

## Research Article

# Testing the Effectiveness of Substance Misuse Outpatient Treatment Settings on Treatment Completion for Women with Substance Use Disorder Using Propensity Score Matching

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### Abstract

**Background:** The literature varies when exploring treatment outcomes as they relate to the type of drug used in conjunction with the type of treatment setting in particular on women. This study employs Propensity Score Matching (PSM) to balance the treatment groups and thus optimize the estimation effects of Substance Use Disorder (SUD) treatment on Treatment Completion (TC) among women with SUD.

**Methods:** 213,546 records from the SAMHSA TEDS-Discharge 2016 data was extracted to develop the matched samples using PSM, resulting in a total sample size of 27,868 individuals with no prior, and 60,928 cases with 1+ prior treatment episodes. Conditional logistic regression models were employed to test the effectiveness of intensive and non-intensive Outpatient Treatment Settings (OTS) on TC and then by type of substance used. Additionally, separate analyses examining this relationship were done for no prior treatment episode cases, and cases with a history of SUD treatment.

**Results:** Cases with history of SUD treatment showed intensive OTS (40.74%) to be more effective than non-intensive (37.18%) on

TC, while those with no prior treatment showed no difference. A similar pattern was seen for cases with prior treatment episodes within the different substances used (alcohol; methamphetamine; heroin; marijuana; and opiate/synthetics substance).

**Conclusion:** Intensive OTS was more effective compared to non-intensive for only cases with prior SUD treatment history regardless of all included substance used except for methamphetamine. This finding emphasizes the need to further examine treatment history, substance used, and types of OTS as relevance factors for treatment completion.

**Keywords:** Drug type; Outpatient treatment settings; Propensity score matching women with substance use disorder; Substance type; Substance use disorder treatment completion

### Introduction

A current controversy in predicting completion rates for treatment for Substance Use Disorder (SUD) is whether or not gender should be considered in designing a treatment protocol. Certain studies have found that gender-based matched treatment programs for treating SUD as well as other mental health disorders have been successful; other results have shown no difference [1-3]. Among some of the factors associated with treatment outcomes, type of substance used and type of treatment settings have shown to vary by gender [3-5]. Residential SUD treatment has been well documented in the literature as a consistent significant predictor for treatment completion [6-8]. However, Outpatient Treatment Settings (OTS) as indicated in previous research are the most utilized for those with SUD [7,8]. Furthermore, the type of OTS has shown to impact success rates.

Existing studies found that Intensive Outpatient Programs (IOPs) were equally effective as inpatient treatment on decrease of substance use [9]. Other studies found OTS to be more impactful compared to residential treatment depending on the level of substance use severity [10]. Conversely, other studies have found no difference among types of SUD treatment settings on treatment outcomes, even abstinence, when accounting for all other factors [7,9]. The relevance of SUD treatment and treatment completion cannot be overstated. Studies have shown women to have higher rates of alcohol and other substance use abstinence post outpatient treatment [11]. They also tend to see more improvements in the areas of family and health [12], are more likely to seek help after relapse [11], and were less likely to recidivate to the criminal justice system [13].

While available evidence shows the relevance of OTS on SUD treatment, research in this area remains minimal. This is particularly relevant for women as studies have shown that they are more likely to be referred to OTS compared to men [4,14]. This study therefore aims to add to the paucity in the literature by examining the effect of the types of OTS on SUD treatment completion for women with SUD and to determine if these outcomes vary by type of choice of substance.

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## Women and substance use

It is well established that substance use and addiction patterns are different for women compared to men as they have special needs and multiple barriers that appear to affect treatment outcomes [15]. While women are less likely than men to develop alcohol-related problems and use illegal drugs, the gap varies by substance and may be closing. Nationwide, males have been found to be more likely to develop SUD compared to females [16] but when it comes to certain substances, this disparity lessens considerably [17]. Recent studies also suggest that trends for SUD rates are rising among women and are now close to parity with that of men [18,19]. Additionally, while women are less likely to use, they have a shorter trajectory from drug use onset to full blown SUD and an equal propensity for addiction [20]. Women report more severe problems sooner than men, such as the inability to manage their daily lives and responsibilities, and more health-related consequences from substance use [11,17,21]. Moreover, women may be more susceptible to craving and relapse. Their tendency to seek care in mental health or primary care settings rather than in specialized treatment programs may contribute to poorer treatment outcomes.

Other gender differences include disparities in drug use, route of administration, drug preference and dose responses [22,23]. However, it is uncertain how much of this disparity can be attributed to biological differences specific to gender such as differences in “endocrine and metabolic systems,” [19] and structure and activities of the brain [24], rather than clinical or programmatic treatment approaches or structural and policy issues that may reflect gender biases.

