

Published in final edited form as:

J Subst Abuse Treat. 2014 March ; 46(3): 295–305. doi:10.1016/j.jsat.2013.10.005.

Criminal Justice Outcomes after Engagement in Outpatient Substance Abuse Treatment

Deborah W. Garnick, ScD¹, Constance M. Horgan, ScD¹, Andrea Acevedo, PhD¹, Margaret T. Lee, PhD¹, Lee Panas, MS¹, Grant A. Ritter, PhD¹, Robert Dunigan, PhD¹, Alfred Bidorini, MA², Kevin Campbell, DrPH³, Karin Haberlin, MA², Alice Huber, PhD³, Dawn Lambert-Wacey, MA⁴, Tracy Leeper, MA⁵, Mark Reynolds, EdD⁵, and David Wright, PhD⁵

¹Institute for Behavioral Health, The Heller School for Social Policy and Management, Brandeis University

²Connecticut Department of Mental Health and Addiction Services

³Washington State Department of Social and Health Services, The Division of Behavioral Health and Recovery

⁴New York State Office of Alcoholism and Substance Abuse Services, Division of Outcome Management and System Investment

⁵Oklahoma Department of Mental Health and Substance Abuse Services

Abstract

The relationship between engagement in outpatient treatment facilities in the public sector and subsequent arrest is examined for clients in Connecticut, New York, Oklahoma and Washington. Engagement is defined as receiving another treatment service within 14 days of beginning a new episode of specialty treatment and at least two additional services within the next 30 days. Data are from 2008 and survival analysis modeling is used. Survival analyses express the effects of model covariates in terms of “hazard ratios,” which reflect a change in the likelihood of outcome because of the covariate. Engaged clients had a significantly lower hazard of any arrest than non-engaged in all four states. In NY and OK, engaged clients also had a lower hazard of arrest for substance-related crimes. In CT, NY, and OK engaged clients had a lower hazard of arrest for violent crime. Clients in facilities with higher engagement rates had a lower hazard of any arrest in NY and OK. Engaging clients in outpatient treatment is a promising approach to decrease their subsequent criminal justice involvement.

1. Introduction

By focusing on arrests after treatment for substance use disorders, the goal of this study is to add to the emerging literature on the association of engagement in treatment (a process measure) and outcomes. Both process measures focused on the treatment that clients receive and outcome measures describing client status are important in monitoring the delivery of treatment for substance use disorders. Process measures offer two advantages: they are more immediately actionable and they are often more useful for identifying specific areas of care that may require improvement (Horgan & Garnick, 2005; Krumholz, Normand, Spertus,

Shahian, & Bradley, 2007; McLellan, Chalk, & Bartlett, 2007). However, only processes of care that have a strong foundation of research showing an association with improved clinical outcomes should be used as performance measures (Chassin, Loeb, Schmaltz, & Wachter, 2010; Harris, Kivlahan, Bowe, Finney, & Humphreys, 2009).

We focus on the treatment engagement measure (described in the next section) developed over a decade ago by the Washington Circle (Garnick et al., 2002) which has been widely adopted, endorsed and adapted for use in various settings (Garnick et al., 2011; Harris, Humphreys, Bowe, Tiet, & Finney, 2010; National Committee for Quality Assurance, 2010; National Quality Forum, 2009). It is important to study the outcome considered here -- criminal justice involvement -- because of its high cost to society and individuals (Harwood, 2000; Office of National Drug Control Policy, 2004; Zarkin et al., 2012). Criminal justice involvement also is a well-established outcome measure for substance abuse treatment (Gossop, Trakada, Stewart, & Witton, 2005; McLellan, Cacciola, Alterman, Rikoon, & Carise, 2006; Prendergast, Podus, Chang, & Urada, 2002). Nearly half of those arrested meet the criteria for an alcohol or other drug disorder (Kubiak, Arfken, Swartz, & Koch, 2006) and these disorders are prevalent in the prison population (Belenko & Peugh, 2005).

The purpose of this study, therefore, was to examine how adults engagement in outpatient treatment in the public sector relates to subsequent involvement in the criminal justice system in the year after beginning treatment. Specifically, using treatment and criminal justice systems data from four states (Connecticut, New York, Oklahoma and Washington), we explored:

- The extent to which individual client and facility-level engagement in outpatient specialty treatment is associated with any arrest or specifically drug related arrests or property or violence related arrests
- Whether the predictive relationships between client engagement in outpatient specialty treatment and criminal justice outcomes are affected by the client's pre-treatment criminal justice involvement.

1.1 Measure of treatment engagement

Treatment engagement is an important performance measure because it is highly associated with the longer term continuation in treatment that is often clinically recommended for success (Garnick 2009). Moreover, it can be measured in a short enough time period to target efforts to contact non-engaged clients and encourage them to receive treatment on a timelier basis. Therefore, more than a decade ago the Washington Circle (Garnick, et al., 2002; The Washington Circle, n.d.), focused its initial efforts on developing measures that assess provision of timely substance abuse services at the start of an outpatient treatment episode. Currently used by the National Committee for Quality Assurance (NCQA) and Department of Veterans Affairs and endorsed by the National Quality Forum (NQF) (Harris, Humphreys, & Finney, 2007; National Committee for Quality Assurance, 2012; National Quality Forum, 2009), individuals are initiated if they receive treatment through an inpatient alcohol or other drug admission, outpatient visit, intensive outpatient encounter or partial hospitalization within 14 days of the diagnosis. Individuals are engaged if they have initiated and also receive two or more additional services with a diagnosis of alcohol or other drug dependence within 30 days of the initiation visit.

In 2004, the Washington Circle formed a workgroup, including the four states reported on here as well as eight other states, to evaluate the suitability of these measures for publically funded treatment. This Workgroup recommended that performance measures be calculated separately by level of care because of differences in treatment approach and client severity

in specialty care in public sector settings (Garnick, et al., 2011; Garnick, Lee, Horgan, Acevedo, & Washington Circle Public Sector, 2009). For public sector outpatient treatment:

- Initiation is defined as receiving another treatment service within 14 days after the beginning of a new outpatient or intensive outpatient treatment episode
- Engagement is defined as receiving two additional services within 30 days after the initiation service.

Thus, the engagement measure reported on in this paper differs from the widely accepted measures of initiation and engagement in two ways: only outpatient or intensive outpatient treatment can begin the episode and only specialty treatment is included.

1.2 Criminal justice outcomes

The cost of crime to society is enormous. Substance abuse treatment is an intervention that not only has the potential to improve individual lives but also to benefit society by bringing about a reduction in drug-related crimes (McCollister, French, & Fang, 2010). Many individuals who have a substance use disorder also have criminal justice involvement (Belenko & Peugh, 2005; Greenfield & Weisner, 1995). A high proportion of arrestees have been found to have a problem with drug dependence (National Institute of Justice, 2003). Webster and colleagues found that having one or more lifetime arrests for driving under the influence (DUI) was associated with use of illegal drugs and these individuals have more criminal activity than individuals without a history of DUI (Webster et al., 2009). Among a nationally representative sample of non-institutionalized individuals, adults who had been arrested in the past year for a serious violent or property offense were more likely to have used illicit substances than those who had not been arrested for a serious offense (Substance Abuse and Mental Health Services Administration, 2005). The association between alcohol use and criminal activity has been well documented. About 40 percent of violent offenders in state and local jails across the country had been drinking at the time of the offense for which they were incarcerated and about a quarter of state prisoners are alcohol dependent (Martin, 2001).

Prior criminal justice involvement probably makes it more difficult to bring about positive outcomes. Individuals who were recently arrested were less likely to engage in treatment as were those with a diagnosis of drug dependence (Brown, Bennett, Li, & Bellack, 2011). Indeed, the most consistent and most powerful predictors of poor criminal justice outcomes have been shown to be pretreatment measures of those same variables (Calsyn, Yonker, Lemming, Morse, & Klinkenberg, 2005; Easton, Babuscio, & