of use at admission (\$2,898).

Factors Associated with Positive Treatment Outcomes: Variables independently and significantly associated with positive treatment outcomes (as defined by moving from active substance use at admission to no use at discharge) were peer support participation at discharge, independent living arrangements at discharge, duration of residential treatment, treatment completion status, and referral source (Health Care Providers, Court/Criminal Justice, and Other Community Referrals).

The most commonly cited influence on costs reported by agencies providing 3.5 Level residential treatment services was staffing, including education and licensing requirements to have staff that provide good quality care. The most commonly cited influences on substance use outcomes was length of time in good quality care and supportive environments/networks.

Recommendations for Data Quality Improvement: Through this first of its kind of study in New Hampshire a number of quality improvement opportunities for current data collection systems were identified. Recommendations include 1) engaging with the WITS management

vendor to better understand the data collection structure and make needed improvements, 2) work with providers of substance use disorder services to gain better understanding of how client data is collected and entered into the WITS database as well as to work collaboratively to improve the utility of the information, and 3) conduct longer term follow up data collection with clients after disenrollment from care in order to understand any enduring effects of treatment.

Background and Introduction

In 2018, New Hampshire House Bill 1626 (HB 1626) was passed into law requiring cost effectiveness reports of certain substance use prevention and treatment programs. This study of Clinically Managed High Intensity Residential Treatment Services in New Hampshire was undertaken in fulfillment of this statutory requirement.

Legislation and Statutory Requirement. The 2018 HB1626 requires the Commissioner of the New Hampshire Department of Health and Human Services in conjunction with the Governor's Commission on Alcohol and Other Drugs to make an annual report relative to the cost effectiveness and outcomes of programs funded in whole or in part by the Governor's Commission (see RSA 12-J:5 Report on Cost-Effectiveness and Outcomes of Programs Required.)

- Commencing January 1, 2020 and annually thereafter, the Commission shall issue a report reflecting currently funded programs and findings relative to the evidence of effectiveness on the intended outcomes of programs funded in whole or part by the Governor's Commission
- Each annual report shall provide an evaluation of 4 programs, alternating between treatment and prevention.
 - The programs selected shall be chosen from among the 10 highest dollar value programs in that category based on expenditures
 - No law enforcement programs shall be selected
- "Program" means a set of systematic activities that engage participants in order to achieve desired outcome"
- "Outcome" means the program effects in the participant population
- "Evidence of effectiveness" means documented assessment of the effect of the program on the intended outcome for program participants, or program beneficiaries in the case of prevention programs

Although the legislation was informed by work done through the [Pew-MacArthur Results First Initiative](#), there are distinct differences between the Results First Initiative and the NH legislation to conduct cost effectiveness analysis.

The Results First Initiative is based upon cost benefit analysis; while the legislation calls for cost effectiveness analysis. Cost effectiveness analysis is a form of economic analysis that shows the relationship between the program costs and outcomes (effects) on individuals (e.g., changes in behavior). Cost benefit analysis uses monetary terms for not only the program costs but also for the outcomes by assigning monetary value to the benefits of the program.

1. The legislation in NH sought to identify a specific subset of existing programs in the state--the highest cost substance use disorder treatment and prevention programs--and conduct cost effectiveness analysis of those programs. The Results First Initiative, meanwhile, has developed a "Results First Clearinghouse Database, an online resource that brings together information on the effectiveness of social policy programs from nine national

clearinghouses...this database can help users easily access and understand the evidence base for a variety of programs¹.”

2. The Results First Initiative primarily relies on existing literature and evaluations as the basis for its review process, whereas the cost effectiveness study in New Hampshire necessitated original analysis of primary data collected within the state in order to undertake a direct study of actual program experience and cost effectiveness.

The scope of the legislated cost effectiveness work includes two phases:

- 1) Develop a Program Inventory
- 2) Conduct Cost Effectiveness Analysis

JSI Research & Training Institute, Inc. (JSI) / NH Community Health Institute (CHI) Center for Excellence in Addressing Alcohol and Drug Misuse was contracted by the New Hampshire Bureau of Drug and Alcohol Services (BDAS) to conduct the cost effectiveness analysis. JSI initiated the scope of work by forming a work group made up of key stakeholders to ensure there would be informed input, guidance on data availability and utilization of the findings. This work group was made up of key leadership in the Department of Health and Human Services Quality Assurance and Improvement and the Bureau of Drug and Alcohol Services in addition to project staff at JSI.

Phase 1 was completed on March 1, 2019. The Program Inventory lists each of the funded programs and provides details about each program. The inventory offers criteria about programs for decision-makers to consider when looking to identify where current investments are being made.

Phase 2: conducting cost effectiveness analysis, was subsequently initiated based upon the information in the Program Inventory.

On June 21, 2019 the Governor’s Commission approved the recommendation that the initial cost effectiveness study focused on substance use treatment follow these guidelines:

- Use [American Society of Addiction Medicine](#) (ASAM) levels of care to identify programs
- Focus the first cost effectiveness report on Clinically Managed High Intensity Residential Treatment Services, which is ASAM level 3.5 (see section below for more details about this level of care) given the fact that this level of care:
- Is the only treatment program type in which the cost for each of the state funded programs are among the 10 highest expenditures
 - Serves one of the highest number of clients by ASAM level of care
 - Serves clients with the highest level of substance use disorder acuity

¹ <https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2015/results-first-clearinghouse-database>

Focus of the Cost Effectiveness Analysis

The cost effectiveness analysis is based upon *cost* incurred by the provision of 3.5 level of care and *outcomes* among clients who receive 3.5 level of care.

Cost in this study is defined as actual service costs that were paid by the Bureau of Drug and Alcohol Services for client services delivered in a 3.5 level of care setting.

Effectiveness in this study is defined by client-level change in indicators of National Outcome Measures (NOMs) as recorded at the point a client is admitted for care that incorporates 3.5 level of care services and following the end of their 3.5 level of care services.

Listed below are the six treatment NOMs, which are expressed as positive attributes related directly or indirectly to substance use disorder recovery. The treatment NOMs are collected at admission and discharge from an episode of care at a treatment provider agency. The information collected describes client status relative to the treatment NOMs over the 30-day period prior to intake and 30-day period prior to discharge from treatment. There are some limitations to the NOMs with respect to the level of granularity that can be identified as the type of change at a client level. For example, the NOMs are a record of whether a client used alcohol or not. The NOMs do not measure the change in frequency of alcohol use, although for some clients in the study cohort this information was available and incorporated in this analysis. The NOMs for substance use treatment are:

- No use of alcohol
- No use of illicit drugs
- No new criminal justice involvement
- Employment or school participation
- Peer/Community support participation
- Housing stability

The study sample for the cost effectiveness analysis is defined as clients who received any 3.5 level of care utilizing BDAS funding in FY2019 (July 1, 2018-June 30, 2019). Clients included in the sample may have had 3.5 level of care services that began prior to the start of FY2019 and/or extended past the close of FY2019. Because the study focuses on costs associated with care, only services that had been submitted for billing and adjudicated for payment were considered. The primary data source for cost and effectiveness relies on the New Hampshire Web Information Technology System (WITS) data system, which is used to track patient admission, program enrollment, and activity through the system.

Conventionally, cost effectiveness analysis is conducted to compare the relative cost of producing a unit of outcome or benefit under different scenarios. Cost effectiveness analysis can be conducted to compare a base level program to variations or enhanced versions of that program or a different program. The calculation is based on the cost of a unit of desired outcome across different

approaches. As other researchers² have cited, conducting cost effectiveness analysis with substance use treatment programs presents a unique set of challenges.

In the context of the current cost effectiveness study of substance use treatment programs that offer 3.5 level of care, the alternative option for comparison of those clients who need 3.5 level of care, but do not receive it, is unknown. The current clinical practice for identifying that a client is in need of a particular program is based on the ASAM assessment criteria for determining the most appropriate level of care according to an individual client's clinical and social presentation. Consequently, an appropriate comparison group would be individuals who needed, but did not receive 3.5 level care, for whom outcome information is not available, nor is information about the alternative courses of care they may have received including no treatment at all.³ Similarly, comparing programs that offer the same level of care is not considered comparing alternatives (unless there is something different about the programs that can be identified).

It is known that some clients who need this level of care either complete their treatment, are referred to other providers, or do not complete treatment. The length of stay (duration) in treatment can also be a variable that distinguishes treatment costs and effectiveness. One aspect of this study was to assess the relationship between treatment duration, cost and outcomes.

² Sindelar, Jody & Jofre-Bonet, Mireia & French, Michael & McLellan, A.Thomas. (2004). Cost-Effectiveness Analysis of Addiction Treatment: Paradoxes of Multiple Outcomes. *Drug and alcohol dependence*. 73. 41-50. 10.1016/j.drugalcdep.2003.09.002.

³ Future investigation to identify the existing alternatives to meet the needs for the same population of clients could provide options for comparison.

Clinically Managed High Intensity Residential Level of Care

According to the [American Society of Addiction Medicine \(ASAM\)](#), Clinically Managed High-Intensity Residential Services (Adult Only) known as ASAM Level 3.5 is a residential level of care that “provides 24-hour care with trained counselors to stabilize multidimensional imminent danger and prepare for outpatient treatment.⁴” The length of stay is based on time needed for stabilization of the imminent danger that made the patient appropriate for the level of care.

Services provided in an ASAM 3.5 level of care typically include:

- Individual/group/family counseling
- Case management
- Relapse prevention / educational groups
- Medication management
- Motivational enhancement and engagement strategies
- Reintegration into work, education, and/or family life
- Supportive and structured milieu

An overview of unique services provided by these programs are identified later in the report.

Research Questions

The questions that guide this study of cost effectiveness are:

1. What are the characteristics of the programs that offer 3.5 level of care? How are the programs similar or different from each other? To what extent are evidence based practices offered?
2. What are client characteristics (demographic information, referral source)?
3. What is the cost of care?
4. What outcomes are seen among clients?
5. What is the relationship between the cost of service for 3.5 level of care and client outcomes?
6. Are there particular NOMs that show positive outcomes in 3.5 level of care?
7. Does achievement of quality metrics of service influence or mediate outcomes?
 - a. Number and percent of clients receiving services within 14 days of social detox screener
 - b. Number and percent of clients enrolled in the program for at least 3 days (3-5 days)
 - c. Number and percent of clients enrolled in the program for at least 6 days (6 or more days)
 - d. Number and percent of clients receiving ASAM Level of Care within 30 days of the original social detox screener
 - e. Number and percent of clients collectively who successfully completed treatment (i.e., completed or transferred to another program)

⁴ American Society of Addiction Medicine “What are the ASAM Levels of Care?”

<https://www.asamcontinuum.org/knowledgebase/what-are-the-asam-levels-of-care/> Accessed on 12/24/19

Methodology

In order to answer the research questions, the study utilizes a mixed methods design, relying on two primary sources of data: The New Hampshire Web Information Technology System (WITS) and survey data from state funded providers of 3.5 level services.

The New Hampshire Web Information Technology System (WITS). WITS is the source of quantitative data for the analysis including costs of services, client characteristics and client measures related to the National Outcome Measures (NOMs.) WITS is a secure web-based case management system maintained by the Bureau of Drug and Alcohol Services (BDAS) at the New Hampshire Department of Health and Human Services. All substance use disorder treatment providers who are contracted by BDAS are required to input client level data into WITS. This data is utilized by BDAS to meet all federal and state reporting requirements for funded services. Data from WITS used for the analysis includes such variables as client demographic information, primary/secondary/tertiary substance of use, referral source, units (days) of service, and costs paid by BDAS for services. The measures of desired outcomes (NOMs) are also collected in the WITS database and were used for the analysis. Details about the steps taken to extract and clean the target data from WITS can be found in Appendix A.