## Women and substance use disorder treatment

Previous research findings on gender differences in predicting SUD treatment outcomes vary. While some studies showed women to be less likely to complete treatment [4], other findings indicated minimal difference when racial and ethnic differences were taken into account [25] to no difference [14,26]. Studies that did find treatment outcome differences showed women to be more likely than men to drop out of treatment [27,28]. Factors such as severity of profiles [3], co-occurrence of SUD with another mental health disorder [29], and type of substance [30] were found to contribute to the attrition rate of women SUD treatment as compared to men. One complication that is unique to women is that they are more likely to have a dual diagnosis, as a mental health condition can complicate the effect of SUD treatment [14,19]. Despite conflicting findings on treatment outcomes among males and females, what cannot be ignored is the existence of gender related factors (e.g., pregnancy) that do impact SUD treatment completion [1,11]. Variance in SUD treatment completion between genders may further differ when considering race/ethnicity. The existing literature frequently points out that this variance in treatment completion may be correlated with substance of choice and other factors known to impact treatment success. Significant differences have consistently been found within and between groups in large national studies examining treatment completion while considering the interaction of gender and ethnicity/race [25]. Minorities typically show a disadvantage in completion rates. Information on women of color suggests they may face unique co-occurring issues with regard to drug use and treatment needs. For example, women of color are more likely than white women to be victims of rape or physical violence by an intimate [31,32]. They also have access-to-treatment issues (such as the need for childcare for inpatient treatment) and financial barriers. DeVall and Lanier [33] found that while substance use history

(e.g., drug of choice and onset), employment, and educational employment were all related to SUD treatment completion, the degree and directionality varied across groups.

Several factors that moderate the relationship between treatment setting on outcomes such as treatment retention and completion include an individual’s demographics, frequency of use, onset, pregnancy, and type of substance used, pregnancy, peer relations, and presence of another mental health condition [1,24,34,35]. Some studies found the impact of type of treatment setting was moderated by type of substance [8] while others did not [36].

## Substance use disorder outpatient treatment settings

Substance use disorder OTS are usually characterized as intensive and non-intensive. OTS are usually used as a “step down” treatment after detoxification for those who require additional help with abstinence [37]. However, some enter OTS directly when their diagnostic assessment do not meet residential treatment criteria but require a certain amount of hours for treatment [9]. Intensive Outpatient Treatment Settings (IOTS) provide similar services but differ from Non-Intensive Outpatient Setting (NIOTS) by the number of treatment hours a client receives per week and intensity of services. While a patient in a NIOTS receives 9 hours or less a week, the patient in an IOTS gets more than 9 hours, depending on their assessed needs [38].

## Purpose

Women with SUD are more likely to have co-occurring mental health diagnosis and are more likely referred to outpatient treatment [14]. However, their treatment outcomes are generally similar to those of men [19]. This research aims to examine the effectiveness of the different types of OTS on treatment completion among women, using propensity score matching to account for the effects of known related factors identified in previous research, including type of substance used. The study will address the following questions: 1) Is one type of Outpatient Treatment Setting (OTS) more effective than the other on SUD treatment completion when accounting for all demographic and related covariates? 2) Does the effect of the type of OTS on SUD treatment completion differ depending on the type of substance used? In relation to the first question, we hypothesize that IOTS compared to NIOTS will be more effective on SUD treatment completion when controlling for all other covariates given the higher amount of hours and intensity of services [39]. Based on previous research on gender differences in substance use and treatment outcomes [28,40-43], our second hypothesis posits that the effectiveness of the types of OTS on treatment completion will vary by substance used (marijuana, methamphetamine, heroin, opiates/synthetics).

Additionally, factors such as type of substance [40,42,43], presence of a mental health problem [2,44], economic factors such as employment as source of income [45], education level [46], marital status [47], referral source, pregnancy, number of substances reported at admission, number of arrests within 30 days of admission, prior treatment, race, and age impact SUD treatment outcomes will also be included in the analysis. Due to the non-random selection nature of the dataset used for this study, it was important to include these covariates in the Propensity Score Matching (PSM) to control for their effect on the dependent variable.

