

# Against professional advice: treatment attrition among pregnant methamphetamine users

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**Abstract:** Pregnant methamphetamine users who leave substance use treatment against professional advice may be at risk of poorer health outcomes. To examine the hypothesis that methamphetamine use during pregnancy may be associated with leaving substance use treatment against professional advice, the 2006 Treatment Episode Data Set was analyzed. A logistic regression adjusting for age, race, service setting, prior substance abuse treatment, criminal justice referral, and education was conducted. Inclusion criteria were met by 18,688 pregnant admissions; 26.4% identified methamphetamines as their primary substance of use. Frequency of use was identified as an effect modifier, therefore results were stratified by less than weekly use and weekly or more use. Methamphetamine use was significantly associated with leaving treatment against professional advice regardless of usage level. However, the odds of leaving treatment were greater among women using methamphetamine less than weekly. Further investigation into this association may be warranted due to the complications that may result from methamphetamine use during pregnancy.

**Keywords:** pregnancy, methamphetamines, treatment, attrition

## Introduction

Methamphetamine use is a growing problem among pregnant women in the United States. Whereas it accounted for only 8% of all pregnant admissions to substance abuse treatment in 1994, since 2003 it has surpassed cocaine as the number one substance compelling treatment and now accounts for 24% of all admissions.<sup>1</sup> Rates of methamphetamine treatment admissions are greater in pregnant women than among both nonpregnant women (12.5%) and men (7%).<sup>2</sup> Similarly, hospitalizations of pregnant women with a diagnosis of methamphetamine abuse doubled from 1998 to 2004 while hospitalizations of pregnant women with a diagnosis of cocaine abuse declined 44%.<sup>3</sup>

Methamphetamine usage is disproportionately distributed between men and women compared to other drugs, possibly because of its effects as a weight loss agent.<sup>4-6</sup> Although men account for a greater proportion of the users of most illicit substances, women account for a greater percentage of methamphetamine users.<sup>4</sup> The disparity is even more pronounced among adolescents<sup>4</sup> which is especially concerning as methamphetamine use has been associated with risky sexual activity and pregnancy in adolescents.<sup>4,7</sup>

One of the difficulties in elucidating methamphetamine's effects on the developing fetus is that drug-using pregnant women may consume more than one substance, including tobacco and alcohol. Current research has demonstrated associations

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between methamphetamine and preterm birth, low gestational weight, smaller head circumference, and intrauterine growth restriction.<sup>8–10</sup> Pregnant women admitted to the hospital with a diagnosis of methamphetamine use are more likely to experience hypertension, cardiovascular disorders, and placenta previa when compared to pregnant cocaine users.<sup>8,11</sup> The evidence that drug use during pregnancy has adverse effects on the mother and the developing baby and results in increased healthcare costs for both is well documented.<sup>12–16</sup> Effects of neonatal drug exposure have also been shown to continue into childhood and early adolescence.<sup>14,16</sup>

Prior research indicates that substance abuse treatment during pregnancy is associated with increased abstinence and improved social functioning in the mother, as well as improved neonatal outcomes such as reduced incidence of preterm births and higher birth weight.<sup>17–19</sup> Despite this, pregnant women may be at higher risk of not completing treatment.<sup>17,20–22</sup> Given the increasing prevalence of methamphetamine as a primary drug of abuse in pregnancy, it is imperative that treatment outcomes in this population be examined. This study was undertaken to examine whether pregnant women admitted into treatment for methamphetamine use were more likely to leave against professional advice compared with those admitted for other substances. As a corollary, it was examined whether there were particular demographic or treatment-specific characteristics among methamphetamine admissions that were associated with leaving treatment prematurely.