1. **Provider Agency Data.** In order to provide contextual information for the cost effectiveness analysis findings, a need for more information about the agencies providing 3.5 level of care was deemed necessary. There are factors that could potentially influence the extent of cost effectiveness of a particular treatment organization including both client factors and program infrastructure. There may be, for example, client factors related to social determinants of health (lack of housing stability, low income and others) that may require higher program costs in order to engage these clients and provide the services they need to ensure they have positive outcomes. Infrastructure considerations, such as number of years of experience in providing the care, staff qualifications, limited staff and/or programming available, (including no use or limited use of evidence based practices) would play a role in or challenge the ability to provide what is needed to affect client outcomes while keeping costs low. In order to gain information about these factors, a survey collecting quantitative and qualitative data was administered to providers of 3.5 level of care services. (See Appendix B for the survey questions.)

Analysis Plan

The following steps were taken to analyze the WITS data needed for the cost effectiveness study.

1. **Create data set** for each admission to 3.5 level of care where the data set includes demographics, referral source, substance used (primary/secondary/tertiary), frequency of use, number of 3.5 level of care service days received, paid cost of 3.5 level of care, intake/discharge NOMs associated with 3.5 level of care, reason for discharge and whether completed course of treatment. ⁵
2. **Create variables to identify quality metrics including:**
 - a. Time enrolled in program
 - b. Successfully completed treatment (completed or transferred to another program)
3. **Determine effectiveness by:**
 - a. Coding each client set of NOMs for direction of change between admission/enrollment and discharge/disenrollment. Options for coding change were: negative change, no change-not a current asset, no change-current asset, positive change.
 - b. Calculate the prevalence of clients in the data set who showed no change, negative change and positive change for each of the NOMs
 - c. Calculate the average net change across the set of NOMs by assigning numerical values to the change direction observed
4. **Determine cost by calculating:**
 - a. Total cost of 3.5 services across agencies
 - b. Average cost of 3.5 services per client across agencies
5. **Conduct comparative analysis:**
 - a. Total costs for clients receiving 3.5 level of care services.
 - b. Percentage of those who had positive NOMs
 - c. Total Cost / number of clients who had a positive change in NOMs
 - d. Compare data for those who completed treatment to those who did not complete treatment
 - e. Time in treatment
 - f. Incremental cost calculation
 - g. Regression analysis of variables associated with positive change in substance use
6. **Stratify data by variables such as demographic information, referral source, and type of substance to identify any differences in costs and effectiveness among subgroups.**

⁵ Note: There was insufficient consistency in the WITS data to reliably understand the relationship of the Social Detox Screener to receiving services. For example when looking at the date of the Social Detox Screener and start of services, 50 clients did not have a documented Social Detox Screener before the start of their treatment. Provide organizations were asked in the survey if they have any practices in place to ensure clients are receiving services within 14 days of a social detox screener. Responses indicated that in cases where the level of care needed is at capacity, efforts are made to find another program and/or let BDAS know of the enrollment limitation.

Findings

There are six agencies contracted by the NH Bureau of Drug and Alcohol Services to provide 3.5 level of care. Among these six agencies, one did not have any billed services to BDAS for 3.5 level of care meeting the criteria for inclusion in this study as previously described. (Note: it is possible the program served clients who were covered by another payer.) This agency, however, was asked and did participate in the survey to provide information about their 3.5 level of care services in order to have a complete set of contextual information from all agencies contracted by BDAS to provide 3.5 level residential treatment services.

As findings are reviewed, it is important to keep in mind that the data from WITS reflect BDAS funded 3.5 level of care services. Given that it was not practical to ask survey respondents to describe *only* BDAS funded clients or services, the information gathered via the provider survey reflect their overall 3.5 level of care services regardless of funding for those services.

Client Cost and Effectiveness Results (Data - Source: New Hampshire WITS)

The data set extracted from WITS according to the identified study criteria yielded 236 cases from 5 agencies for inclusion in the analysis. The analysis produced summary descriptive statistics such as client demographics; cost of services, observed change in National Outcome Measures between admission and discharge, and measures of cost effectiveness. The following tables and charts display the primary study findings and are organized as follows:

Table 1:	Descriptive Statistics - Demographics and Providers
Table 2:	Descriptive Statistics - Substance Use at Admission
Table 3:	Descriptive Statistics - Treatment Duration and Cost
Figures 1 and 2:	Change in National Outcome Measures from Admission to Discharge
Figures 3 and 4:	Change in National Outcome Measures from Admission to Discharge, Completed Treatment Cases
Table 4:	Composite NOMS Score, Net Effect
Table 5:	Cost and Effect by Primary Substance at Admission
Table 6:	Cost and Effect by Referral Source
Table 7:	Incremental Cost and Effect of Treatment Duration, not Including Pregnant and Parenting Women
Table 8:	Cost per Reduced Day of Substance Use
Table 9:	Regression Model of Factors Associated with Positive Treatment Outcomes

Appendix C includes additional Results Tables for particular subsets of the study cohort such as Pregnant and Parenting Women.

Table 1: Descriptive Statistics - Demographics and Providers							
All Cases, n=236							
Admission Age (years)		Gender (% of total cases)		Provider Agency (% of total cases)		Referral Source	
Mean	37.6	Male	58.9%	Farnum Center	48.7%	Safe Stations - Manchester	24.6%
Median	35	Female	40.7%	North Country Health Consortium	28.8%	Safe Stations - Nashua	8.5%
Min	21	Transgender	0.4%	Greater Nashua Council on Alcoholism (GNCA)	19.1%	Individual (includes self-referral)	24.2%
Max	73			Southeastern NH Services	1.7%	Court/Criminal Justice	12.7%
				Hope on Haven Hill	1.7%	Health Care Provider including behavioral health provider	18.6%
						Other Community Referral / Unknown	11.4%

As displayed by Table 1, the median age of clients included in the study cohort was 35 years at the time of admission, ranging from 21 to 73 years old. The majority of clients were male (58.9%). The most common referral sources were Safe Stations - Manchester (24.6%), Individual / self-referral (24.2%) and health care providers including behavioral health providers (18.6%). Farnum Center (48.7%) and North Country Health Consortium (28.8%) were the treatment providers for the majority of cases.

As displayed by Table 2 on the next page, Opioids overall were the most commonly cited primary substance of use at admission (“Other Opiates and Synthetics” (28.4%) and Heroin (25.4%)) followed by Alcohol (31.4%). About 16% of clients indicated use of both Alcohol and Drugs at the time of admission.

Table 2: Descriptive Statistics - Substance Use at Admission

All Cases, n=236

Primary Substance at Admission		Secondary Substance at Admission		Tertiary Substance at Admission		Substance Summary	
Opioids Total	53.8%	None*	53.0%	None*	84.7%	Drugs Only (any position^)	59.7%
Opioids Subtotal		Cocaine/Crack	13.1%	Marijuana / Hashish / THC	3.8%	Alcohol Only	24.6%
Other Opiates and Synthetics	28.4%	Methamphetamine	8.5%	Alcohol	3.4%	Alcohol and Drugs (any position^)	15.7%
Heroin	25.4%	Alcohol	5.5%	Cocaine/Crack	3.0%		
Alcohol	31.4%	Heroin	5.5%	Benzodiazepines	1.7%		
Methamphetamine	6.4%	Marijuana / Hashish / THC	4.2%	Other Opiates and Synthetics	1.7%		
Cocaine/Crack	4.2%	Other Opiates and Synthetics	3.8%	Methamphetamine	0.8%		
Other Amphetamines	2.1%	Other Amphetamines	2.5%	Other Amphetamines	0.4%		
Other Stimulants	1.3%	Other Stimulants	1.7%	Other Stimulants	0.4%		
Benzodiazepines	0.8%	Benzodiazepines	1.3%				
		Other Non-Barbiturates Sedatives or / Hypnotics	0.8%				

*None=No secondary and / or tertiary substance recorded. All clients have a primary substance (substance category) recorded.

^^Any position' means the substance was recorded in any one of the data entry fields - primary, secondary or tertiary - at admission.

Table 3: Descriptive Statistics - Treatment Duration and Cost				
All Cases, n=236				
	Days of High Intensity Residential Service (ASAM Level 3.5)	Total Paid Amount		Discharge Reason (% of all cases)
Mean (Std Dev)	17.9 days (18.1)	\$3,296.96 (\$3,666.08)		Completed Treatment 62.3%
Median	14.0	\$2,585.50		Left Against Treatment Advice 10.6%
Min	1	\$154.00		Program Decision to Discharge Client for Non-Compliance with Program Rules 8.5%
Max	152	\$38,760.00		Transfer to Another SA Treatment Program or Facility 1.3%
Sum	4,234	\$774,943.10		Transfer to another SA Facility, but did not report 0.8%
				Other 16.5%

As displayed by **Table 3**, the mean number of High Intensity Residential Service days received by clients included in the analysis was 17.9, with an average cost of about \$3,297. The total cost of 3.5 services paid by BDAS for the 236 clients included in the analysis was \$774,943. About 62% of clients were discharged from high intensity residential care upon ‘completing treatment’ while about 19% ‘left against treatment advice’ (10.6%) or were discharged for ‘program non-compliance’ (8.5%).

About 90% (89.8%) of 3.5 level clients had 3 or more high intensity residential service days (a BDAS indicator of engagement) and the number of clients with 6 or more days (a BDAS indicator of retention) was 77.1%. After reviewing the results of comparative outcomes analysis between multiple subgroups of treatment duration, it was determined that two categories – those with less than 14 service days and those with 14 or more service days – provided a logical (the median) and sufficient sample size for categorizing the treatment duration variable for further analysis of cost and effect.

Figure 1 displays changes in specific NOMs measures from admission to discharge. About 56% of clients who had used alcohol at any point in the 30 days prior to admission had not used alcohol 30 days prior to discharge (includes all clients who indicated alcohol as a substance of use whether primary, secondary or tertiary). A lower proportion of clients (36.5%) who indicated drug use at admission had moved to no drug use in the 30 days prior to discharge from treatment. Other columns display the percentage of clients who had an asset at admission that was unchanged at discharge (light green=current asset retained; e.g. 52.5% of clients had no recent criminal justice involvement at admission or discharge), or the percentage of clients who did not have the asset at admission or discharge (light red=not a current asset, no change; e.g. 6.4% of clients had new criminal justice involvement at both admission and discharge), or the percentage who had an asset at admission that was changed at discharge (dark red=negative change; e.g. 2.5% of clients had no recent criminal justice involvement at admission, but had new criminal justice involvement at discharge).