OTS Group	Completed N (%)	No Prior Not completed N (%)	Sum	p	Completed N (%)	One or More Prior Not completed N (%)	Sum	p
<b>Before Matching</b>								
Intensive	6,112(43.81%)	7,839(56.19%)	13,951	0.076	12,895(40.93%)	18,613(59.07%)	31,508	<0.0001
Non-intensive	26,973(42.98%)	35,779(57.02%)	62,752		32,015(34.92%)	59,671(65.08%)	91,686	
Total	33,085	43,618	76,703		44,910	78,284	123,194	
<b>After Matching</b>								
Intensive	6,102(43.79%)	7,832(56.21%)	13,934	0.629	12,411(40.74%)	18,053(59.26%)	30,464	<0.0001
Non-intensive	6,061(43.50%)	7,873(56.50%)	13,934		11,328(37.18%)	19,136(62.82%)	30,464	
Total	12,163	15,705	27,868		23,739	37,189	60,928	

**Table 1:** Frequencies and proportions of treatment completion by Outpatient Treatment Settings for “no prior treatment episode” and “one or more prior treatment episode,” and before and after propensity-score matching.

## Materials and Methods

### Data source and sample

The dataset used in this analysis is the Treatment Episode Data Set-Discharges (TEDS-D) from the Substance Abuse and Mental Health Services Administration (SAMHSA), compiled for public use from 2016. TEDS-D 2016 provides information on discharge characteristics from alcohol or drug treatment facilities that report to the state administrative data systems. Data included are from states-licensed or certified SUD treatment centers that receive federal public funding including Puerto Rico and the District of Columbia. All U.S. states were included in the 2016 dataset except for Georgia, West Virginia, and Oregon due to insufficient data [48]. Adult females of 18 years or older made up 505,611 cases in the dataset. A total of 213,546 had information on treatment outcomes of interest, specifically treatment completion in OTS. As shown in table 1 of the unmatched sample, a total of 33,085 (43%) completed treatment for those cases with no prior treatment episodes. Forty four percent (n=6,112) were in IOTS and 43% (n=26,973) NIOTS. For one or more episodes, treatment completion for both settings totaled 44,910 (36%), with greater percent in IOTS (41%, n=12,895) compared to NIOTS (35%, n=32,015).

### Measures

#### Dependent Variable: treatment outcome

Treatment outcome was recoded as a dichotomous variable (treatment completion or treatment non-completion) from the ‘reason for discharge’ variable. Treatment completion cases completed recommended treatment. Treatment non-completion included cases that left against professional advice and/or were terminated by facility. All other reasons for case closures such as transfer to another facility, incarcerated, death, other and unknown were excluded from the analysis [30].

#### Independent variable: intervention

The intervention variable to be tested was also dichotomous with two types of treatment compared: intensive (IOTS) and non-intensive (NIOTS) outpatient treatment settings. The outpatient detoxification option was excluded from this study as its goals differ from that of

these other two interventions [49]. Intensive OTS are described in TEDS-D as services that lasts two or more hours per day for three or more days per week. OTS include individual, family, and/or groups services and may include pharmacological services. NIOTS, however, meet less frequently than IOTS.

### Covariates

Researchers have identified certain structural factors that differ by gender and affect treatment outcomes-including race [50], income, education [46], employment, number of substances used, types of substances used [40,42,43], psychiatric disorders and symptoms [2,44], marital status [1,47], age, and health insurance.

### Data analysis

Testing the effectiveness of an intervention can be a problem when covariates are not considered in nonexperimental designs. To reduce selection bias and adjust for the influence of observed covariates due to the nonrandomization nature of secondary data [51], Propensity Score Matching (PSM) was utilized for this study to balance the characteristics that were assigned to either group IOTS or NIOTS. Propensity score is the predicted probability of an individual to be assigned to either of the treatments based on a set of covariates from the logistic regression model. This approach enhances causal inferences of the independent variable in determining whether or not one type of outpatient treatment is more effective than the other. Details of PSM method are described in the next section. Because TEDS-D reported on SUD treatment discharge by episodes and not by individuals, separate analyses were performed on cases with: 1) no prior treatment episodes; and 2) those with prior treatment episodes. Cases with no prior SUD treatment episode was used to capture individual clients. However, interpretation of findings for cases with prior history of SUD treatment are of cases and not of individuals.

