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Author manuscript

*Addict Behav.* Author manuscript; available in PMC 2018 March 01.

Published in final edited form as:

*Addict Behav.* 2017 March ; 66: 132–137. doi:10.1016/j.addbeh.2016.11.014.

## Beyond methamphetamine: Documenting the implementation of the Matrix model of substance use treatment for opioid users in a South African setting

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### Abstract

**Introduction**—The Matrix model of substance use treatment has been evaluated extensively in the United States as an effective treatment for methamphetamine use disorders. Since 2007, the Matrix model has been implemented in Cape Town, South Africa, where one in four treatment-seeking individuals are primarily opioid rather than stimulant users. Yet, there has been limited data on the application of the Matrix model for other types of substance use disorders in a resource-limited setting.

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#### Contributors

JM conceptualized the study and wrote the first draft in collaboration with HG and AC. WB, CW, BM, and JJ all critically edited and revised the current draft.

#### Conflict of Interest

Mr. Warren Burnhams is employed by the City of Cape Town as the Key Supervisor for Matrix Clinics in the Western Cape. All other authors declare that they have no conflicts of interest.

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**Methods**—We compared primary opioid and primary methamphetamine users seeking treatment at the first certified Matrix model substance use treatment site in Cape Town, South Africa from 2009–2014 ( $n=1,863$ ) on engagement in treatment, an important early predictor of later substance use treatment outcomes, and urine-verified abstinence at treatment exit.

**Results**—Compared to primary opioid users, primary methamphetamine users had over 50% greater odds of initiating treatment (defined as attending at least one treatment session following intake; OR=1.55; 95% CI: 1.24–1.94), and 4.5 times greater odds of engaging in treatment (i.e., attending at least four treatment sessions; OR=4.48; 95% CI: 2.27–8.84). There were no significant differences in rates of urine-verified abstinence at treatment exit.

**Conclusions**—Results suggest primary opioid users may experience additional barriers to treatment initiation and engagement with Matrix model substance use treatment, yet those who enter treatment are equally as likely compared to primary methamphetamine users to be abstinent at treatment exit. Findings highlight the need for additional strategies to optimize treatment initiation and engagement among primary opioid users in this setting, for instance by integrating medication-assisted treatment (e.g., methadone).

### Keywords

opiates; stimulants; treatment engagement; treatment initiation; sub-Saharan Africa; Matrix model

## 1. Introduction

South Africa's Western Cape province has experienced an ongoing methamphetamine (locally known as "tik") epidemic (Dada et al., 2016). Since 2002, Cape Town, the largest city in the Western Cape, has experienced an approximately 150-fold increase in rates of methamphetamine users presenting for substance use treatment (Dada et al., 2015). In response, the city of Cape Town has supported the rollout of evidence-based treatment for methamphetamine use; in 2007, the city began implementing the Matrix Model of outpatient treatment (Rawson et al., 1995) within primary health care in local peri-urban communities. Developed and tested in the United States (US), the Matrix model is an evidence-based, 16-week outpatient substance use treatment developed for methamphetamine use (Rawson et al., 2004; Rawson et al., 1995; Shoptaw, Rawson, McCann, & Obert, 1994).

Alongside the methamphetamine epidemic, opioid use in South Africa also has steadily grown since 1994 (Pasche & Myers, 2012). Between 1994 and 2010, treatment demand for heroin increased from less than 1% to between 5% to 20% depending on the province (Plüddemann et al., 2010). In the Western Cape specifically, reported heroin use among treatment-seeking patients grew from 12% to 19% between 2010 and 2014 (Dada et al., 2016).

The increase in heroin use has resulted in growing needs for opioid use treatment services. Medical professionals are facing increased requests to treat patients with opioid use disorders, but many are not equipped with required skills and training to deal with these patients adequately (Weich, Perkel, van Zyl, Rataemane, & Naidoo, 2008). Addressing heroin use and improving substance use treatment options for heroin use has been a health

policy recommendation for almost 20 years (Parry, Pluddemann, & Myers, 2005). Some privately-owned detoxification and rehabilitation facilities have become available; however, due to the large disparity between the cost of services in the private vs. public sectors, many individuals in need of treatment cannot afford such services (dos Santos, Rataemane, Fourie, & Trathen, 2010).

To date, there has only been limited evidence to evaluate the application of the Matrix model for other substance use disorder types in addition to methamphetamine use (Chatchawan & Rungtip, 2007; Eghbali, Zare, Bakhtiari, Monirpoor, & Ganjali, 2013). Yet, given the lack of access to other affordable treatments for opioid use disorders, primary opioid users also utilize the Matrix model as an available treatment for substance use; indeed, opioids (i.e., heroin) are the second most common primary drug reported among individuals entering substance use treatment in this setting (after methamphetamine) (Gouse et al., 2016). Yet, there is limited data documenting the implementation of Matrix for primary opioid users, particularly in a resource-limited setting.

The overall aim of this study was to examine the application of the Matrix model of substance use treatment for primary opioid users at the first certified Matrix model substance use treatment site in sub-Saharan Africa in Cape Town, South Africa. Specific aims were to compare primary methamphetamine vs. opioid users on (1) demographic and clinical characteristics at treatment entry; (2) treatment initiation (defined as attending at least one treatment session following intake) and treatment engagement; and (3) urine-verified abstinence at treatment exit.

## 2. Method

### 2.1. Setting

This study was conducted at the first certified Matrix site in sub-Saharan Africa, located within a city-funded community health center in a peri-urban area outside Cape Town. The Matrix program was launched in 2008, and in 2010 it was certified as a Matrix ‘program of excellence’ (City of Cape Town, 2010). The clinic chiefly serves the surrounding low-income, largely “coloured” (an apartheid classification for ‘mixed race’, still in use) community. However, due to the limited drug treatment services in the region, clients from outlying areas also utilize the site. At this facility, after methamphetamine, opioids are the second most common primary substance, followed by alcohol, methaqualone (mandrax) and cannabis (Gouse et al., 2016). The initial point of contact with the program is a drop-in, non-appointment screening visit. At this point, an evaluation is made for whether the patient is suitable for the Matrix program. Referrals to a higher level of service may be made for detoxification or more intensive services (i.e., residential treatment). Psychiatry referrals to a local psychiatric hospital or emergency department are also made when a patient is experiencing psychosis or is a serious suicide risk. If the client is suitable for the Matrix model program, the first individual session is typically attended within two days of enrollment. At least one mandatory random urine drug panel test screen is required on a weekly basis from all clients.

Medication-assisted treatment is not available at the Matrix program. In Cape Town, methadone is available by physician prescription and dispensed from local pharmacies. Patients are typically responsible for their own methadone management for either detoxification or maintenance, which would be paid for at the patient's own expense. Opioid users who are unable to manage their withdrawal on an outpatient basis are referred for detoxification before entering Matrix. Clients are able to attend the program while waiting for detoxification referral. Opioid use disorders who can manage withdrawal on an outpatient basis (with or without using methadone) can enroll directly into the program.

## 2.2. Procedures

Data used in this study were extracted from chart reviews from intake and discharge assessments collected during routine care from one-year post inception (June 2009) until May 2014 among patients who reported their primary substance as methamphetamine or opioids ( $n=1,863$ ). The project was approved by the University of Cape Town Human Research Ethics Committee and City of Cape Town Health Department.

## 2.3. Assessments

**Sociodemographic and substance use treatment history:** Sociodemographic information included age, race/ethnicity, gender, relationship status, and employment. Number of previous substance use treatment episodes and primary substance at treatment entry were also assessed.

*Treatment motivation* was assessed using the *Stages of Change Readiness and Treatment Eagerness Scale* (Miller & Tonigan, 1996). The SOCRATES assesses readiness for change among alcohol and substance users, and has been found to have good internal consistency and reliability across diverse samples. It yields three composite scores ranging from 10 (very low) to 90 (very high): *Recognition* indexes acknowledgement of substance use-related problems. *Ambivalence* measures degree of uncertainty about changing substance use. *Taking Steps* provides information regarding the degree to which individuals are taking concrete actions towards changing substance use (Miller & Tonigan, 1996). SOCRATES administration was initiated one-year into program implementation (starting November 2011). As such, only a subset of the total sample completed this measure.

### Clinical outcome variables

**Treatment initiation and engagement:** *Treatment initiation* was defined as attending a minimum of one group or individual session following treatment intake. To define *treatment engagement*, the City's Matrix Key Supervisor (WB) provided clinically meaningful cut-offs, including: 1) attending at least four group sessions (two weeks), 2) attending at least eight group sessions (i.e., *completing early recovery*; one month); and 3) later engagement (attending at least 16 group sessions; i.e., two months). Treatment initiation and engagement are important early indicators of whether patients are receiving timely services in the early phases of treatment (Acevedo et al., 2015) and are strong predictors of later retention and substance use treatment outcomes, including decreased likelihood of relapse over one year (Acevedo, Garnick, Ritter, Lundgren, & Horgan, 2016; Blonigen, Timko, Jacob, & Moos,

2015). The categorizations used for treatment initiation and early engagement are in line with other definitions in the field (Acevedo et al., 2016).

**Urine toxicology screen results at treatment exit:** Urine drug screens were administered weekly to all participants using a Drugs of Abuse Panel Test Card for amphetamine, benzodiazepine, cocaine, opiates, and marijuana (THC). Toxicology screen results at treatment exit were assessed using urine drug test results (positive or negative) for each substance in the last two weeks of each client's clinic attendance. Use (yes/no) was assessed for all substances, and then examined for only the client's primary substance type. Frequencies of urine toxicology screen results were calculated for all clients who had at least one drug test at treatment exit.

#### 2.4. Statistical analysis

To test Aim 1, whether primary methamphetamine vs. opioid users differed on demographic and clinical characteristics at treatment entry, we calculated descriptive statistics (i.e., means, standard deviations, frequencies) of the sample of all demographic and clinical characteristics and compared groups based on primary substance (opioid vs. methamphetamine) using independent sample t-tests and one-way ANOVAs.

To test Aim 2, whether primary methamphetamine vs. opioid users differed on treatment initiation and engagement, the number of individual and group sessions attended was calculated. Multivariable logistic regression results examined whether primary substance of use was associated with treatment initiation and treatment engagement in separate analyses. All variables assessed in Aim 1 were considered potential covariates for all analyses. A covariate was included if significantly related to the dependent variable at  $p < 0.1$ .

To test Aim 3, whether primary methamphetamine vs. opioid users differed on rates of urine-verified abstinence at treatment exit, multivariable logistic regression results examined whether primary substance was associated with abstinence at treatment exit. All variables assessed in Aim 1 were considered potential covariates for this analysis. A covariate was included if significantly related to the dependent variable at  $p < .1$ .

#### 2.5. Participants

From June 2009 through May 2014 a total of 2,233 clients had a screening visit at the Matrix program. Methamphetamine (61%;  $n=1,329$ ) and opioids (24%;  $n=534$ ) were the two most commonly reported primary substances of abuse. Other primary substances reported were alcohol (5.9%;  $n=129$ ), marijuana (5.6%;  $n=122$ ), mandrax (3.1%;  $n=68$ ). For this study, the current sample comprised only individuals who reported either methamphetamine or opioids as their primary substance (total  $n=1,863$ ). In the sample of primary methamphetamine or opioid users, clients were 64% male ( $n=1,185$ ), 98% "coloured" ( $n=1,825$ ), 88% unemployed ( $n=1,639$ ), 69% single ( $n=1,281$ ), and mean age of 27.4 years ( $SD=6.4$ ). Regarding mode of use, only .2% of individuals ( $n=4$ ) reported injecting, while the majority of individuals (99.2%;  $n=1848$ ) reported smoking their drug of choice.

### 3. Results

Table 1 provides the descriptive statistics for the entire sample and by primary substance (methamphetamine vs. opioid). Compared to primary opioid users, primary methamphetamine users were significantly less likely to be male ( $\chi^2(1)=133.10$ ;  $p<.0001$ ) and have a previous treatment episode ( $\chi^2(1)=74.47$ ;  $p<.0001$ ). Primary methamphetamine users had lower problem “recognition” on the SOCRATES ( $t(581)=-6.37$ ,  $p<.0001$ ) yet greater actions to address substance use (higher “Taking steps” ( $t(578)=2.25$ ,  $p<.05$ ). See Table 1 for all descriptive statistics for the total sample and other comparisons by group.