Figure 1

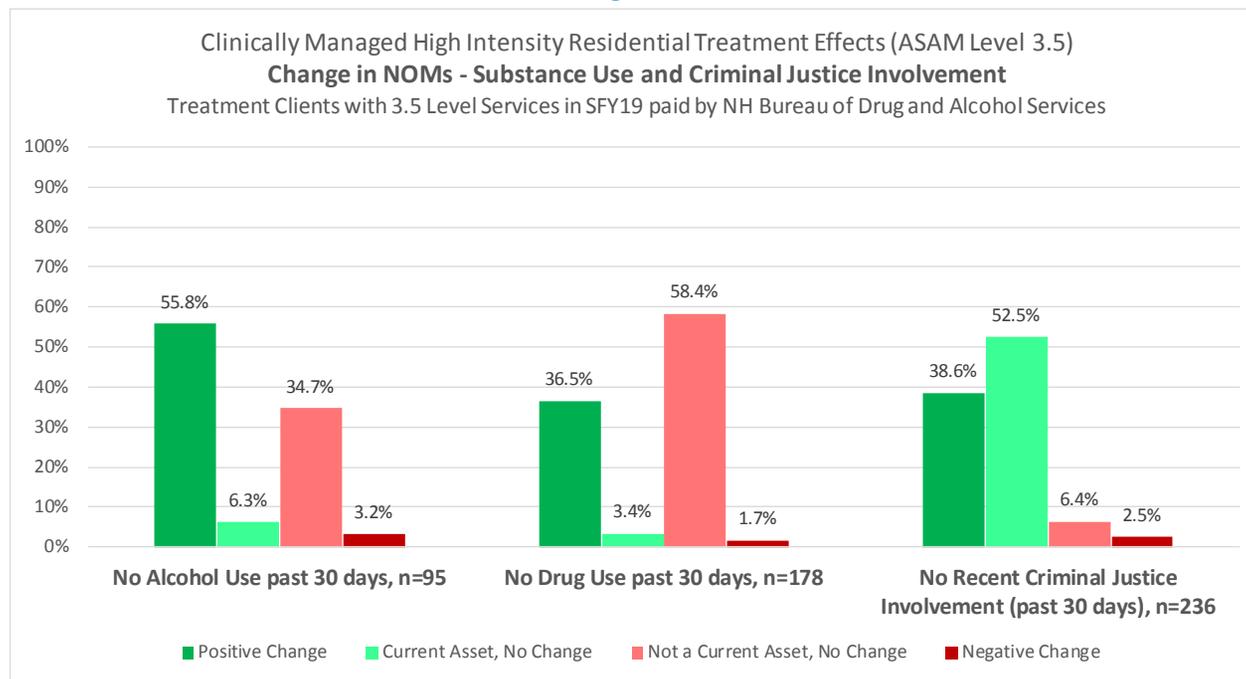
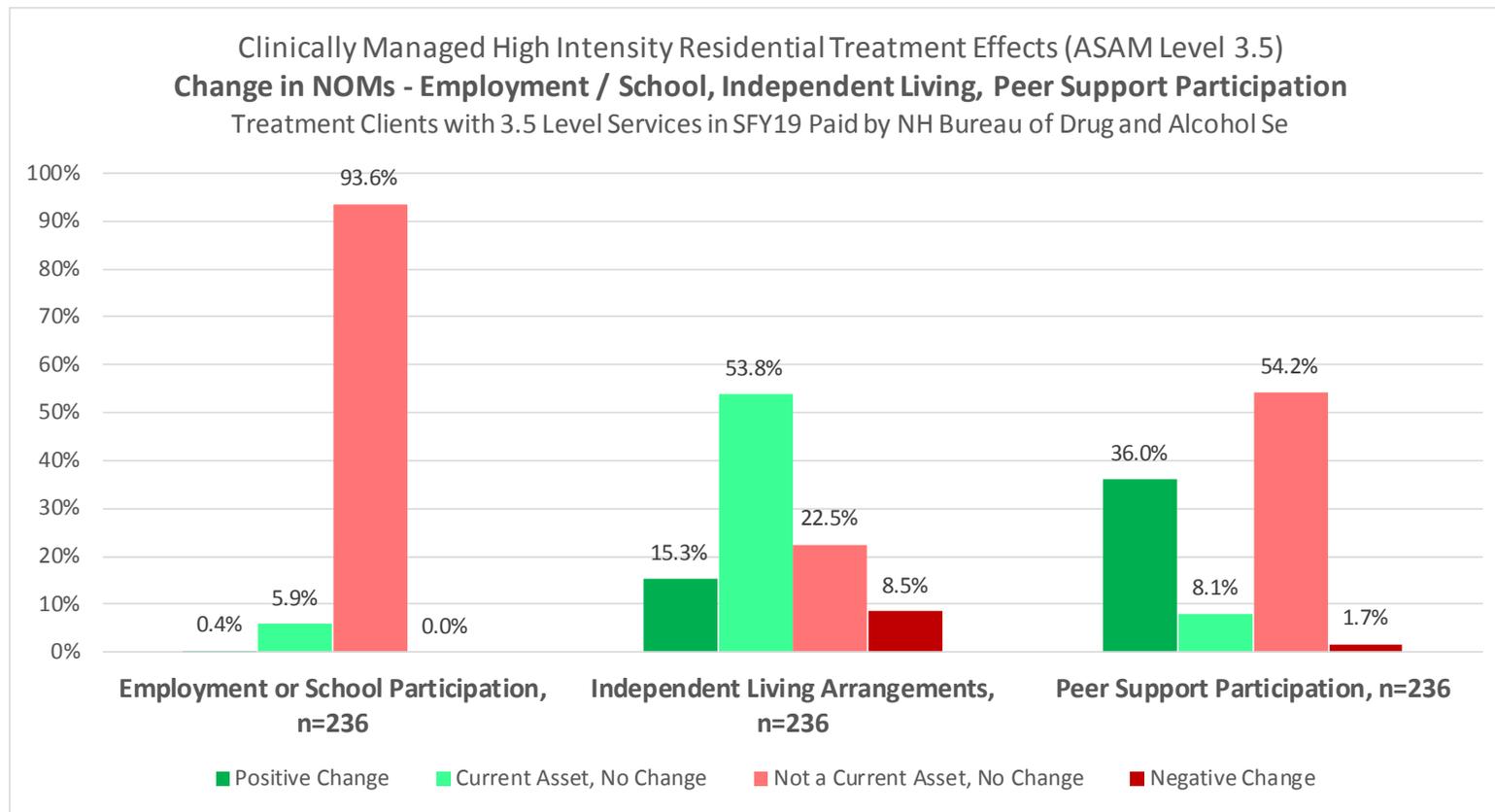


Figure 2 displays changes in the remaining 3 NOMs associated with reduced substance use: employment or school participation, social connectedness defined as participation in peer support or self-help groups, and independent living arrangements (other possible designations are dependent living (supervised setting), homeless, or controlled environment). The largest change among these 3 NOMs was observed for 'no peer support participation' at admission changing to 'peer support participation' at discharge (36.0%). The observed changes from admission to discharge for each of the NOMs measures except employment / school participation were positive and statistically significant. (See Appendix C for complete Results tables.)

Figure 2



Figures 3 and 4 display the results on the same 6 measures for clients who ‘completed treatment’ (per discharge reason selected in the WITS data system, n=147). About 62% of ‘completed treatment’ clients moved from alcohol use at admission to no alcohol use at discharge (among clients indicating alcohol as a substance of use) compared to 55.8% of all clients (Fig. 1). Among clients indicating any drugs as a substance of use, 48.6% had moved from use at admission to no use at discharge, compared to 36.5% of all clients. Among completed treatment clients, the highest percentage of outcome changes observed were for clients who had criminal justice involvement at admission, no new involvement at discharge (41.5%) and no peer support participation at admission changing to peer support participation at discharge (39.5%).

Figure 3

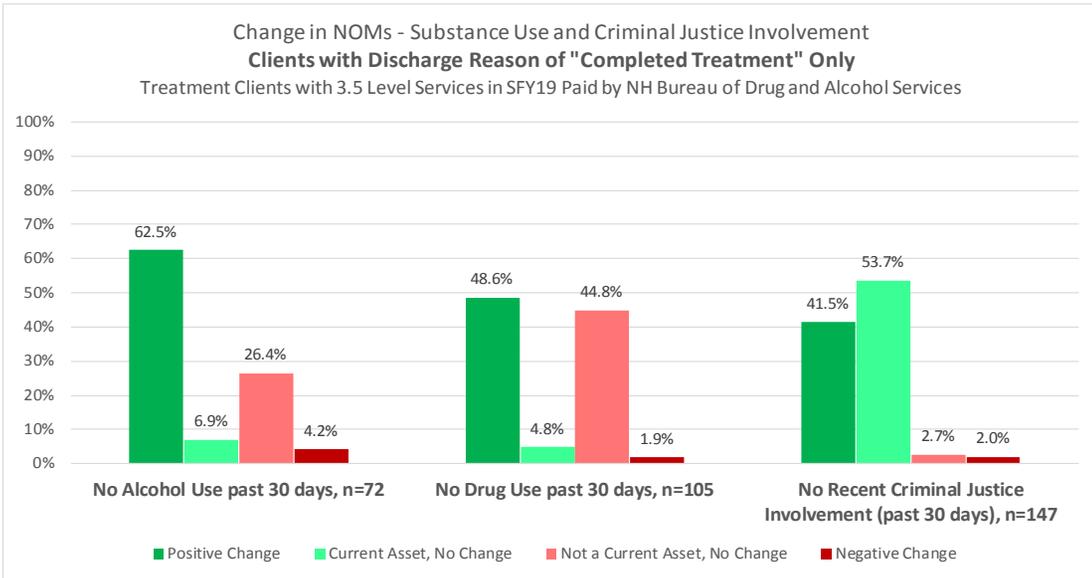
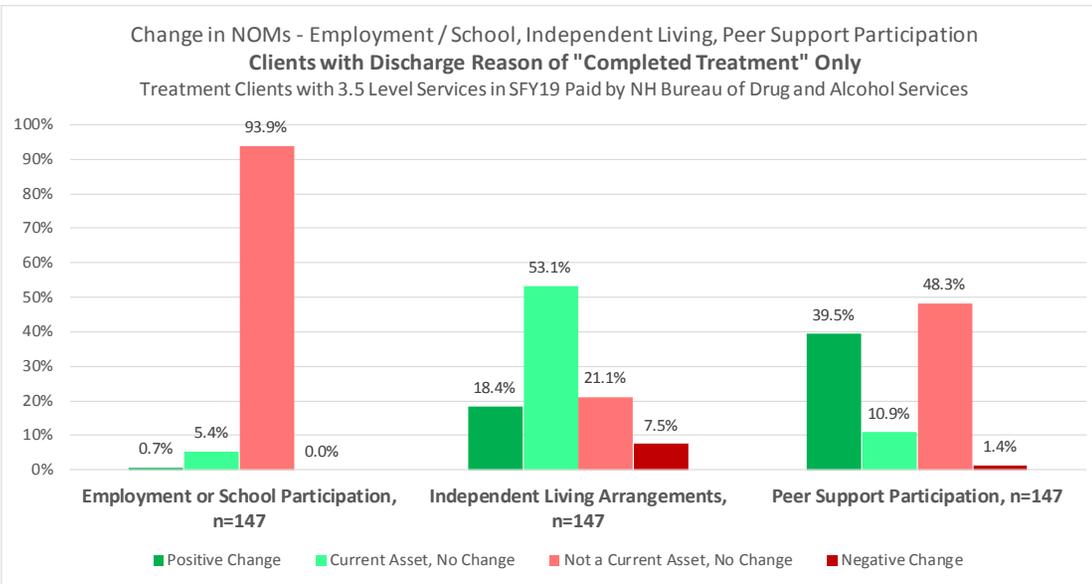


Figure 4



A measure of treatment effect was created by deriving a composite NOMs score at admission and at discharge for each client where presence of a NOMs asset (e.g. no substance use, no criminal justice involvement, peer support participation, etc.) each contributed 1 point to the composite score (and the absence of each asset contributed zero points). **Table 4** displays Composite NOMs scores (means) and change from admission to discharge for 3 groups of clients: those who indicated alcohol use only, those who indicated drug use only, and those who indicated both alcohol and drug use (primary, secondary or tertiary). The observed treatment effect as measured by the change in Composite NOMs Score was positive and statistically significant for each cohort.