To answer the second research question, conditional logistic regression analyses were employed to develop models for each substance (alcohol, heroin, marijuana, methamphetamine, opiates/synthetic drugs, methamphetamine) to control for their possible effect on the effectiveness of the two OTS on SUD treatment completion. The matched sample was utilized for these models as the sample

Variables	No Prior (N=27,868)			One or More Prior (N=60,928)		
	Intensive (n=13934)	Non-intensive (n=13934)	std_d	Intensive (n=30464)	Non-intensive (n=30464)	std_d
<b>Age</b>						
18-20	875(6.3%)	855(6.1%)	0.006	1,046(3.4%)	1,006(3.3%)	0.007
21-24	2,087(15.0%)	2,074(14.9%)	0.003	3,609(11.8%)	3,530(11.6%)	0.008
25-29	3,036(21.8%)	3,028(21.7%)	0.001	6,340(20.8%)	6,381(20.9%)	-0.003
30-34	2,500(17.9%)	2,520(18.1%)	-0.004	5,949(19.5%)	5,990(19.7%)	-0.003
35-39	1,729(12.4%)	1,720(12.3%)	0.002	4,235(13.9%)	4,228(13.9%)	0.001
40-44	1,125(8.1%)	1,154(8.3%)	-0.008	2,800(9.2%)	2,866(9.4%)	-0.007
45-49	941(6.8%)	947(6.8%)	-0.002	2,614(8.6%)	2,669(8.8%)	-0.006
50-54	797(5.7%)	848(6.1%)	-0.016	2,125(7.0%)	2,067(6.8%)	0.008
55-64	742(5.3%)	698(5.0%)	0.014	1,606(5.3%)	1,584(5.2%)	0.003
65+	102(0.7%)	90(0.6%)	0.010	140(0.5%)	143(0.5%)	-0.001
<b>Race</b>						
White	9,982(71.6%)	10,044(72.1%)	--0.010	22,336(73.3%)	22,401(73.5%)	-0.005
Black or African Am	2,169(15.6%)	2,151(15.4%)	00.004	4,467(14.7%)	4,421(14.5%)	0.004
NH or PI	139(1.0%)	109(0.8%)	00.023	171(0.6%)	149(0.5%)	0.010
Asian	105(0.8%)	102(0.7%)	00.003	123(0.4%)	111(0.4%)	0.006
Asia or PI	13(0.1%)	11(0.1%)	00.005	23(0.1%)	25(0.1%)	-0.002
American Indian	323(2.3%)	310(2.2%)	00.006	1,008(3.3%)	921(3.0%)	0.016
Alaska Native	59(0.4%)	56(0.4%)	00.003	96(0.3%)	92(0.3%)	0.002
Other single race	674(4.8%)	659(4.7%)	00.005	1,164(3.8%)	1,226(4.0%)	-0.010
Two or more races	283(2.0%)	294(2.1%)	--0.006	824(2.7%)	838(2.8%)	-0.003
Unknown	187(1.3%)	198(1.4%)	--0.007	252(0.8%)	280(0.9%)	-0.010
<b>Education</b>						
8 years or less	521(3.7%)	533(3.8%)	--0.005	1,164(3.8%)	1,199(3.9%)	-0.006
9-11 years	2,778(19.9%)	2,724(19.5%)	00.010	6,613(21.7%)	6,555(21.5%)	0.005
12 years	6,118(43.9%)	6,222(44.7%)	--0.015	13,070(42.9%)	13,392(44.0%)	-0.021
13-15 years	3,057(21.9%)	3,028(21.7%)	00.005	6,874(22.6%)	6,671(21.9%)	0.016
16 or more	1,121(8.0%)	1,111(8.0%)	00.003	2,144(7.0%)	2,064(6.8%)	0.010
Unknown	339(2.4%)	316(2.3%)	00.011	599(2.0%)	583(1.9%)	0.004
<b>Marital Status</b>						
Divorced	2,037(14.6%)	2,010(14.4%)	00.005	5,193(17.0%)	5,163(16.9%)	0.003
Never married	7,245(52.0%)	7,184(51.6%)	00.009	16,410(53.9%)	16,181(53.1%)	0.015
Now married	2,162(15.5%)	2,138(15.3%)	00.005	3,968(13.0%)	3,986(13.1%)	-0.002
Separated	944(6.8%)	934(6.7%)	00.003	2,154(7.1%)	2,149(7.1%)	0.001
Unknown	1,546(11.1%)	1,668(12.0%)	-0.027	2,739(9.0%)	2,985(9.8%)	-0.028
<b>Living Arrangement</b>						
Dependent living	2,448(17.6%)	2,455(17.6%)	--0.001	6,126(20.1%)	6,026(19.8%)	0.008
Homeless	1,047(7.5%)	1,071(7.7%)	--0.006	2,706(8.9%)	2,756(9.0%)	-0.006
Independent living	10,072(72.3%)	10,029(72.0%)	00.007	21,039(69.1%)	21,054(69.1%)	-0.001
Unknown	367(2.6%)	379(2.7%)	--0.005	593(1.9%)	628(2.1%)	-0.008
<b>Pregnant</b>						
No	13,005(93.3%)	12,962(93.0%)	0.012	28,464(93.4%)	28,366(93.1%)	0.013
Yes	529(3.8%)	549(3.9%)	-0.007	1,211(4.0%)	1,243(4.1%)	-0.005
Unknown	400(2.9%)	423(3.0%)	-0.01	789(2.6%)	855(2.8%)	-0.013