## Methods

A cross-sectional study was conducted using the Treatment Episode Data Set-Discharges (TEDS-D), an administrative data system that contains data on all substance abuse admissions to treatment facilities receiving federal funding in the United States. These data are collected by states to monitor their individual substance abuse treatment programs and submitted to Substance Abuse and Mental Health Services Administration. In 2006, the admissions data were linked to discharge data and made publically available for the first time. The unit of analysis in TEDS-D is the admission episode and not the individual client. TEDS-D contains client-level information on demographics (age, race, housing, and socioeconomic status), substance abuse behavior (type of substance, frequency, and mode of use), as well as treatment characteristics (referral source, days waiting for treatment, prior treatment, and service setting) and discharge information (length of stay and reason for discharge). The dataset in this study was limited to pregnant admissions only.

## Primary variables of interest

The primary exposure of this study was methamphetamine use, defined by methamphetamine or amphetamine being the primary drug compelling treatment admission. Amphetamines were not separated from methamphetamines as states varied in their subclassification of these substances. Some states did not separate methamphetamines from amphetamines in their reporting. However, for the states that made this distinction in TEDS 2007, methamphetamines constituted about 95% of all stimulant admissions.<sup>23</sup> Methamphetamine use was contrasted with other primary substances compelling treatment which included other illicit substances and alcohol. Nicotine use is not included in TEDS-D.

The primary outcome of this study was clients that left substance abuse treatment against professional advice. TEDS-D includes reasons for treatment discharge. Leaving against professional advice is defined as “the client chose not to complete the treatment program.” It includes those who have not received treatment for some time and are discharged for administrative reasons. Leaving against professional advice was contrasted with any other reason for ending treatment episode, including completion or incarceration.

## Covariates

Additional variables included in the analysis were either demographic or treatment specific. A dichotomous variable was created that indicated polysubstance use prior to admission. Prior treatment, injection drug use, and marital status were all coded as dichotomous variables, as was education, which was collapsed into some high school or less versus completed high school or greater. Criminal justice referral was also coded as a dichotomous variable with those identified as having been referred by any police official, judge, prosecutor, probation officer, or other person affiliated with the federal, state or county judicial systems. Race and age were categorized into subgroups for analysis as was service setting. Service setting is defined in TEDS-D as follows: ambulatory (consisting of outpatient intensive or nonintensive treatment services), residential (nonacute inpatient short- or long-term treatment), and detoxification (an acute 24 hour/day service to provide a safe withdrawal from substances). Finally, frequency of substance use was described as either less than weekly use or weekly or more use.

## Statistical analysis

Demographic and treatment specific variables were analyzed using univariate and bivariate analysis. Chi-square tests were used to identify association between covariates and primary

exposure and outcome of interest. The crude association between methamphetamine use and leaving against professional advice was described using an unadjusted odds ratio with a 95% confidence interval (CI). Interaction and confounding were assessed using the Breslow–Day test statistic and Mantel–Haenszel odds ratio (OR). A Breslow–Day *P* value of less than 0.01 was considered to provide evidence for effect modification. Confounders were identified by comparing Mantel–Haenszel OR to the unadjusted OR; a difference of 10% or more was considered evidence of confounding. A *P* value of less than or equal to 0.05 was considered statistically significant.

Based on the results of the multivariable analysis, logistic regression models were built including relevant variables of interest. The association between methamphetamine use and leaving against professional advice was described using stratified ORs from the final logistic regression model with 95% CI. All data analysis was completed using SAS (v 9.2; SAS Institute Inc, Cary, NC).

## Results

In 2006, 18,762 pregnant women were discharged from treatment in TEDS-D, 74 (0.4%) of whom were missing data on methamphetamine use. The remaining 18,688 formed the sample for this study. Demographic characteristics of pregnant women stratified by methamphetamine use are presented in Table 1. Approximately 26% of the sample

identified methamphetamines as their primary substance of use. Other substances compelling treatment admission included alcohol (*n* = 2836, 15%), cocaine (*n* = 3656, 20%), marijuana (*n* = 3397, 18%), and heroin (*n* = 2585, 14%).