Table 4 - Composite NOMS Score, Net Effect			
All Cases	Composite NOMS Score at Admission, Mean	Composite NOMS Score at Discharge, Mean	Net Effect on Total NOMS Score[^]
Alcohol Only, Possible Score 0 to 5 (n=58)	1.62	3.00	1.38
Drugs Only, Possible Score 0 to 5 (n=141)	1.26	2.33	1.07
Alcohol and Drugs, Possible Score 0 to 6 (n=37)	1.65	3.38	1.73
Completed Treatment Cases Only (Clients with Reason for Discharge listed as "Completed Treatment")			
Alcohol Only, Possible Score 0 to 5 (n=42)	1.64	3.12	1.48
Drugs Only, Possible Score 0 to 5 (n=75)	1.24	2.64	1.40
Alcohol and Drugs, Possible Score 0 to 6 (n=30)	1.50	2.87	1.37

[^]All observed changes in cohort means from Admission to Discharge are net positive and significant at $p < 0.001$ (Paired Samples T test)

A measure of cost and effect was calculated by dividing the average cost of care associated with Clinically Managed High Intensity Residential Services by the net change in the Composite NOMs scores. As displayed by **Table 5**, the Cost and Effect for all clients included in the study was \$2,637.57 per unit change in the Composite NOMs Score. The lowest cost effect ratio was observed for clients reporting Alcohol as the primary substance at admission (\$2,272) and the highest cost effect ratio was observed for clients indicating Heroin or Other Opioids as the primary substance of use at admission (\$2,898).

Table 5: Cost and Effect by Primary Substance at Admission; n=236

Primary Substance at Admission	Client count	Percent of total	Duration of 3.5 Level Service (mean days)	% Completing Treatment*	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge^	Cost / Effect+
Heroin; Other Opiates and Synthetics	127	53.8%	17.4	78.0%	\$3,130.26 (\$2,123.00)	1.28	2.36	1.08	\$2,898.39
Other Drugs	35	14.8%	18.1	82.9%	\$3,559.44 (\$4,520.29)	1.37	2.77	1.40	\$2,542.46
Alcohol	74	31.4%	18.8	85.1%	\$3,363.26 (\$2,799.65)	1.64	3.12	1.48	\$2,272.47
All Cases	236	100%	17.9	80.9%	\$3,296.96 (\$3,666.08)	1.41	2.66	1.25	\$2,637.57

* Includes clients referred to another provider or discharge reason was “Other; Excludes clients with discharge Reason of “Left Against Treatment Advice” or “Program Decision to Discharge Client for Non-Compliance with Program Rules”. All clients are included in calculations of costs and effects.

^ All observed changes in cohort means from Admission to Discharge are positive and significant at p<0.001 (Paired Samples T test)

+Payment per unit change in Composite NOMs Score

Table 6 displays a similar set of calculations of cost and effect by category of referral source. The calculations by Referral Source category resulted in the observation of lowest cost / effect ratio for individual/self-referral to treatment (\$2,051), while the highest cost / effect ratio was observed for clients referred by health care providers including other behavioral health providers (\$3,565).

Table 6: Cost and Effect by Referral Source; n=236									
Referral Source	Client count	Percent of total	Duration of 3.5 Level Service (mean days)	% Completing Treatment*	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge^	Cost / Effect+
Individual (includes self-referral)	57	24.2%	17.0	80.7%	\$2,954.84 (\$1,974.78)	1.63	3.07	1.44	\$2,051.97
Safe Stations - Manchester and Nashua	78	33.1%	16.6	84.6%	\$2,910.35 (\$2,753.46)	1.22	2.31	1.09	\$2,670.05
Court/Criminal Justice	30	12.7%	20.6	73.3%	\$4,248.90 (\$4,894.48)	1.20	2.77	1.57	\$2,706.31
Health Care Provider including behavioral health provider	44	18.6%	21.2	75.0%	\$3,922.57 (\$5,906.80)	1.70	2.80	1.10	\$3,565.97
Other Community Referral / Unknown	27	11.4%	15.4	88.9%	\$2,796.70 (\$1,889.41)	1.22	2.44	1.22	\$2,292.38

* Includes clients referred to another provider or discharge reason was “Other”; Excludes clients with discharge Reason of “Left Against Treatment Advice” or “Program Decision to Discharge Client for Non-Compliance with Program Rules”. All clients are included in calculations of costs and effects.

^ All observed changes in cohort means from Admission to Discharge are positive and significant at $p < 0.001$ (Paired Samples T test)
 +Payment per unit change in NOMS

Table 7 displays an incremental cost and effect ratio associated with duration of Clinically Managed High Intensity Residential Services (ASAM level 3.5). Two groups were created comprised of clients who received the equivalent of less than 14 days of 3.5 level services and those who received 14 or more days of services. The break point for these cohorts (14 days or more) was selected because the 14 day break point appears to be a natural point for grouping based on the proportion of clients (about 50% in each group) and analyses of more and different categorical configurations of the duration variable revealed that the relationship between number of service days and the Composite NOMs Score was not linear for this client cohort.

Table 7: Incremental Cost and Effect of Treatment Duration , Not Including Pregnant and Parenting Women; n=224									
3.5 level service days	Client count*	Percent of total	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge^	Incremental effect	Incremental cost	Incremental CE ratio (change in cost/change in effect)+
less than 14 days	114	50.9%	\$1,164.65 (\$646.12)	1.30	2.41	1.11	--	--	--
14 days or more	110	49.1%	\$4,467.66 (\$1,469.91)	1.45	2.85	1.40	0.29	\$3,303.01	\$11,389.69

*Not including Pregnant and Parenting Women

^Paired Samples T test < 0.001

+Payment per incremental unit change in NOMS

The Incremental Effect of longer length of stay (14 days or more) was calculated as the net difference between Total NOMs score means at admission and at discharge (0.29) between the two groups. The incremental cost difference was calculated as the difference between mean Payments for each group (\$3,303.01). The incremental Cost-Effect ratio is then calculated by dividing the net effect into the net cost resulting in an incremental cost ratio of \$11,389.69 per unit change for the group with more 3.5 level service days compared to the group with fewer 3.5 service days. (Note: Pregnant and Parenting Women (12 cases) were not included in the results reported above because of the programmatic differences, most particularly the substantially different and longer lengths of stay on average (mean=57.3 days). Appendix C contains a similar results table for Incremental Cost and Effect including Pregnant and Parenting Women cases.

These results suggest that, on average, Clinically Managed High Intensity Residential Treatment Services had a beneficial effect on the study cohort and the effect of longer treatment duration was net positive although diminishing in magnitude. This is not to say that more 3.5 level service is not associated with improved outcomes. In fact, a multivariate regression analysis (see **Table 9**) of factors associated with the core NOMs measure of substance use abstinence at discharge demonstrates that a greater amount of 3.5 level service is significantly associated with change from substance use at admission to no substance use at discharge. The strength of that effect may dissipate with increasing amounts of service as other factors, such as the client decision to seek treatment in the first place or differences in substance use disorder acuity, may be more determinative. Additional insights on the relative influence of individual client characteristics such as these would require additional information not available through this study.

Table 8 on the next page displays the results of an additional method for estimating cost and effect based on *cost per reduced day of substance use*⁶. This calculation is derived from the frequency of substance use variable where the frequency (days) of reported substance use in the 30 day periods prior to admission and discharge produces an estimate of the total change in number of days substances were used for individual clients. The individual change in 'substance use days' was then summed to produce a cohort total.

On average, the number of days estimated for substance use in the 30 days prior to admission for individuals included in the study was 25.3 days compared to 6.6 days out of the 30 days prior to discharge. Among clients for whom both admission and discharge substance use frequency was recorded⁷, the total number of substance use days decreased from 3,041 days to 795 days. The net change (reduction) in substance use days can be divided into the total cost of services (BDAS payments) for this client cohort to produce a cost per reduced substance use day (cost / effect) estimate of approximately \$186 per reduced substance use day.

It is important to note that the calculation of a cost and effect ratio for reduced substance use days would hypothetically decrease over additional time as a proportion of clients can be assumed to sustain recovery / continue reduction in substance use over a period of time longer than 30 days while program cost inputs associated with sustaining recovery (e.g. counseling, recovery programs) would be less costly per person than residential treatment. However, this analysis is limited to the difference between reported substance use over the 30 days prior to admission compared to the reported substance use 30 days prior to discharge. Data is not available to this study for longer periods of post-discharge follow up.

⁶ For method reference, see Zarkin GA, et al. "The Cost and Cost-Effectiveness of an Enhanced Intervention for People with Substance Abuse Problems at Risk for HIV" *Health Services Research* 36:2 (June 2001)

⁷ A limitation of this method is that only 120 client records included substance use frequency at admission and at discharge. Cases where either substance use frequency at admission or discharge was unknown were excluded from this aspect of the analysis.

Table 8: Cost per Reduced Day of Substance Use; n=120

Primary Substance at Admission	Number of Clients with Primary Substance Use Frequency Recorded at Admission and Discharge	Mean Number of Days Primary Substance Used, 30 days prior to admission	Mean Number of Days Primary Substance Used, 30 days prior to discharge	Total Days of Substance Use, 30 days prior to Admission	Total Days of Substance Use, 30 days prior to Discharge	Total Change in Days of Substance Use from Admission to Discharge	Total Paid Amount	Cost / Reduced Day of Substance Use*
Alcohol	44	26.6	5.7	1172	250	922	\$145,797.72	\$158.13
Heroin; Other Opiates and Synthetics	58	23.3	7.5	1351	435	916	\$203,058.79	\$221.68
Other Drugs	18	28.8	6.1	518	110	408	\$68,921.76	\$168.93
All Cases	120	25.3	6.6	3041	795	2246	\$417,778.26	\$186.01

While this study does not attempt to produce dollar estimates of the comparative benefits of reduced substance use days, it is reasonable to posit that the cost per reduced day of substance is offset in some measure by potential avoidance of other costs. Such costs would include those associated with the consequences of continued substance misuse including emergency department and other health care costs including hospitalization, potential costs associated with personal and third party injury including the consequences of operating motorized vehicles while impaired by alcohol or drugs, criminal justice costs including incarceration, and increased risk of mortality. Some possible reference points for consideration are the average cost of incarceration in NH state prison on an annual basis (\$34,155)⁸ and the average cost of an inpatient stay in a community hospital for a primary diagnosis of Substance Use Disorder (national average length of stay=4.7 days; national average cost per stay \$7,900).⁹

⁸ NH Department of Corrections accessed at <https://www.nh.gov/nhdod/divisions/administration/admingeneral.html>; last accessed on 12.16.19.

⁹ Owens PL, et al. Inpatient Stays Involving Mental and Substance Use Disorders, 2016. Agency for Healthcare Research and Quality, Statistical Brief #249, March 2019.

Regression Model

To further investigate factors associated with observed treatment outcomes, a Binary Logistic Regression model was calculated. The dependent variable (outcome) was created by dividing the treatment cohort into two groups: clients who were actively using substances at admission and not using substances at discharge (n=101) and all other clients (n=135). Independent variables (predictors) input to the regression model were client age at admission, gender, treatment completion status, duration of residential treatment (less than 14 days / 14 or more days of residential treatment), primary substance at admission (alcohol, heroin/other opioids, or other drugs), referral source, peer support participation at discharge, independent living arrangements at discharge, and recent criminal justice involvement at discharge. The table below displays the results of the regression model.

Table 9: Logistic Regression Model of Factors Associated with Positive Treatment Outcomes

Input Variables	B	Standard Error	Significance	Odds Ratio (Exp(B))
Treatment Completion Status				
Left Against Tx Advice / Noncompliance^			0.006	
Referred to Another Agency / Other Completed Treatment	-0.366	0.594	0.538	0.693
	1.015	0.473	*0.032	2.759
Treatment Duration – 2 weeks or more	0.764	0.353	0.030*	2.146
Participation in Peer Support	1.958	0.377	***0.000	7.082
Independent Living Arrangements	1.173	0.383	**0.002	3.231
Referral Source				
Safe Stations - Manchester^			0.068	
Safe Stations - Nashua	1.154	0.736	0.117	3.169
Health Care Provider including behavioral health provider	1.438	0.546	**0.009	4.212
Other Community Referral	1.517	0.598	*0.011	4.560
Individual (includes self-referral)	1.001	0.536	0.062	2.722
Court/Criminal Justice	1.597	0.620	*0.010	4.941
Constant	-4.836	0.809	0.000	0.008

Excluded Variables: Age at admission, gender, primary substance at admission, recent criminal justice involvement; Other Community Referral includes Unknown.

Method = Backward Stepwise (Conditional); R Square (Nagelkerke)=0.444; Overall percentage classification=80.1%

^ Reference Category; *Significant at $p < .05$; **Significant at $p < .01$; ***Significant at $p < .001$

Variables independently and significantly associated with positive treatment outcomes (as defined by moving from active substance use at admission to no use at discharge) were peer support participation at discharge, independent living arrangements at discharge, duration of residential treatment (2 weeks or more compared to less than two weeks), treatment completion status (completed treatment compared to left against treatment advice/noncompliance), and referral source (Health Care Providers, Court/Criminal Justice, and Other Community Referrals). Variables excluded from the final regression model – meaning that their contribution to explaining the observed variation was not statistically significant after controlling for the other variables – were age, gender, primary substance at admission, and recent criminal justice involvement.

The factor most strongly associated with positive treatment outcomes was peer support participation. The right-side column on **Table 9** displays odds ratios for each variable in relationship to the outcome. For peer support participation, the odds ratio is about 7; meaning **if all other variables in the model were held constant** participation in peer support increases the odds of a successful treatment outcome by a factor of 7.

It is important to note that the regression model cannot be used to predict an individual outcome, particularly considering that the final model explains less than half of the observed variation in outcome ($R^2 = 0.44$). However, the model can be useful for highlighting factors that may be more strongly associated with positive treatment outcomes at a population level.

Background of the High Intensity Residential Treatment Programs

In order to understand the background of the agencies for which client data was included in the analysis, an online survey of Clinically Managed High Intensity Residential Treatment providers in New Hampshire was administered between December 2 and December 6, 2019. Seven programs within six different agencies (one agency operates two different programs) completed of the survey. These agencies (and programs) included (in alphabetical order):

1. Farnum Center
2. Hope on Haven Hill, Inc.
3. GNCA/Keystone Hall Adult Residential Program
4. GNCA/Keystone Hall Cynthia Day Family Center
5. North Country Health Consortium
6. Phoenix House New England (Dublin Center and Keene Center)
7. Southeastern NH Alcohol & Drug Abuse Services

A majority of the programs (n=5) have been providing 3.5 level of care for more than five years (**Figure 1**). A little over half (n=4) served over 100 clients in FY19 and 2 served less than 50 clients (**Figure 2**). A little less than half of the programs (n=3) have total annual operating budgets between \$1 and \$2 million for their 3.5 level of care (**Figure 3**). One quarter have operating budgets < \$1 million and another quarter have operating budgets > \$2 million. Almost all of the programs (n=6) report that 89% or more of their admissions are for greater than 6 days (data not shown). Only two programs have an expected length of stay; both are 28 days.

Programs were asked about specialty populations they serve. While one program reported not serving any specialty populations, most noted serving at least one or more of the following:

- Pregnant/Parenting Women (n=6)
- Military/Veterans (n=6)
- Women (n=6)
- Dual Diagnosis/Serious Mental Illness (n=6)
- Housing Insecure/Homeless (n=6)

Figure 1. Number of Years Providing 3.5 Level of Care (n=7)

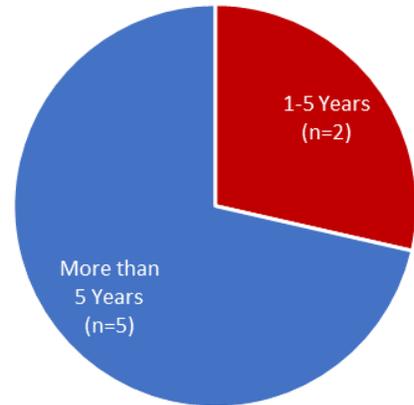


Figure 2. Number of Admissions into 3.5 Level of Care in FY19 (n=7)

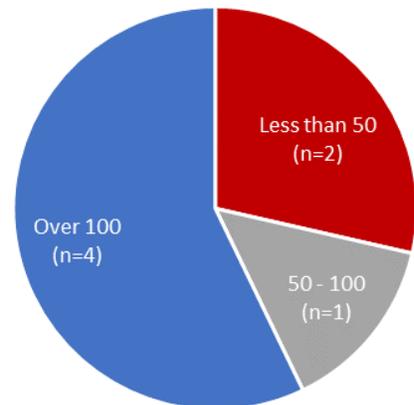
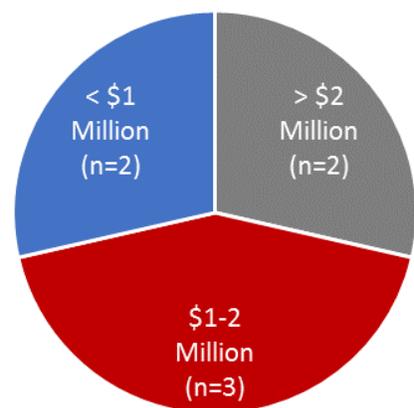


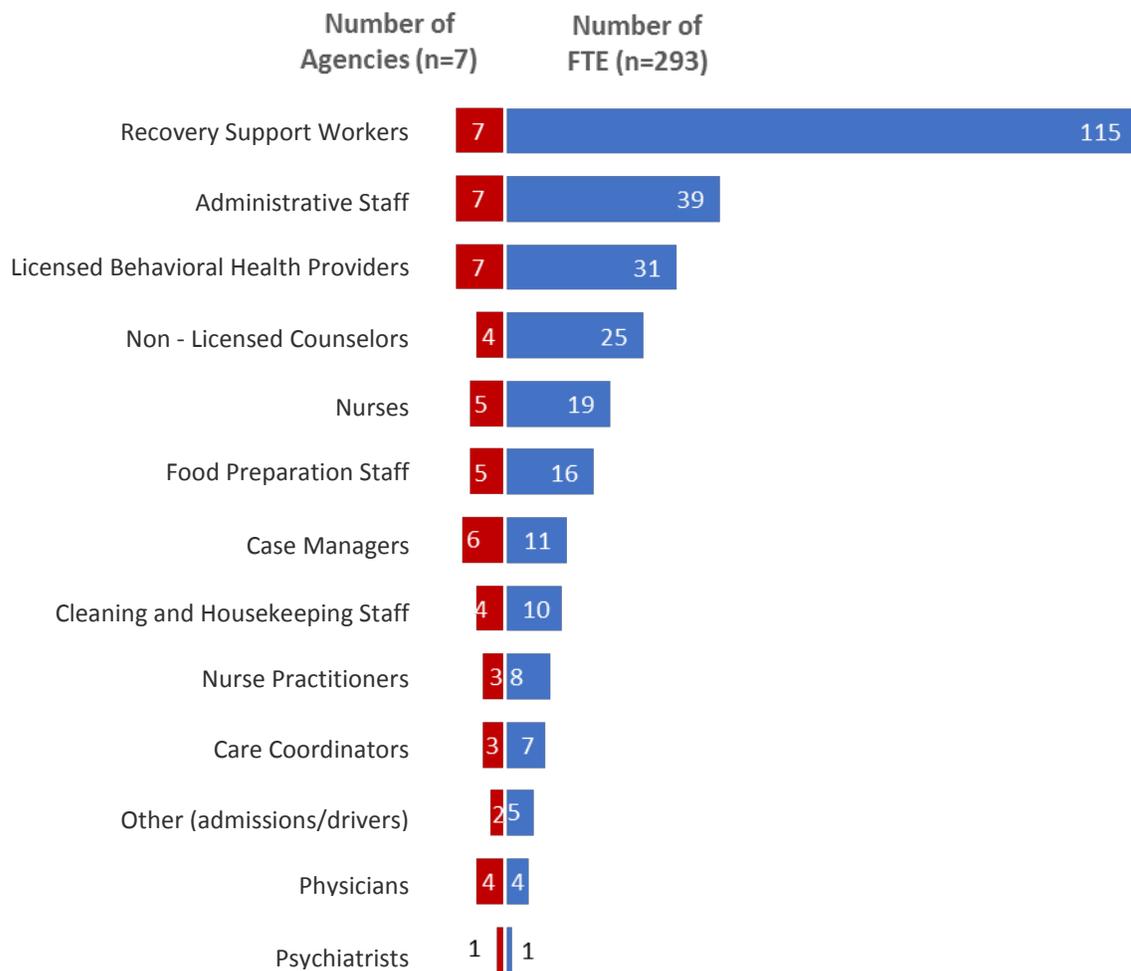
Figure 3. Total Annual Operating Budget for 3.5 Level of Care (n=7)



- LGBTQ (n=5)
- Cognitive Limitations or Disabilities (n=5)
- Older Adults (65+) (n=3)
- Other (criminal justice system involvement) (n=1)

The seven programs employ a wide variety of staff (**Figure 4**). The total number of employees (FTE equivalent) per program ranges from 15 to 120. Certified Recovery Support Workers (CRSWs) are most common, with the total employed per program ranging from 8 to 38. Every program also has administrative staff and licensed behavioral health providers. Interestingly, while many of the programs use case managers for several ancillary services to affect NOMS outcomes (discussed more below), they only employ about 1-2 FTE per program.

Figure 4. Number of Agencies Employing Each Type & Total Number of Staff



Services Provided

Table 1. Types of Services Provided for Substance Use Treatment in 3.5 Level of Care

Type of Service	Number of Agencies
Individual/Group/Family Counseling	7
Case Management	7
Relapse Prevention/Educational Groups	7
Motivational enhancements and engagement strategies	7
Medication Management	5
Contingency Management	5
Reintegration into work, education and/or family life	5

Table 2. Evidence-Based Practice (EBP) Services Provided for Substance Use Treatment in 3.5 Level of Care

Type of Service	Number of Agencies
Relapse Prevention Therapy (RPT)	7
Cognitive Behavioral Therapy (CBT)	7
Motivational Interviewing (MI)	7
SAMHSA Anger Management	5
Seeking Safety	5
Medication Management	5
Matrix Model	4
Getting Motivated to Change	3
Dialectical Behavioral Therapy (DBT)	2
Living In Balance	2
Nurturing Parenting	2
Life Skills Curriculum: Strategies for Maintaining Residential Stability	1

Table 3. Non-EBP Services Provided for Substance Use Treatment in 3.5 Level of Care

Type of Service	Number of Agencies
Relapse prevention skills	7
12-Step Meetings	7
Activities based groups	7
Neurobiology of Addiction	6
Process Group	6
Expressive Arts	6
Self-help groups	6
Health Group- Tobacco, MAT, HIV	6
Psychoeducation	6
Treatment Plan/Case Management Group	5
Mindfulness/Meditation skills/training	5
Anger Management	5
ASAM Continuum Assessment	4
Introduction to peer support	4
Expressive Arts	4
YMCA/physical activities	4
Community recovery coaching presenter	4
Four Agreements	3
Yoga	3
Presenter for liver related diseases	3
3 Principles	2
PH Essential Seminars	2
Acupuncture	2
Outside Activities	2
In-House Medical Provider Clinic	1

Opioid Use Disorder Treatment

All programs offer Medication Assisted Treatment (MAT) for Opioid Use Disorder (OUD). Two of these programs offer both integrated MAT and coordinated delivery, two offer integrated MAT only, and three only provide coordinated delivery through an active agreement with an external MAT provider. In terms of medications offered, five programs offer access to Methadone (coordinated with Outpatient Treatment Provider), formulations of buprenorphine/Suboxone, and naltrexone/Vivitrol; two offer just formulations of buprenorphine/Suboxone and naltrexone/Vivitrol.