<b>Employment</b>						
Full time	2,224(16.0%)	2,125(15.3%)	00.020	3,359(11.0%)	3,269(10.7%)	0.009
not in labor force	4,441(31.9%)	4,610(33.1%)	-0.026	10,989(36.1%)	11,188(36.7%)	-0.014
part time	1,519(10.9%)	1,484(10.7%)	00.008	2,738(9.0%)	2,609(8.6%)	0.015
unemployed	5,502(39.5%)	5,458(39.2%)	00.006	12,994(42.7%)	12,966(42.6%)	0.002
Unknown	248(1.8%)	257(1.8%)	--0.005	384(1.3%)	432(1.4%)	-0.014
<b>Primary Income</b>						
None	3,193(22.9%)	3,355(24.1%)	--0.027	7,403(24.3%)	7,691(25.2%)	-0.022
other	1,596(11.5%)	1,486(10.7%)	00.025	4,041(13.3%)	3,409(11.2%)	0.063
public assistance	1,084(7.8%)	1,098(7.9%)	-0.004	3,311(10.9%)	3,153(10.3%)	0.017
retirement/ pension/ disability	746(5.4%)	811(5.8%)	--0.020	2,140(7.0%)	2,351(7.7%)	-0.027
wages/salary	3,365(24.1%)	3,254(23.4%)	0.019	5,323(17.5%)	5,264(17.3%)	0.005
Unknown	3,950(28.3%)	3,930(28.2%)	0.003	8,246(27.1%)	8,596(28.2%)	-0.026
<b>Health Insurance</b>						
Medicaid	3,201(23.0%)	3,420(24.5%)	--0.037	7,745(25.4%)	8,530(28.0%)	-0.058
Medicare, other (e.g., TRICARE, CHAMPUS)	535(3.8%)	563(4.0%)	-0.010	1,048(3.4%)	1,115(3.7%)	-0.012
None	3,479(25.0%)	3,602(25.9%)	-0.020	6,393(21.0%)	6,647(21.8%)	-0.020
Private insurance	846(6.1%)	917(6.6%)	-0.021	1,682(5.5%)	1,804(5.9%)	-0.017
Unknown	5,873(42.1%)	5,432(39.0%)	00.064	13,596(44.6%)	12,368(40.6%)	0.082
<b>Referral source</b>						
Alcohol/ Drug use care provider	934(6.7%)	937(6.7%)	-0.001	3,750(12.3%)	3,736(12.3%)	0.001
Court/ Criminal justice referral/DUI/DWI	4,051(29.1%)	4,025(28.9%)	0.004	8,519(28.0%)	8,698(28.6%)	-0.013
Employer/ EAP	61(0.4%)	55(0.4%)	0.007	60(0.2%)	47(0.2%)	0.010
Individual/ Self referred	4,790(34.4%)	4,885(35.1%)	-0.014	10,214(33.5%)	10,119(33.2%)	0.007
Other community referral	2,681(19.2%)	2,639(18.9%)	0.008	5,632(18.5%)	5,638(18.5%)	-0.001
Other health care provider	1,060(7.6%)	1,039(7.5%)	0.006	1,807(5.9%)	1,711(5.6%)	0.014
School (Educational)	19(0.1%)	19(0.1%)	0.000	10(0.0%)	12(0.0%)	-0.003
Unknown	338(2.4%)	335(2.4%)	0.001	472(1.5%)	503(1.7%)	-0.008
<b>Psychiatric disorders and symptoms</b>						
No	6,041(43.4%)	6,219(44.6%)	-0.026	11,063(36.3%)	11,705(38.4%)	-0.044
Yes	5,274(37.8%)	5,450(39.1%)	-0.026	13,813(45.3%)	14,093(46.3%)	-0.018
Unknown	2,619(18.8%)	2,265(16.3%)	0.067	5,588(18.3%)	4,666(15.3%)	0.081
<b>Number of arrests at admission</b>						
None	12,655(90.8)	12,599(90.4%)	0.014	27,922(91.7%)	27,909(91.6%)	0.002
Once	932(6.7%)	954(6.8%)	-0.006	1,948(6.4%)	1,925(6.3%)	0.003
Two or more times	108(0.8%)	107(0.8%)	0.001	213(0.7%)	203(0.7%)	0.004
Unknown	239(1.7%)	274(2.0%)	-0.019	381(1.3%)	427(1.4%)	-0.013
<b>Number of substances reported</b>						
0	308(2.2%)	314(2.3%)	-0.003	343(1.1%)	402(1.3%)	-0.018
1	6,425(46.1%)	6,307(45.3%)	0.017	10,797(35.4%)	10,785(35.4%)	0.001
2	4,556(32.7%)	4,615(33.1%)	-0.009	10,447(34.3%)	10,446(34.3%)	0.000
3	2,645(19.0%)	2,698(19.4%)	-0.010	8,877(29.1%)	8,831(29.0%)	0.003

**Table 2:** Baseline characteristics between intensive and non-intensive Outpatient Services (OTS) in the propensity-score matched sample for “no prior treatment episode” and “one or more prior treatment episode”.

optimized the matching of observed variables considered to impact the outcome variable. Finally, to further explore the impact of the types of OTS and the five types of substance used, bivariate logistic regression was used on the matched sample to estimate the Odds Ratio (OR) for the independent variable and each selected substance used on SUD treatment completion. The statistical software package R version 3.5.1 was used for all analyses.

### Matching method

A one-to-one matching method was used to yield the lowest bias [52,53]. The nearest neighbor matching method was used with a narrow caliper value of 0.05 of “the standard deviation of the logit of the propensity score” to optimize estimation of treatment effects [54] on treatment outcome using the following covariates: age, race, education, marital status, pregnant status, employment, primary income, health insurance, referral source psychiatric disorders and symptoms, number of arrests at admission, and number of substances reported. Cases that are not matched are dropped from the analysis. To assess the adequacy of the propensity score model specification, the standardized difference between the IOTS and NIOTS groups was used to examine the balance in the observed variables. The standardized difference compared the balance of matching in the observed variables. This is done by comparing the difference in prevalence of the pooled standard deviation [55] between the IOTS and NIOTS episodes (Table 2). Guided by Cohen’s [56] recommendation on effect size indices, standardized difference threshold of 0.2 was recommended to indicate balance [52]. Descriptive statistics were reported to examine the sample characteristics for IOTS and NIOTS groups in the matched sample.

### Handling of missing data

Since all covariates are categorical and the proportions of missing data for each variable were substantial, missing values were assigned a new category “unknown” to prevent loss of data.

## Results

### Matched sample characteristics

No prior SUD treatment episodes. As shown in table 1, a total of 27868 cases with no prior SUD treatment episodes were matched, with both treatment groups being equal in size (N= 13,934 each). The absolute values of all standardized differences were below 0.1, indicating a good match between the IOTS and NIOTS groups (Table 2). White women comprised almost three quarters of the sample (72%), followed by Black/African American women (15%). Over half were never married (53%) and living independently (69%). The majority were high school graduates (43%), in the 25-29 age range (21%), and unemployed (43%) or not in the labor force (37%). Most of the women had no medical insurance (25%), closely followed by those receiving Medicaid health insurance (24%). The percentages of women who reported no source of income and those earning wages were similar (24%). Many were self-referred (35%) followed by about a third who were referred by the court or a criminal justice referral (29%). Thirty-eight percent had a psychiatric problem in addition to alcohol/drug misuse, a small percentage (3.9%) were pregnant at the time of admission, 46% percent reported the use of at least one substance at admission, and over a half (52%) reported use of three or more substances at admission. Those with no arrests made up a little over 90% of the final sample.

**One or more prior episodes:** A total of 60,928 cases in the matched sample had one or more prior episodes of SUD treatment. Each OTS group consisted of 30,464 cases. Baseline characteristics for cases with one or more prior episodes showed a similar pattern with the no prior treatment episodes regarding the order of prevalence for the categories within each variable.

### Type of outpatient treatment services on treatment completion by type of substance used

Similar to the unmatched sample (Table 1), the matched sample showed that the completion rate of IOTS (43.79%) was no different compared to the rate of NIOTS (43.5%) for cases with no prior treatment episodes. However, cases with one or more prior treatment episodes showed IOTS as more effective on treatment completion (40.74%) compared to NIOTS (37.18%). Results were also similar to that of the unmatched sample. Intensive OTS was not more effective compared to NIOTS on any substance type for those with no history of prior treatment. However, as indicated in table 3, IOTS was significantly more effective on SUD treatment completion compared to NIOTS for all five substance types when there were multiple prior treatment episodes. Additionally, the bivariate logistic regression suggests that if marijuana, heroin, and opiate/ synthetic drugs were the type of substance used, there was a lower likelihood of treatment completion. However, when the effects of the different types of OTS on treatment completion were examined in the context of substance used, the relationship changed. That is, cases with a history of SUD treatment, were more likely to complete treatment in IOTS compared to NIOTS (Table 3).

Models for each substance	No Prior OR(95%CI)	One or More Prior OR(95%CI)
†Intensive vs. non-intensive OTS	1.01(0.96,1.05)	1.14(1.10,1.18)***
Alcohol Substance reported	1.50(1.43,1.58)***	1.50(1.45,1.55) ***
†Intensive vs. non-intensive OTS	1.01(0.96,1.06)	1.16(1.12,1.20) ***
Marijuana Substance reported	0.89(0.85,0.94)***	0.93(0.90,0.97) ***
†Intensive vs. non-intensive OTS	1.01(0.96,1.05)	1.15(1.11,1.19) ***
Heroin Substance reported	0.53(0.50,0.57)***	0.61(0.59,0.63) ***
†Intensive vs. non-intensive OTS	1.02(0.97,1.07)	1.16(1.12,1.20) ***
Methamphetamine Substance reported	0.84(0.79,0.89)***	1.00(0.96,1.04)
†Intensive vs. non-intensive OTS	1.01(0.96,1.06)	1.16(1.12,1.20) ***
Opiates/Synthetics Substance reported	0.74(0.69,0.79)***	0.85(0.82,0.89) ***

**Table 3:** Logistic Regression Models, by reported primary substance of use.

\* p < .05, \*\* p < .01, \*\*\* p < .001; †Referent group

### Types of substance use and outpatient treatments bivariate logistic regressions

Using primary substance use, as shown in table 4, alcohol use was found to be associated with higher odds of treatment completion for both cases of no prior (OR=1.5, 95% CI 1.43, 1.58, p<0.001) and one or more prior treatment episodes (OR=1.5, 95% CI 1.45, 1.55, p<0.001). Conversely, the use of marijuana, heroin, methamphetamine, and other opiates and synthetic drugs indicated a lower likelihood of treatment completion for cases with no prior treatment episodes. The results were similar for cases with one or more prior treatment episodes, except for methamphetamine where no difference was observed.

var	levels	No Prior		1+ Prior	
		completed	OR(95%CI)	completed	OR(95%CI)
Outpatient Treatment	Intensive	6,102(43.8%)	Ref	12,411(40.%)	Ref
	Non-intensive	6,061(43.5%)	0.99(0.94,1.04)	11,328(37.%)	0.86(0.83,0.89) ***
Alcohol at admission	No	5,976(39.1%)	Ref	11,943(34.%)	Ref
	Yes	6,187(49.1%)	1.50(1.43,1.58) ***	11,796(44.%)	1.51(1.46,1.56) ***
Marijuana at admission	No	7,514(44.8%)	Ref	15,628(39.%)	Ref
	Yes	4,649(42.0%)	0.89(0.85,0.94)***	8,111(37.9%)	0.93(0.90,0.96) ***
Heroin at admission	No	10,683(46.2%)	Ref	18,062(42.%)	Ref
	Yes	1,480(31.3%)	0.53(0.50,0.57) ***	5,677(30.9%)	0.61(0.58,0.63) ***
Methamphetamine at admission	No	9,656(44.6%)	Ref	18,166(38.%)	Ref
	Yes	2,507(40.3%)	0.84(0.79,0.89) ***	5,573(39.1%)	1.01(0.97,1.05)
Opiates/Synthetics at admission	No	10,304(44.9%)	Ref	19,480(39.%)	Ref
	Yes	1,859(37.6%)	0.74(0.69,0.79) ***	4,259(35.8%)	0.85(0.81,0.88) ***

**Table 4:** Bivariate logistic regression models for outpatient treatment settings and type of substance used on Treatment completion with matched sample.

Further examination revealed that heroin cases were almost twice as likely (OR= 1.88, 95% CI 1.75, 2.0,  $p < 0.001$ ) to not complete SUD treatment for cases with no prior treatment history. This was followed by opiates/synthetics (OR=1.35, 95% CI 1.27, 1.45,  $p < 0.001$ ), indicating significant challenges in treatment completion for individuals using these substances.