Overall, the majority of the sample was young and white, unemployed, but not homeless. Approximately 50% had graduated from high school. Compared with other substance admissions, methamphetamine admissions tended to be slightly younger. They also tended to be white (64% vs 53%) or of Latino descent (24% vs 12%). Only a very small proportion (3% vs 28%) identified themselves as African American (Table 1).

Overall, 5335 admissions (29%) were classified as having left treatment against professional advice (Table 2), the second most common reason for discharge. The most common reason for discharge was treatment completion (*n* = 6842, 37%). Other reasons included transfer to another facility (*n* = 3203, 18%) and treatment terminated by the facility generally because of client noncompliance (*n* = 1282, 7%).

Thirty-one percent of the sample was referred by the criminal justice system and the majority (67%) entered an ambulatory treatment setting. Slightly more admissions reported less than weekly frequency of substance use (54%). When stratified by methamphetamine use, it was found that a slightly higher proportion of methamphetamine admissions left against professional advice compared to other substance admissions (32% vs 28%).

**Table 1** Demographic characteristics of pregnant treatment episodes by primary substance reported (*n* = 18,688)

Treatment type	Methamphetamine treatment episodes ( <i>n</i> = 4931) <i>n</i> (%)	Other primary substance ( <i>n</i> = 13,757) <i>n</i> (%)	<i>P</i> value	Total ( <i>n</i> = 18,688) <i>n</i> (%)
<b>Characteristic</b>				
<b>Age</b>				
<21	138 (3)	658 (5)	<0.001	796 (4)
21–29	2328 (47)	5061 (37)		7389 (40)
30–39	2075 (42)	5665 (41)		7740 (41)
>39	390 (8)	2373 (17)		2763 (15)
<b>Race</b>				
White	3139 (64)	7296 (53)	<0.001	10,435 (56)
African American	141 (3)	3783 (28)		3924 (21)
Latino	1186 (24)	1719 (12)		2905 (15)
Other	465 (9)	959 (7)		1424 (8)
<b>Education*</b>				
Some high school or less	2375 (49)	6434 (47)	0.078	8809 (47)
Completed high school or greater	2498 (51)	7185 (53)		9683 (52)
<b>Living arrangement*</b>				
Homeless	743 (16)	1542 (12)	<0.001	2285 (13)
Not homeless	4005 (84)	11,849 (88)		15,854 (87)
<b>Employment status*</b>				
Employed	529 (11)	1858 (14)	<0.001	2387 (13)
Not employed	4384 (89)	11,748 (86)		16,132 (87)

**Note:** \*Missing data account for discrepancies in row totals.

**Table 2** Treatment characteristics of pregnant treatment episodes by primary substance reported (n = 18,688)

Treatment type	Methamphetamine episodes (n = 4931) n (%)	Other primary substance (n = 13,757) n (%)	P value	Total (n = 18,688) n* (%)
<b>Characteristic</b>				
Left against professional advice				
Yes	1574 (32)	3761 (28)	<0.001	5335 (29)
No	3327 (68)	9594 (72)		12,921 (71)
Referral source				
Criminal justice system	1917 (40)	3775 (28)	<0.001	5692 (31)
Other	2890 (60)	9648 (72)		12,538 (69)
Prior substance abuse treatment				
Yes	2447 (51)	6218 (52)	0.17	8665 (52)
No	2342 (49)	5678 (48)		8020 (48)
Route of administration				
Intravenous	842 (17)	1628 (12)	<0.001	2470 (14)
Nonintravenous	4048 (83)	11,733 (88)		15,781 (86)
Service setting				
Ambulatory	2999 (61)	9565 (70)	<0.001	12,564 (67)
Residential	1715 (35)	3472 (25)		5187 (28)
Detoxification	217 (4)	720 (5)		937 (5)
Substance use frequency				
Less than weekly	3269 (67)	6651 (50)	<0.001	9920 (54)
Weekly or more	1633 (34)	6765 (50)		8398 (46)
Polysubstance abuse				
Yes	3040 (62)	8539 (62)	0.603	11,579 (62)
No	1891 (38)	5218 (38)		7109 (38)

**Note:** \*Missing data accounts for discrepancies in column totals.

Additionally, a much higher proportion was referred to treatment through the criminal justice system (40% vs 28%). Another notable finding was that methamphetamine admissions tended to report less than weekly drug use more often compared to all other substance admissions (67% vs 50%) (Table 2).

Results of the multivariable analysis are presented in Table 3. Frequency of use was identified as an effect modifier; therefore results were stratified by less than weekly and weekly or greater use. Total N with complete, nonmissing values for all variables in the multivariable analysis was 15,421, including 8313 who used methamphetamines less than weekly and 7108 who used at least weekly. After adjusting for age, race, service setting, prior substance abuse treatment, criminal justice referral, and education, it was found that pregnant methamphetamine admissions had higher odds of leaving treatment against professional advice compared with reported users of all other substances. This difference was more pronounced among less than weekly users. Among less than weekly substance users, methamphetamine use was associated with 1.57 times the odds of leaving against professional advice (95% CI: 1.42–1.75). Among more frequent users, methamphetamine admissions were 1.19 times more likely to leave treatment against professional advice compared to users of other substances (95% CI: 1.04–1.36).

Among admissions with less than weekly use, it was found that criminal justice referral (OR: 0.70, 95% CI: 0.63–0.77) and a high school education (OR: 0.77, 95% CI: 0.70–0.85) were both protective against leaving against professional advice. Race also appeared to be a significant predictor of leaving treatment against professional advice. African Americans were 1.42 times (95% CI: 1.23–1.65) and Latinos 1.29 times (95% CI: 1.13–1.46) more likely to leave treatment compared with whites.

Results were similar in more frequent methamphetamine admissions, however, only a criminal justice referral had a significant protective effect (OR: 0.62, 95% CI: 0.54–0.71) and only Latinos were statistically more likely to leave treatment compared to whites. In this group, a high school education was a slightly protective factor (OR: 0.91, 95% CI: 0.82–1.01). In both usage frequencies, those in residential and in detoxification treatment were statistically less likely to leave treatment against professional advice compared to admissions in ambulatory settings.

## Discussion

Methamphetamine use during pregnancy impacts substance abuse treatment outcomes. Pregnant methamphetamine users have increased odds of leaving treatment against

**Table 3** Adjusted association between methamphetamine use and leaving against professional advice (n = 15,421)

	Frequency of use	
	Less than weekly	Weekly or more
Unadjusted	n = 9779	n = 8129
Methamphetamine use	1.36 (1.24–1.49)*	1.06 (0.95–1.20)
Adjusted**	n = 8313	n = 7108
Methamphetamine use	1.57 (1.42–1.75)*	1.19 (1.04–1.36)*
Age		
<21	0.76 (0.60–0.97)*	0.97 (0.70–1.34)
21–29	Ref	Ref
30–39	1.08 (0.97–1.21)	1.04 (0.92–1.16)
>39	1.00 (0.84–1.19)	0.98 (0.84–1.15)
Race		
White	Ref	Ref
African American	1.42 (1.23–1.65)*	1.08 (0.95–1.23)
Latino	1.29 (1.13–1.46)*	1.39 (1.18–1.63)*
Other	1.08 (0.90–1.30)	1.07 (0.86–1.33)
Service setting		
Ambulatory	Ref	Ref
Residential	0.81 (0.72–0.91)*	0.88 (0.79–0.98)*
Detoxification	0.54 (0.36–0.82)*	0.53 (0.44–0.65)*
Prior substance abuse treatment		
Yes	1.07 (0.97–1.18)	1.12 (1.01–1.24)*
Criminal justice referral		
Yes	0.70 (0.63–0.77)*	0.62 (0.54–0.71)*
Education		
High school or greater	0.77 (0.70–0.85)*	0.91 (0.82–1.01)

**Notes:** \*Significant; \*\*adjusted for age, race, service setting, prior treatment, criminal justice referral, and education.

professional advice when compared to pregnant users of other drugs, and frequency of use is an effect modifier of this relationship. Among pregnant admissions that report less than weekly frequency of use, methamphetamine users are 57% more likely to leave treatment against professional advice. Other covariates associated with leaving treatment against professional advice were also identified, in particular, a criminal justice system referral and a high school education or greater resulted in decreased odds of leaving treatment.

The interpretation of frequency of substance use as an effect modifier is difficult. There have been few studies reporting on the frequency of methamphetamine use among pregnant women. Della Grotta et al<sup>24</sup> observed that among pregnant methamphetamine users, frequency of use declined over the course of pregnancy from an average of 3.1 days/week in the first trimester to an average of 1.5 days/week in the last trimester. If frequency of use decreases over the course of pregnancy, then those users in the less than weekly group may have been further along in their pregnancies and may have left treatment to deliver. Unfortunately, gestational age cannot be assessed from TEDS-D. Alternatively, less

frequent users may not perceive themselves as having a substance abuse problem that is severe enough to require treatment and therefore may be less committed to remaining.

Findings regarding high school education and criminal justice referral are consistent with previous studies on substance treatment in pregnant women and mixed gender populations. These studies identified high school education and a criminal justice referral as predictors of treatment completion.<sup>17,18,25,26</sup> Pregnant women who are referred to treatment by the criminal justice system rather than self-referred can risk loss of custody of their children if they don't complete treatment, which may explain the strong negative association of this covariate with leaving treatment against professional advice. A high school education could be a proxy for socioeconomic level which, along with employment, may engender greater access to child care, transportation, or a support network. Similarly, the finding that prior drug treatment is associated with treatment attrition is consistent with a previous study.<sup>17</sup>

Prior research in pregnant women on the role of race in predicting treatment completion has been inconclusive.<sup>17,18,21,27,28</sup> This current study adds evidence in favor of a role for race and suggests that race may be related to both substance of abuse and frequency of use.

Administrative data is subject to certain limitations. TEDS-D only includes institutions receiving public funding; therefore some treatment facilities are not included. However, TEDS has been estimated to capture 87% of all treatment admissions in the United States.<sup>29</sup> Another limitation of TEDS-D is that the unit of data collection is treatment episode (admission coupled with discharge), not the individual client. Detoxification treatment usually results in the transition to residential or ambulatory treatment. Therefore, it is likely that a particular client could be entered into the data set more than once, which challenges the assumed independence of the samples. Because TEDS-D is deidentified, it is not possible to run an analysis for correlated data based on repeated admissions. If correlation was properly accounted for, then variance would likely increase and results would be biased away from the null.

Many previous studies of pregnant substance users were conducted in inpatient facilities with small populations, limiting statistical power.<sup>17,18,21,30</sup> Therefore, strengths of this study include a large national sample that provided the statistical power needed to examine and identify multiple covariates in the regression model, even when stratified by frequency of use. This research adds depth to the literature on pregnant amphetamine users, a subgroup that has not

been well studied and is of increasing importance. This is the first study to examine treatment outcomes in pregnant methamphetamine users and the first to stratify pregnant drug users by frequency of use.

## Conclusion

Pregnant methamphetamine admissions are more likely to leave treatment against professional advice, and this relationship is impacted by frequency of use. Not only does methamphetamine use currently account for the greatest number of pregnant admissions to substance abuse treatment, but recent reports indicate that methamphetamine production is increasing in the United States.<sup>31</sup> It is clear that methamphetamine use during pregnancy will continue to impact maternal and neonatal health, as well as substance abuse treatment outcomes, for years to come. More studies are needed to further examine the frequency of use patterns among pregnant methamphetamine users and how they, and other characteristics, impact treatment outcomes in this population.

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## Disclosure

The authors report no conflicts of interest in this work.

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