Ancillary Services to Affect NOMs Outcomes

The seven programs offer a range of ancillary services to assist clients: 1) educational attainment/vocation skills, 2) employment/job-seeking skills, 3) housing support, 4) peer/community support, and 5) criminal justice system involvement. Main themes from the qualitative responses are included below for each outcome.

Education

- Several programs simply offer information and referral, which is integrated into their case management services.
- A couple of programs offer direct assistance with applying to, or engaging with, community programs.
- One agency has direct partnerships with community programs that offer individual services to their clients. For example, one community program comes to the agency regularly to work with clients and another has an agreement in place to hire for entry-level positions in their recovery-friendly workplaces.
- One agency assists their clients with developing vocation skills from within the 3.5 level of care through a culinary preparedness training program.

Employment

- Services offered for employment are similar to those offered for education – information and referral as part of case management services, assistance with applying to community programs, and partnerships with community programs to offer direct services to their clients.
- A few programs also offer groups focused specifically on building job seeking skills. For example, resume building, job preparedness skills, interviewing skills, and completing an interest survey.
- Two programs said that they do not offer services to assist their clients with increasing employment or job-seeking skills.

Housing

- Generally, assistance with housing support is offered through case management services. The services offered by the case manager includes referral, assistance with completing housing applications, and working collaborative with local/state transitional living programs.
- Two programs have a specific aftercare coordinator or counselor who helps with transitional services, including housing support.
- One agency will assist with payment of first month's rent, if needed.

Peer/Community Support

- Several of the programs have onsite alumni/community meetings.
- A couple of programs have groups or care coordinators that help clients in identifying peer groups and community supportive recovery pathways for aftercare support.
- One agency has a community-based program that comes to their site or hosts clients in the community classes/meetings to help in developing supports while still in 3.5 level of care.

Criminal Justice System Involvement

- Several offer assistance through their case management services, including referrals, ensuring clients remain in compliance with court mandates, and assistance with getting to appointments/hearings.
- Several programs communicate directly with probation/parole officers or criminal justice programs, with client consent.

Factors that Influence Costs and Outcomes

Programs were asked about what they perceive as the factors that most influence the cost of providing 3.5 level of care, as well as the primary outcome of reducing substance use.

Main Influences on Costs

- All programs said that staffing influenced costs, including education and licensing requirements to have staff that provide good quality care.
- Several programs mentioned that reimbursement rates/funding does not support the array of services that are needed in 3.5 level of care.
- Several programs mentioned the costs to maintain compliance with state and insurance regulations, including comprehensive documentation, billing, and reporting.
- Others mentioned the high needs of clients, facility and maintenance costs, and the length of stay.

Main Influences on Substance Use Outcome

- A couple of programs said the quality of care is important, including have a lot of case management and staff supervising and supporting clients.
- Several programs mentioned the length of stay or time in care as influencing outcomes. Although, this seemed to be related to the quality of care and being in a supportive environment. One agency said, “the longer a person can engage in a caring and supporting environment with supports the better the outcome”.
- Also related to social support, two programs mentioned the importance of family involvement and connection to support systems.
- A few programs mentioned specific types of services, such as life skills for coping, step down levels of care, availability of wrap around services, and sober living aftercare.

Programs were asked to identify additional outcomes, beyond substance use, that they see among clients who are successful in their programs. The following outcomes were reported:

- Connecting with safe and supportive resources in the community, including peer-based recovery, counseling, and reconnecting with family and friends.
- Finding employment and stable and permanent housing, including sober living aftercare.
- Increased life skills such as cooking and budgeting, and healthy coping skills.
- Accessibility to Medicaid/healthcare for continued treatment aftercare.

Data Limitations

There are a number of limitations to note related to the use of the data for this study.

Interpretation

- This study does not purport to attribute or define any causal relationships in the data (i.e. correlation is not sufficient to demonstrate causation).
- A control group was not available nor feasible to provide comparison for these findings. The sample of clients who were studied for the analysis were all similar in that they were seeking and obtained access to treatment. It is not known how these individuals differ from those who have similar health and social conditions but do not seek treatment and/or do not obtain access to treatment. Furthermore, it is possible that individuals who enter residential treatment may be at a highly acute stage of substance use or have other motivators such as criminal justice involvement such that substantial incentives are perceived for change in a positive direction.
- It cannot be stated that outcomes are better or worse due to any particular services or program characteristics, There are many factors that have yet to be studied in order to understand with any certainty what set of characteristics or combination of services may influence effectiveness.
- Although a list of services provided by the agencies were collected, there are many factors still unknown. For example, it is not known to what extent providers have sufficient training, which services are actually needed by clients (compared to the ones they received), whether the services meet recognized standards, to what extent strategies or evidence based programs were implemented, implemented with fidelity to best practices, or how many clients received those services.

Sample

- The sample size allowed for various permutations of the data however, a larger sample size would have included wider variation in the data and allowed for data analysis of more subsets of the data. This could include comparison of provider organization characteristics to compare any factors specific at the organizational level as well as comparison of clients within and across the provider organizations.
- The data set was restricted to client information while they received services paid for by BDAS funding. It is likely that some proportion of clients change payer sources in the course of their care.
- The data set was restricted to only looking at clients for whom claims have been adjudicated, which, due to the time lag for claims adjudication, does not include all the clients who may have received services during the defined time period of the study.
- Since this analysis ONLY included clients whose services were paid by BDAS, one cannot infer that the same findings of cost and effectiveness would be true for all clients in the agencies' 3.5 level of care.

Cost Calculations

- Costs were based on the daily reimbursement rate for BDAS funded clients, thus the costs of care are defined as the costs incurred by the state; not actual or total operating costs for an

agency to deliver care to clients. This limited the variation in costs between agencies to the point where number of days in treatment was directly related to cost for each agency included in the analysis.

- Assuming each individual who entered 3.5 level care had a need for that level of care, those individuals who stayed in treatment will in aggregate have more days of treatment and thus higher cost than those who left early.
- The unit of analysis for the study was established at the ‘admission’ level (representing all services rendered during an episode of treatment as opposed to the services of an individual program enrollment), though data was collected at the billed service level under each admission. admission level Criteria to select service activity data from WITS to measure costs and effectiveness to be included in the analysis are billed and adjudicated services where the record indicates:
 - a) Admissions where at least one 3.5 level of care service was received in FY19 and covered by BDAS funding
AND
 - b) Included all service costs associated with that admission, including all 3.5 level service costs and any non 3.5 level services, provided that 3.5 level care constituted the majority of associated costs for the admission.

Effectiveness Calculation

- The WITS database construction groups together data related to an ‘episode of care’, which could include a variety of service levels. Although it is possible to enter data related to the NOMs at the enrollment and disenrollment to a level of care, this is not standardly done. The usual practice among providers is to only complete the discharge NOMS after clients are discharged from an episode of care (as outlined in the BDAS WITS User Manual.) It is, therefore, challenging to connect a measure of outcome directly to a level of care. For the purpose of cost effectiveness evaluation of specific levels of care, it is valuable to identify not only the start and end date of each enrollment in a level of care, but also the relevant NOMs at those points in time (or other indicators of outcome).
- The current indicators of outcomes (the NOMs) are collected in relation to the 30 days prior to recording the NOMs information. Assuming the discharge NOMs are recorded on the date of discharge from 3.5 level care, a client who stayed in care for less than 30 days would have some portion of the 30 days that are used as a reference time period at the end of their 3.5 level services also reference at least some time prior to the start of their 3.5 level of care.
- There are limitations to what would be expected at a 3.5 level of care setting using NOMs as the outcome measure. For example, it would be expected that clients report substance use at intake in order to qualify for care.
- Given that data in the WITS system is limited to the services delivered to clients for whom BDAS is the payer, if a client gains health insurance, that individual is identified as “discharged” in WITS and no further data collection is conducted for entry into WITS. Although obtaining insurance coverage can be a positive development for clients, the ability to understand the course of treatment and outcomes is limited without capability for linking datasets across payment sources.
- Because the NOMs measures focus on the documentation of a ‘positive’ state related to the category in question, an “unknown” or missing response can be considered to be equivalent to the ‘negative’ or absent state for that measure. For example, there were instances found in

the WITS data where a client intake record included identification of a primary substance, but the NOMs measure for past 30 day use was entered as “unknown.” Given that these clients were admitted to a residential level of care for substance use disorder treatment, it is logical to assume the negative state or absence of abstinence in the 30 days prior to admission.

- Given that clients are in a residential setting during their length of stay in a 3.5 level of care, there are particular changes in client behaviors that are more likely to be expected and ones that would not be expected. For example, given the level of oversight in the setting, it would be expected that clients would not be using substances. Given clients would be limited in their ability to pursue employment opportunities during this time, it would be expected that there would not be any significant positive changes in their employment during the course of their treatment.

Summary of Findings

1. Cost of Services

The mean number of High Intensity Residential Service days received by clients included in the analysis was 17.9, with an average cost of about \$3,297. The total cost of 3.5 services paid by BDAS for the 236 clients included in the analysis was \$774,943.

2. Client Outcomes

On average, the data showed that clients experience positive outcomes related to substance use between the time of their intake and discharge.

About 62% of 'completed treatment' clients moved from alcohol use at admission to no alcohol use at discharge (among clients indicating alcohol as a substance of use) compared to 55.8% of all clients. Among clients indicating any drugs as a substance of use, 48.6% had moved from use at admission to no use at discharge, compared to 36.5% of all clients.

Criminal justice system involvement and peer support participation showed the greatest positive change among the non-substance use indicators.

The regression analysis showed that variables independently and significantly associated with positive treatment outcomes, defined by moving from active substance use at admission to no use at discharge, were peer support participation at discharge, independent living arrangements at discharge, duration of residential treatment (2 weeks or more compared to less than two weeks), treatment completion status (completed treatment compared to left against treatment advice/noncompliance), and referral source (Health Care Providers, Court/Criminal Justice, and Other Community Referrals.)

The factor most strongly associated with positive treatment outcomes was peer support participation.

3. Cost Effectiveness

Given the small sample size it was most feasible to compare two subgroups of clients -- those who stayed in treatment less than two weeks and those who stayed in treatment longer than two weeks. The breakdown per the defined quality metrics for length of stay could be considered for future analysis of a larger data set.

The findings show that clients who stayed in treatment two weeks or more had a stronger, although modest, effect on positive change in NOMs than those who stayed in treatment less than 2 weeks. The incremental effect of being in care for two weeks or longer was 0.29. In other words, those who were in care longer had a 0.29 increase in the NOMs score (possible range=0 to 5 or 0 to 6, depending on the substances used). The incremental cost was \$3,303.01. The incremental cost

effectiveness ratio was \$11,389.60, meaning that it costs \$11,389.60 to obtain a one unit change in NOMS outcomes.

4. Program Characteristics

Variations between the programs including length of time operating program, overall budget, and services provided were found based on the responses to the survey administered to providers.

- A majority of the programs (n=5) have been providing 3.5 level of care for more than five years. A little over half (n=4) served over 100 clients in FY19 and two programs served less than 50 clients.
- Most common EBPs (offered by all seven agencies) were Relapse Prevention Program, Cognitive Behavioral Therapy, and Motivational Interviewing. Most common non-EBP services were general relapse prevention skills, 12-Step meetings, and activities-based groups.
- The seven programs offer a range of ancillary services to assist clients with increasing NOMS outcomes, in addition to substance use outcomes:
 - Educational/Employment: information and referral as part of case management, partnerships with community programs to hire clients in recovery-friendly workplaces, and in-house programs to develop specific vocational skills.
 - Housing support: referral and assistance through case management, aftercare coordinator to help with transitional services, and assistance with payment of first month's rent.
 - Peer/Community support: onsite alumni/community meetings, groups or care coordinators that help clients in identifying peer groups and community supportive recovery pathways for aftercare support.
 - Criminal justice system involvement: individual case management services, assistance with getting to appointments/hearings, direct communication with probation/parole officers.
- Most commonly cited influence on costs was staffing, including education and licensing requirements to have staff that provide good quality care. Several programs also mentioned the costs to maintain compliance with state and insurance regulations, including comprehensive documentation, billing, and reporting.
- Most commonly cited influences on substance use outcomes was length of time in good quality care and supportive environments/networks.

Lessons Learned

It was identified by the work group that this cost effectiveness study of state funded substance use treatment programs using data collected via WITS was the first of its kind conducted in New Hampshire and served as a pilot, or formative study, which led to a robust set of learnings. The lessons learned had as much to do with the data collection and management systems in place as about cost effectiveness. Through a steady process of inquiry by the work group, questions were continuously raised; many of which were answered while others remain for future investigation. The lessons learned are grouped by themes.

Data Collection

It is unclear how client status on each of the NOMs is determined, when it is collected and by whom. There is no known protocol or instrument that is required to be used to collect this data. This might account for the inconsistency found in the data set.

In order to identify the confirmed paid cost of services by the state, the adjudicated amount must be used. This can take up to 90 days after a service is provided to be available in the database. Therefore, in order to understand costs during a particular date range, one must wait after the desired date range to conduct a query of the data.

WITS

The WITS system contains over 58,000 data elements, and there is some variation in the way the data elements are populated between states using the system. A data dictionary was made available, however, the creation of the desired data set to conduct analysis necessitated reliance on data tables initially generated by FEI, the contracted vendor for managing the WITS system. The analysts at JSI used and built off of these tables and its underlying functionality as the basis for refining the data set needed to conduct the cost effectiveness analysis.

An episode of care and any related program enrollments can remain open indefinitely. Additional services cannot be associated with an episode of care that has been closed (client discharged). However, a client may be discharged from an episode of care within the date parameters of the analysis and be receiving services after that discharge date that associated with a different episode of care. An agency could use the same episode of care for a client that received services for a 30-day period and not since over two years ago, if the provider agency never discharged the client (closed the case) from that episode of care. The NOMs admission data for this client could be two years old at this point.

When initiating a “new episode of care,” WITS provides an option to associate the intake with the most recent Social Detox Screener (reference item 1.4 in on page 13 of the WITS User Guide), which may be pulling outdated NOMS admission data into the client record even when starting a new episode of care.

The WITS User Guide instructs providers to discharge clients that are transferring to a different agency, but otherwise does not provide any instructions or requirements for discharging clients.

In cases where a client has a change in status from BDAS as the payer to another payer and is thus “discharged” from the treatment program, there is a limit imposed on the ability to understand the ongoing services and outcomes of a client in the program.

Service Delivery Processes

Administering the social detox screener is a part of the identified process for treatment providers to complete and is used as a variable in the WITS data system. However, it is unclear how providers are utilizing this tool and whether they are following a consistent process.

Recommendations

Utilize the findings to inform decision-making

Conducting this cost effectiveness analysis was valuable as a process in itself because it facilitated a deep look at data availability. Much was learned about the state system of data collection and data management. A recommendation is to convene a group of key stakeholders to review the process of conducting this study, the lessons learned and key findings from the analysis.

Make refinements to improve data collection and quality

Interview the providers of substance use disorder services in order to gain a better understanding of how they collect the client data that is entered into the state database, WITS, and the validity and reliability of that data. Use extracted data to share with providers and have a conversation about the challenges, gaps and opportunities to improve data quality and usage.

Provide training to the providers as to how to collect and confirm accurate data would make the data set much more robust and informative for ongoing analysis. Ensure there is common understanding about the definitions of variables and processes to collect the data between BDAS and contracted agencies.

Collaborate with FEI as to how data tables are constructed in order to enable timely analysis and use of the data.

Create mechanisms in the data entry process that require/force input at the relevant time points of care to ensure data is collected.

Identify meaningful client change

Conduct follow up data collection after disenrollment from care in order to understand enduring effects when outside of treatment setting. Consider whether it may be more feasible for a third party to conduct this follow up using objective and systematic methods.

Appendix A: Data Extraction and Coding Methods

- FEI queries were built at the billed service level, but contained predominately data descriptive of the admission as a whole, with only units of service by service type and ASAM level, as well as units of service, charges and paid costs reflecting the individual billed service level. This included some records where the only service charges were negative, likely reflecting charge reversals and retroactive reassignment for previous claim to another payer.
- Queries were modified to identify any admission ID number with a billed and adjudicated 3.5 level service taking place in State Fiscal year 2019 (July 1, 2018 - June 30, 2019). The initial extract reflected 278 unique client admissions.
- All service details and related costs for the admissions identified were extracted, including non 3.5 level services delivered under the same admission ID number. This assured that all analyses captured the full cost of the admission, as the admission and discharge NOMs are intended to reflect.
- A series of data situations were identified that led to the exclusion of certain admission records due to the following:
 - The 3.5 level service enrollment was listed as taking place after the discharge date for the admission
 - All payments for 3.5 service days billed within the desired time frame were subsequently credited back
 - There was a lack of NOMs data recorded prior to and following the 3.5 level of care services
 - The client's only 3.5 level service was an evaluation (i.e. no residential services were initiated)
 - Level 3.5 services accounted for less than half of the paid cost of the overall admission such that the potential effect of 3.5 services relative to other services were not sufficiently isolated.
- The remaining cases (236 admissions) were aggregated to admission-level records for analysis including:
 - Descriptive characteristics: patient demographics, admission and discharge dates, referral source, discharge status
 - Admission and Discharge characteristics (separately): Primary/Secondary/Tertiary drug use and frequency, NOMs Measures
 - Quantitative measures: total and 3.5 level charges and amount paid, and 3.5 level service days billed
- Change in NOMs measures were coded to reflect the nature and direction of change from admission to discharge for each measure, including Positive, Neutral, and Negative change. Neutral change was further classified as to whether a positive or negative state was maintained (e.g. independent living situation at admission and discharge (positive state maintained) or homeless status at admission and discharge (negative or asset absent state

maintained). An aggregate NOMs change metric was calculated by assigning numerical values to the direction of change and averaging across measures, with the two substance use measures first aligned to their substance use category (alcohol only, drugs only, or using both alcohol and drugs).

- A variety of recodes were conducted to align the data to meaningful classifications for analysis such as grouping by type of referral source (e.g. health care provider, criminal justice, etc.) or type of drug groupings.

Appendix B: Survey Questions

High Intensity Residential Treatment Provider Questionnaire

Thank you for taking the time to complete the following questions about the services you provide to those in High Intensity Residential Treatment, ASAM 3.5 level of care (HIRT). This information will be used to describe the programs with state funding in New Hampshire and will inform a cost effectiveness analysis that will be reported to the NH Governor's Commission on Alcohol & Other Drugs as required by statute. The questions are specific to your High Intensity Residential Treatment (ASAM 3.5 level of care) and to services in fiscal year 2019, which is July 2018 - June 2019.

The survey is being sent out by staff at John Snow Research & Training Institute. The information you provide will be shared with the NH Department of Health and Human Services so that they can better understand the services you provide and the clients you serve. A summary of this information will be included in a report to the NH Governor's Commission on Alcohol & Other Drugs, which will not include the names of the programs providing information. For additional questions, please contact Anna Ghosh at anna_ghosh@jsi.com or 603.573.3334.

Your response to the questions in this survey is requested by December 6. Every organization that submits their response by December 6 will receive a \$50 gift card as a token of our appreciation of your efforts and timely response.

* 1. What is the name of your agency?

2. How many years has your agency been providing a 3.5 level of care?

- Less than one year
- 1-5 years
- More than 5 years

3. How many admissions did you have to your 3.5 level of care between July 2018-June 2019? (Please count a person as multiple admissions if they returned to care within the same year.)

- Less than 50
- 50 - 100
- Over 100

4. How many of the total admissions from July 2018 through June 2019 were clients who stayed in the program less than 3 days?

5. How many of the total admissions from July 2018 through June 2019 stayed in program for 6 days or more?

6. What is your total annual operating budget for your 3.5 level of care program?

7. Select the specialty subpopulations that your program serves (check all that apply):

- Individuals who are housing insecure/homeless
- Individuals with dual diagnosis/major mental illness
- Individuals with cognitive limitations or disabilities
- Women
- LGBTQ
- Military/Veterans
- Pregnant/parenting women
- Older adults (65+)
- N/A - we do not serve special subpopulations
- Other subpopulations (please specify)

8. Does your program have an expected length of stay for a client?

- Yes
- No

High Intensity Residential Treatment Provider Questionnaire

9. What is the standard expected length of stay?

10. How many of each type of staff provide services in your 3.5 level of care program?

Physicians

Number of physicians who are psychiatrists

Physician Assistants

Nurse Practitioners

Nurses

Licensed behavioral health providers

Non - licensed counselors

Case Managers

Care Coordinators

Recovery support workers

Administrative staff

Food preparation staff

Cleaning and housekeeping staff

Other (type of staff and number)

Other (type of staff and number)

Other (type of staff and number)

11. Which of the following services does your 3.5 level of care provide? (Check all that apply)

- Individual/group/family counseling
- Case management
- Relapse prevention / educational groups
- Medication management
- Motivational enhancement and engagement strategies
- Contingency management
- Reintegration into work, education, and/or family life
- None of the above
- Other (please specify)

12. Please describe how your program might assist clients with increasing **education attainment or vocation skills**. Please include a description of the services provided, how the services are delivered, and how frequently a client would be offered the services.

13. Please describe how your program might assist clients with increasing **employment/job seeking skills**. Please include a description of the services provided, how the services are delivered, and how frequently a client would be offered the services.

14. Please describe how your program might assist clients with increasing **housing support**. Please include a description of the services provided, how the services are delivered, and how frequently a client would be offered the services.

15. Please describe how your program might assist clients with increasing **peer/community support**. Please include a description of the services provided, how the services are delivered, and how frequently a client would be offered the services.

16. Please describe how your program might assist clients with **addressing criminal justice system involvement**. Please include a description of the services provided, how the services are delivered, and how frequently a client would be offered the services.

17. Which of the following evidence based practices (EBPs) do you provide in your 3.5 level of care? (Check all that apply)

- Motivational Interviewing (MI)
- Cognitive Behavioral Therapy (CBT)
- Medication Management
- Psychoeducation
- Seeking Safety
- Nurturing Parenting
- SAMHSA Anger Management
- Living in Balance
- Matrix Model
- ASAM Continuum Assessment
- Dialectical Behavior Therapy (DBT)
- Life skills curriculum: Strategies for Maintaining Residential Stability
- Getting Motivated to Change
- Relapse Prevention (RP)
- Others (please specify)

18. What additional services do you provide in your 3.5 level of care that are not EBPs? (Check all that apply)

- 3 Principles.
- Introduction to peer support
- Four Agreements
- Neurobiology of Addiction
- Relapse prevention skills
- Process Group
- Expressive Arts
- Treatment Plan/Case Management Group
- 12-Step Meetings
- Expressive Arts
- Mindfulness/Meditation skills/training
- Yoga
- YMCA/physical activities
- Self-help groups
- Anger Management
- PH Essential Seminars (Topics related to life domains)
- Health Group- Tobacco, MAT, HIV
- In house community presenter for liver related diseases.
- In house community recovery coaching presenter.
- Activities based groups
- Others (please specify)

19. Does your program provide treatment for opioid use disorder (OUD)?

- Yes
- No

High Intensity Residential Treatment Provider Questionnaire

20. Is the care for clients with OUD provided using any of these models for Medication Assisted Treatment (MAT)?

- Integrated delivery (MAT providers on site)
- Coordinated Delivery (active agreement and coordination with external MAT providers)
- MAT not available
- MAT provided using another model (please specify)

21. What types of medications for OUD are offered or coordinated by your program? (Check all that apply)

- Methadone (coordinated with an OTP)
- Formulations of buprenorphine/Suboxone
- Naltrexone/Vivitrol

22. Do you have any practices in place to ensure clients are receiving services within 14 days of a social detox screener? If so, briefly describe these practices.