#### 3.1. Treatment Initiation

Of those screened with primary methamphetamine or opioid use, 831 initiated treatment. With the exception of primary substance (methamphetamine vs. opioids), no other variables were related to treatment initiation at  $p < .1$ . In the multivariable logistic regression model of treatment initiation, primary methamphetamine users had over 50% odds of initiating treatment compared to primary opioid users (OR =1.53; 95%CI: 1.24–1.88). See Table 2.

#### 3.2. Treatment Engagement

In the total sample, 381 individuals (45.8%) attended at least four group sessions, 246 individuals (29.6%) attended at least eight group sessions, and 173 individuals (20.8%) attended at least 16 group sessions. See Table 1 for rates of treatment engagement by primary substance.

Regarding covariates, variables that were significantly related to each indicator of engagement at  $p < .1$  included age, prior treatment episode, gender, and “taking steps” subscale of SOCRATES. These four variables were included as covariates in all subsequent analyses.

**3.2.1. Completion of four sessions—**In the multivariable logistic regression model of completion of at least four treatment sessions, primary methamphetamine users had almost 4.5 times greater odds of attending at least four treatment sessions compared to primary opioid users (OR=4.48; 95%CI: 2.27–8.84). The only other variable significantly associated with completion of at least four treatment sessions was the SOCRATES “taking steps” subscale. Each point increase on the taking steps subscale of the SOCRATES was associated with a 6% increased odds of attending at least four treatment sessions (OR=1.06; 95%CI: 1.02–1.11). See Table 2 for full results.

**3.2.2. Completion of eight sessions—**In the multivariable logistic regression model of completion of at least eight treatment sessions, primary methamphetamine users had almost 2.5 times greater odds of attending at least eight treatment sessions compared to primary opioid users (OR=2.44; 95%CI: 1.20–4.94). Individuals who received prior treatment had 42% lower odds of having attended at least eight treatment sessions compared to individuals who had no prior treatment episodes (OR = .58; 95%CI: .34–.98). Each point increase on the taking steps subscale of the SOCRATES was associated with an 8% increased odds of treatment engagement (OR=1.08; 95%CI: 1.03–1.14), and each year older was associated

with a 5% increased odds of attending at least eight treatment sessions (OR=1.05; 95% CI: 1.01–1.08), See Table 2 for full results.

**3.2.3. Completion of 16 sessions**—In the multivariable logistic regression model of completion of at least 16 treatment sessions, primary methamphetamine users had over 3 times greater odds of attending at least 16 treatment sessions compared to primary opioid users (OR=3.04; 95% CI: 1.29–7.13). Each point increase on the taking steps subscale of the SOCRATES was associated with an 11% increased odds of treatment engagement (OR=1.11; 95% CI: 1.04–1.18), and each year older was associated with a 4% increased odds of attending at least 16 treatment sessions (OR=1.04; 95% CI: 1.00–1.08), See Table 2 for full results.

### 3.3. Abstinence

718 individuals in the sample had urine drug testing (86.4% of the 831 who initiated treatment). Of those who had urine drug testing results available, 40.7% ( $n=292$ ) had a negative urine toxicology test at treatment exit. Among primary methamphetamine users ( $n=519$ )<sup>1</sup>, 38.7% had a positive urine test for methamphetamine at treatment exit ( $n=227$ ). Among primary opioid users ( $n=110$ ),<sup>1</sup> 39.4% ( $n=52$ ) had a positive urine test for opioids.<sup>2</sup> There were no significant differences in rates of urine-verified abstinence at treatment exit for any substance or by primary substance (See Table 1).

In the multivariable logistic regression model of urine-verified abstinence at treatment exit (any substance), only “taking steps” was significantly associated with abstinence (not primary substance). Each point increase on the taking steps subscale of the SOCRATES was associated with a 12% increased odds of abstinence at treatment exit (OR=1.12; 95% CI: 1.06–1.18). See Table 2 for full results.

## 4. Discussion

This study is one of the first to examine application of the Matrix model, originally developed for methamphetamine use disorders, to primary opioid use in a resource-limited, South African setting. Opioids were the second most commonly reported primary substance in substance use treatment (24%), second to methamphetamine (61%). In this setting, primary methamphetamine users were over 50% more likely to initiate treatment and almost 4.5 times more likely to attend at least four treatment sessions compared to primary opioid users. Regardless of the cut-offs used for treatment engagement (i.e., a conservative and more liberal measures of engagement were included), methamphetamine users were significantly more likely to engage in treatment. Yet, among those who entered care, rates of abstinence at treatment exit did not differ between primary methamphetamine and opioid users. Results suggest unique barriers to treatment initiation and engagement among primary opioid users in this setting compared to primary methamphetamine users; however, for primary opioid users who were able to initiate treatment, rates of achieving abstinence by treatment exit were comparable to primary methamphetamine users.

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<sup>1</sup>Abstinence at treatment exit was calculated only among those who had provided urine tox screen results ( $n=718$ ).

<sup>2</sup>Percentages may not add to 100% due to missing data.

Barriers facing opioid users for treatment engagement are unclear; they may include the Matrix program being a methamphetamine focused treatment, and as such, further research is needed to understand how opioid users experience the program and how it can be adapted to meet their needs. The lack of accessible methadone maintenance and detoxification support for opioid users also may be a key structural factor that explains lower odds of treatment initiation and treatment engagement among primary opioid users in this study. Although methadone is available by prescription in local pharmacies, currently there are few, if any facilities in Cape Town to monitor methadone use post prescription. Prescribing methadone without sufficient oversight may contribute to substance use, and is often not a viable self-management treatment option for patients with opioid use disorders (Pasche & Myers, 2012; Weich, 2010).

Despite the significant differences in rates of initiation and treatment attendance among primary methamphetamine vs. primary opioid users, there were no significant differences in rates of abstinence at treatment exit among primary opioid vs. methamphetamine users. This suggests that primary opioid patients who are able to enter into and stay engaged in the Matrix program can have successful treatment outcomes. These results are in line with prior pilot research in Iran, which showed promising results for Matrix in optimizing the effectiveness of Methadone maintenance treatment for relapse prevention among individuals with opioid use disorders (Eghbali et al., 2013).

Future research is needed to further understand the contextual barriers to treatment engagement for opioid users, including individual and programmatic factors, to develop an implementation strategy to improve entry into and retention in substance use treatment for primary opioid users. Future work may consider how the addition of medication-assisted treatments in this setting may improve initiation and retention for primary opioid users, and whether this would be an affordable and sustainable treatment option in this resource-limited setting. Opioid substitution therapy (OST) has been shown to significantly increase the likelihood of treatment retention (Bao et al., 2009) in other settings. Further research is needed to evaluate whether adding an OST component is feasible, acceptable, and effective to help opioid users initiate and engage in this setting.

This study is one of the first studies to document evidence of the applicability of the Matrix program for other primary substance types in addition to methamphetamine use in a sub-Saharan Africa setting. The results can be understood given the overlap between Matrix treatment components and behavioral approaches previously showed to be effective for opioid treatment (Eghbali et al., 2013). However, considering the barriers to treatment initiation, our opioid sample may not be representative of all opioid users taking into account that they managed to stay in treatment despite barriers to accessing support for withdrawal symptoms. Delays in accessing detoxification services may also bias the sample, in that primary opioid users may have been further along in their recovery by the time they enter treatment. We however did not assess time since last use in this study.

The only factor significantly related to abstinence at treatment exit in this sample was the “taking steps” scale of the SOCRATES. This relationship was significant over and above primary substance, suggesting that for both primary methamphetamine and primary opioid



users, motivation and readiness to take action to reduce use is what is most associated with treatment success. Screening for low motivation at treatment initiation may be useful to identify clients who may need more intensive intervention efforts. Our study also found interesting differences in treatment motivation across primary methamphetamine and opioid users; primary opioid users were less likely to be taking concrete steps towards reducing their substance use, yet more likely to acknowledge their substance use-related problems. Future research may consider evaluating whether the differences in motivation across primary methamphetamine versus opioid users may explain differences in treatment initiation and attendance (Gossop, Stewart, & Marsden, 2003).

Findings must be interpreted of study limitations, including those related to this being a retrospective chart review, where we were limited to only examining the measures included in routine clinical assessments. We did not assess for duration of drug use or current frequency and severity of use, which may have been important covariates to consider in analyses. Additionally, the majority of our sample was comprised of primary methamphetamine users (71%), and the sample size was small for primary opioid users, particularly when examining retention in later stages of treatment. Distinct procedures by which primary methamphetamine vs. opioid users enter treatment (e.g., due to distinct tolerance and dependence profiles of opioids vs. methamphetamine, and opioid-related withdrawals in particular) may affect the differences in rates of initiation and attendance found, yet we did not track referrals to detoxification or outpatient methadone treatment in this study, nor did we formally assess dependence or tolerance. Thus, we could not report on the number of clients who were referred for these services, nor account for these differences in analyses. We also could not account for the number of opioid users who entered treatment after receiving methadone treatment or other detoxification services. Also, there was limited data for the SOCRATES measure, which was only administered to clients who entered the program from November 2011. Finally, data were collected at a single Matrix site, and findings may not generalize to other contexts.

Despite these limitations, we believe there are strengths in using real-world clinical data from an outpatient Matrix substance use treatment program, which reflects actual implementation of the model in a resource-limited context. We believe these findings provide important data on the application of the Matrix model beyond methamphetamine use disorders and provide preliminary data to support its application for primary opioid users in a resource-limited setting. Future research is required to gain better insight into the barriers primary opioid users face to treatment entry, and how to develop an implementation strategy to promote treatment initiation and treatment engagement in this population. Integrating medication-assisted treatment (e.g., methadone) into the Matrix program could optimize rates of treatment entry and engagement among primary opioid users in this setting.

## Acknowledgments

### Role of Funding Source

Dr. Magidson's time on this manuscript was supported by the National Institutes of Health [K23DA041901]. The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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### Highlights

- Opioid use has increased in South Africa after a methamphetamine (meth) epidemic
- We compared opioid and meth users' engagement in the Matrix treatment model
- Meth users were 4.5 times more likely to engage in treatment vs. opioid users
- Yet, no differences were found in abstinence rates by primary substance
- Strategies to enhance treatment entry and engagement among opioid users are needed

**Table 1**

Descriptive statistics for total sample and comparison of primary methamphetamine and opioid users.

Variable	Total sample (primary meth or heroin; n=1,863)	Primary meth (n=1,329)	Primary opioid (n=534)	p-value
Sociodemographic and clinical characteristics				
Age <i>M, SD</i>	27.4 (6.4)	27.8 (6.6)	26.4 (5.7)	<.0001
<b>Gender</b>				<.0001
Female (% , N)	36.4% (678)	44.5% (592)	16.1% (86)	
Male (% , N)	63.6% (1185)	55.5% (737)	83.9% (448)	
<b>Race</b>				.51
Black (% , N)	1.5% (28)	1.7% (22)	1.1% (6)	
Coloured (% , N)	98% (1825)	97.9% (1301)	98.1% (524)	
Other (% , N)	.5% (10)	.5% (6)	.7% (4)	
<b>Employment</b>				.19
Unemployed (% , N)	88% (1639)	87.1% (1158)	90.1% (481)	
Part-time employed (% , N)	1.3% (25)	1.5% (20)	.9% (5)	
Full-time employed (% , N)	10.7% (199)	11.4% (151)	9% (48)	
<b>Marital Status</b>				.028
Single (% , N)	68.8% (1281)	66.8% (888)	73.6% (393)	
Widowed/Separated/Divorced (% , N)	11.0% (205)	11.1% (147)	10.9% (58)	
Married (% , N)	19.4% (362)	21.2% (282)	15% (80)	
<b>Prior substance use treatment episode</b>				<.0001
Yes (% , N)	24.3% (452)	18.9% (250)	37.9% (202)	
No (% , N)	75.4% (1404)	81.1% (1073)	62.1% (331)	
<b>Mode of use</b>				<.0001
Smoke (% , N)	99.2% (1848)	99.4% (1321)	98.7% (527)	
Inject (% , N)	.2% (4)	0% (0)	.7% (4)	
Snort (% , N)	.1% (1)	0% (0)	.2% (1)	
Oral (% , N)	0% (0)	0% (0)	0% (0)	
<b>Treatment Motivation (Socrates)<sup>a</sup></b>				
Recognition <i>M, SD</i>	31.2 (5.3)	30.4	33.4	<.0001
Ambivalence <i>M, SD</i>	15.8 (3.3)	15.8	15.7	.59
Taking Steps <i>M, SD</i>	32.9 (6.3)	33.2	31.9	.03
<b>Treatment initiation and engagement</b>				
<b>Initiated Treatment</b>				<.0001
No (% , N)	55.4% (1032)	52.4% (697)	62.7% (335)	
Yes (% , N)	44.6% (831)	47.6% (632)	37.3% (199)	
<b>Treatment Attendance among those who entered treatment<sup>b</sup></b>				
Attended 4 group sessions (% yes, N)	45.8% (381)	53% (335)	23.1% (46)	<.0001

Variable	Total sample (primary meth or heroin; n=1,863)	Primary meth (n=1,329)	Primary opioid (n=534)	p-value
Attended 8 group sessions (% yes, N)	29.6% (246)	33.2% (210)	18.1% (36)	<.0001
Attended 16 group sessions(% yes, N)	20.8% (173)	23.7% (150)	11.6% (23)	<.0001
<b>Abstinence at treatment exit<sup>c</sup></b>				
<b>Urine tox result (any substance at exit)</b>				.17
Negative (% , N)	40.7% (292)	46.7% (247)	8.6% (46)	
Positive (% , N)	49.0% (352)	53.3% (282)	13.1% (70)	

Note. Ns listed may not equal the totals or percentages add to 100% due to missing data.

<sup>a</sup> Socrates was only administered for individuals entering treatment after November 2011.

<sup>b</sup> Treatment attendance was calculated only among those who initiated treatment (n=831).

<sup>c</sup> Abstinence at treatment exit was calculated only among those who had provided urine tox screen results (n=718).

**Table 2**

Multivariable logistic regression models of treatment engagement and abstinence.

	B	S.E.	Wald	Sig.	Exp	95% C.I.	
						Lower	Upper
<b>Treatment initiation</b>							
Primary substance <sup>1</sup>	.42	.11	16.22	.00	1.53	1.24	1.88
<b>At least 4 treatment sessions</b>							
Primary substance <sup>1</sup>	1.50	.35	18.68	.00	4.48	2.27	8.84
Previous treatment episode <sup>2</sup>	-.37	.24	2.35	.13	.69	.43	1.11
Gender <sup>3</sup>	.05	.23	.04	.83	1.05	.67	1.64
Age	.02	.02	2.42	.12	1.03	.99	1.06
Socrates Taking Steps	.06	.02	9.05	.00	1.06	1.02	1.11
<b>At least 8 treatment sessions</b>							
Primary substance <sup>1</sup>	.89	.36	6.08	.01	2.44	1.20	4.94
Previous treatment episode <sup>2</sup>	-.55	.27	4.00	.05	.58	.34	.99
Gender <sup>3</sup>	.16	.27	.37	.54	1.18	.70	1.99
Age	.04	.02	6.48	.01	1.05	1.01	1.08
Socrates Taking Steps	.08	.03	10.03	.00	1.08	1.03	1.14
<b>At least 16 treatment sessions</b>							
Primary substance <sup>1</sup>	1.11	.44	6.50	.01	3.04	1.29	7.13
Previous treatment episode <sup>2</sup>	-.59	.31	3.68	.06	.56	.307	1.01
Gender <sup>3</sup>	.01	.30	.00	.99	1.01	.557	1.82
Age	.04	.02	4.56	.03	1.04	1.00	1.08
Socrates Taking Steps	.10	.03	11.25	.00	1.11	1.04	1.18
<b>Abstinence at Treatment Exit</b>							
Primary substance <sup>1</sup>	.08	.36	.05	.83	1.08	.53	2.20
Socrates Taking Steps	.11	.03	16.50	.00	1.12	1.06	1.18

Notes:

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<sup>1</sup> Methamphetamine vs. opioid, with methamphetamine as the reference group.

<sup>2</sup> Coded dichotomously as 0=no prior treatment episodes; 1=at least one prior treatment episode; 1 was the reference group.

<sup>3</sup> Female as the reference group.

Treatment initiation: 0 = attended no treatment sessions, 1 = attended at least 1 session.

At least 4 treatment sessions: 0 = < 4 sessions, 1 = 4 sessions.

At least 8 treatment sessions: 0 = < 8 sessions, 1 = 8 sessions.

At least 16 treatment sessions: 0 = < 16 sessions, 1 = 16 sessions.

Abstinence: 1 = positive urine tox screen, 2 = negative urine tox screen.