## Discussion

This study examined two different types of OTS for women admitted to SUD treatment. Using propensity score matching to enhance internal validity, this study tested the effectiveness of IOTS compared to NIOTS on SUD treatment completion. The results indicated that IOTS was more effective than NIOTS on treatment completion only for cases with prior SUD treatment history. This finding may suggest a few interpretations. One possibility could be that those who enter IOTS after their first time may be more likely to complete treatment because they better understand how to successfully complete treatment after previous experiences with it. Another possibility could be that those who enter IOTS after their first time may be more ready for change and recovery upon their subsequent bouts with treatment. Due to the potential duplication of cases for entries with prior SUD treatment history, results must be considered with caution. For those with no prior treatment episodes, there was no difference between the two types of OTS. While our findings shed light on the impact of the types of OTS on SUD treatment outcomes, further exploration into the specific types of OTS treatment modalities (i.e., cognitive behavioral therapies, behavioral therapies, pharmacotherapies, etc.) and their respective effect on treatment completion is necessary.

Considering the odds of treatment completion in light of the primary type of substance used, similar results were found. The findings also indicated no difference in rates of treatment completion between the two types of OTS for cases with nor prior treatment episodes. However, for cases with prior treatment episodes, IOTS was more effect than NIOTS on SUD treatment completion. Nonetheless the odds ratio is only slightly over 1 for each of the substances (Table 3), suggesting that while the findings may be statistically significant, it may not be clinically impactful [57]. Thus, our second hypothesis was also partially supported. Our findings highlight the importance of examining the specific substance used such as marijuana, heroin, and opiates/ synthetic drugs for cases with prior treatment histories, as

this information may contribute valuable insights when assessing for specialized treatments for women.

Further research on the types of treatment offered in outpatient settings should explore reasons for outcome differences between the group with no prior treatment and those with prior treatment episodes. This is important given the potential cost differences of IOTS versus NIOTS for women with SUD, which has implications for determining the type or level of treatment that would result in treatment completion. Future studies should consider whether OTS was used as a step down from residential treatment, as this may influence treatment outcomes.

Our results also showed that, even when controlling for all other covariates, those with alcohol use as primary were more likely to complete treatment, while the reverse was true for the other substances. Additionally, heroin use among women had the lowest odds of completion followed by opiates and other synthetics. Our findings emphasize the need to further explore the impact various types of SUD treatment modalities for hard substances, as they appear to be a significant risk factor for not completing treatment for women, regardless of the intensity of the outpatient treatment. The positive side is that intensive OTS seems to be effective on treatment completion for cases of heroin use with history of SUD treatment. Thus, our findings also echo the need to further explore the impact of various types of SUD treatment modalities for the hard substances as they seem to be a risk factor of not completing treatment regardless of the intensity of the outpatient treatment.

## Generalizability

Findings of this study can be considered generalizable to women populations with SUD who have no history of treatment episodes only. Although separate analyses were done for cases with prior treatment history, generalizing the findings to women with SUD and prior treatment history in the population would not be recommended. However, our findings do emphasize treatment history as an important aspect when examining treatment outcomes. As previously mentioned, cases with prior treatment episodes are not individuals but of episodes thus multiple episodes may be of an individual. This can pose a problem when interpreting results for these cases.

## Limitations

A major limitation of this study is the restricted amount of information available within the TEDS-D dataset, a common issue with secondary data. For example, specific details on treatment are not specified. The different types of treatment are labeled within inpatient or outpatient treatment settings. Unfortunately, this limits a more thorough investigation of the types of SUD treatment the women received. Additionally, as mentioned prior treatment episodes are not of individuals but of episodes and thus the problem with duplication could not be avoided. This also restricted interpretation of the findings for cases with history of SUD treatment to episodes and not of individuals. Furthermore, while failure to complete treatment is generally an indicator that future recovery is not likely, treatment completion in and of itself, is not necessarily a proxy for treatment effectiveness and long-term recovery. Other areas that are worthy to explore in future studies are: service matching with client choice, length of time in treatment, motivation for treatment, number of children, and social support as these factors were shown to impact SUD treatment completion among women [11]. Lastly, while the use of PSM purports to strengthen internal validity to establish causality as its process of matching minimizes differences between the groups, there is still a slight possibility that groups may still be imbalanced when relevant variables or characteristics are not included in the matching process [58].

## Conclusion

This study contributed to furthering knowledge on outpatient treatment settings on SUD treatment completion among women with SUD. The results show that for women with SUD, IOTS and NIOTS are no different for those with no prior treatment history. However, for cases with prior history of SUD treatment, IOTS did have a significant positive effect on treatment completion regardless of type of substance used (again, with the exception of methamphetamines). These findings emphasize the need to examine the different modalities of OTS for women with SUD, as well the cost, resource, implications of making these differential treatment decisions.

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