23. Do you have any strategies in place to retain clients in care? If so, briefly describe these strategies.

24. This project is trying to understand the relationship between the cost of care and the changes that are seen in clients who participate in a 3.5 level of care program.

Some common factors that are being reviewed are length of stay, type of staff, program size, assessment interviews with family/friends, number of early discharges, rates of participation in aftercare treatment, whether clients were admitted voluntarily or not, and methods used in treatment.

What do you believe are the factors that most influence the cost of providing 3.5 level of care?

25. What do you believe are the factors in a 3.5 level of care that most influence the primary outcome of reducing substance use?

26. Are there any outcomes other than reducing substance use that you see among successful clients who are admitted to your 3.5 level of care?

27. Please add anything else you would like to share.

Appendix C: Additional Results

Table C-1a: Change in National Outcome Measures from Admission to Discharge							
Change in total NOMS Score				Change in Substance Use Measures, Any Substance Use past 30 days			
	Mean NOMS Score at Admission	Mean NOMS Score at Discharge	Net Effect on Total NOMS Score [^]	No Alcohol Use past 30 days, only cases indicating alcohol as a substance used, any position, n=95 [^]		No Drug Use past 30 days, only cases indicating drug use, any position, n=178 [^]	
Alcohol Only, Possible Score 0 to 5 (n=58)	1.62	3.00	1.38	Use at Admission, No Use at Discharge (Positive Change)	55.8%	Use at Admission, No Use at Discharge (Positive Change)	36.5%
Drugs Only, Possible Score 0 to 5 (n=141)	1.26	2.33	1.07	No Use at Admission, No Use at Discharge (No Change)	6.3%	No Use at Admission, No Use at Discharge (No Change)	3.4%
Alcohol and Drugs, Possible Score 0 to 6 (n=37)	1.65	3.38	1.73	Use at Admission, Use at Discharge (No Change)	34.7%	Use at Admission, Use at Discharge (No Change)	58.4%
				No Use at Admission, Use at Discharge (Negative Change)	3.2%	No Use at Admission, Use at Discharge (Negative Change)	1.7%

[^]All observed changes in cohort means from Admission to Discharge are net positive and significant at p<0.001 (Paired Samples T test, 2 sided)

Table C-1b: Change in National Outcome Measures from Admission to Discharge

No Recent Criminal Justice Involvement (past 30 days), n=236 [^]		Employment or School Participation, n=236 [*]		Independent Living Arrangements, n=236 ^{**}		Peer Support Participation, n=236 [^]	
No at Admission, Yes at Discharge (Positive Change)	38.6%	No at Admission, Yes at Discharge (Positive Change)	0.4%	No at Admission, Yes at Discharge (Positive Change)	15.3%	No at Admission, Yes at Discharge (Positive Change)	36.0%
Yes at Admission, Yes at Discharge (No Change)	52.5%	Yes at Admission, Yes at Discharge (No Change)	5.9%	Yes at Admission, Yes at Discharge (No Change)	53.8%	Yes at Admission, Yes at Discharge (No Change)	8.1%
No at Admission, No at Discharge (No Change)	6.4%	No at Admission, No at Discharge (No Change)	93.6%	No at Admission, No at Discharge (No Change)	22.5%	No at Admission, No at Discharge (No Change)	54.2%
Yes at Admission, No at Discharge (Negative Change)	2.5%	Yes at Admission, No at Discharge (Negative Change)	0.0%	Yes at Admission, No at Discharge (Negative Change)	8.5%	Yes at Admission, No at Discharge (Negative Change)	1.7%

* Observed change is not significant

**Observed change in cohort mean from admission to discharge is positive and significant at $p < 0.05$, (Paired Samples T test, 2 sided)

[^] Observed change in cohort mean from admission to discharge is positive and significant at $p < 0.001$, (Paired Samples T test, 2 sided)

**Table C-2a: Change in National Outcome Measures from Admission to Discharge
Cases with Discharge Reason of “Completed Treatment”, n=147**

Change in total NOMS Score				Change in Substance Use Measures, Any Substance Use past 30 days			
	Mean NOMS Score at Admission	Mean NOMS Score at Discharge	Net Effect on Total NOMS Score [^]	No Alcohol Use past 30 days, only cases indicating alcohol use, any position, n=72 [^]		No Drug Use past 30 days, only cases indicating drug use, any position, n=105 [^]	
Alcohol Only, Possible Score 0 to 5 (n=42)	1.64	3.12	1.48	Use at Admission, No Use at Discharge (Positive Change)	62.5%	Use at Admission, No Use at Discharge (Positive Change)	48.6%
Drugs Only, Possible Score 0 to 5 (n=75)	1.24	2.64	1.40	No Use at Admission, No Use at Discharge (No Change)	6.9%	No Use at Admission, No Use at Discharge (No Change)	4.8%
Alcohol and Drugs, Possible Score 0 to 6 (n=30)	1.50	2.87	1.37	Use at Admission, Use at Discharge (No Change)	26.4%	Use at Admission, Use at Discharge (No Change)	44.8%
				No Use at Admission, Use at Discharge (Negative Change)	4.2%	No Use at Admission, Use at Discharge (Negative Change)	1.9%

[^]All observed changes in cohort means from Admission to Discharge are net positive and significant at p<0.001 (Paired Samples T test, 2 sided)

**Table C-2b: Change in National Outcome Measures from Admission to Discharge
Cases with Discharge Reason of “Completed Treatment”, n=147**

No Recent Criminal Justice Involvement (past 30 days), n=147 [^]		Employment or School Participation, n=147*		Independent Living Arrangements, n=147**		Peer Support Participation, n=147 [^]	
False at Admission, True at Discharge (Positive Change)	41.5%	No at Admission, Yes at Discharge (Positive Change)	0.7%	No at Admission, Yes at Discharge (Positive Change)	18.4%	No at Admission, Yes at Discharge (Positive Change)	39.5%
True at Admission, True at Discharge (No Change)	53.7%	Yes at Admission, Yes at Discharge (No Change)	5.4%	Yes at Admission, Yes at Discharge (No Change)	53.1%	Yes at Admission, Yes at Discharge (No Change)	10.9%
False at Admission, False at Discharge (No Change)	2.7%	No at Admission, No at Discharge (No Change)	93.9%	No at Admission, No at Discharge (No Change)	21.1%	No at Admission, No at Discharge (No Change)	48.3%
True at Admission, False at Discharge (Negative Change)	2.0%	Yes at Admission, No at Discharge (Negative Change)	0.0%	Yes at Admission, No at Discharge (Negative Change)	7.5%	Yes at Admission, No at Discharge (Negative Change)	1.4%

* Observed change is not significant

** Observed change in cohort mean from admission to discharge is positive and significant at $p < 0.01$, (Paired Samples T test, 2 sided)

[^] Observed change in cohort mean from admission to discharge is positive and significant at $p < 0.001$, (Paired Samples T test, 2 sided)

Table C-3: Incremental Cost and Effect of Service Duration, Including Pregnant and Parenting Women

3.5 level service days	Client count*	Percent of total	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge^	Incremental effect	Incremental cost	Incremental CE ratio (change in cost/change in effect)+
less than 2 weeks	117	49.6%	\$1,305.94 (\$1,085.60)	1.34	2.44				
2 weeks or more	119	50.4%	\$5,195.03 (\$4,248.87)	1.47	2.87	1.40	0.30	\$3,889.09	\$12,963.63

*Including Pregnant and Parenting Women

^Paired Samples T test < 0.001

+Payment per incremental unit change in NOMS

Table C-4: : Incremental Cost and Effect of Service Duration, Not including Pregnant and Parenting Women or Clients who Left Against Treatment Advice or were Discharged for Noncompliance

3.5 level service days	Client count *	Percent of total	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge ^	Incremental effect	Incremental cost	Incremental CE ratio (change in cost/change in effect)+
less than 2 weeks	80	44.4%	\$1,069.50 (\$643.37)	1.26	2.44	1.18			
2 weeks or more	100	55.6%	\$4,501.67 (\$1,461.59)	1.45	2.91	1.46	0.28	\$3,432.17	\$12,257.75

* Not including Pregnant and Parenting Women or Clients who Left Against Treatment Advice or were Discharged for Noncompliance

^Paired Samples T test < 0.001

+Payment per incremental unit change in NOM

**Table C-5: : Incremental Cost and Effect of Service Duration, Service Initiation
(less than or more than 3 days of 3.5 Level Services)**

3.5 service days	Client count	Percent of total	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge	Incremental effect	Incremental cost	Incremental CE ratio (change in cost/change in effect)+
less than 3 days	24	10.2%	\$392.78 (\$175.57)	1.46	2.38	0.92*			
3 or more days	212	89.8%	\$3,592.34 (\$3,731.42)	1.40	2.69	1.29^	0.37	\$3,432.17	\$8,647.45

*Paired Samples T test < 0.01

^Paired Samples T test < 0.001

+Payment per incremental unit change in Composite NOMs Score

**Table C-6: : Incremental Cost and Effect of Service Duration, Service Engagement
(less than or more than 6 days of 3.5 Level Services)**

3.5 service days	Client count	Percent of total	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge	Incremental effect	Incremental cost	Incremental CE ratio (change in cost/change in effect)+
less than 6 days	54	22.9%	\$609.04 (\$267.18)	1.39	2.52	1.13^			
6 or more days	182	77.1%	\$4,055.58 (\$3,371.50)	1.41	2.70	1.29^	0.16	\$3,446.54	\$21,540.88

^Paired Samples T test < 0.001

+Payment per incremental unit change in Composite NOMs Score

Table C-7: : Incremental Cost and Effect of Service Duration, Clients receiving services within 14 days of 'Social Detox Screener'*

Days between screening date and service enrollment date	Client count	Percent of total*	Mean Payment (Std Dev)	Composite NOMS score at admission (mean)	Composite NOMS score at discharge (mean)	Change from Admission to Discharge	Incremental effect	Incremental cost	Incremental CE ratio (change in cost/change in effect)+
14 days or less	145	61.4%	\$3,460.26 (\$4,398.11)	1.51	2.86	1.35^	0.38	\$385.92	\$1,015.58
More than 14 days	41	17.4%	\$3,086.73 (\$1,969.29)	1.42	2.39	1.15^			
No screen date recorded	50	21.2%							

*NOTE: 50 client records had no indication of 'social detox screener' administration; an additional 30 clients (13%) had screening dates separated in time by over 100 days from the date of admission to an episode of care involving 3.5 level services including 13 where the gap in time was more than a year (several years in some cases). Among clients who did initiate services within 14 days of the 'social detox screener' date, 121 (51% of all clients in the study sample) initiated services on the same day or next day. Taken together, these observations suggest an unreliable relationship between data entry, screener administration and / or service initiation.

^Paired Samples T test < 0.001

+Payment per incremental unit change in Composite NOMs Score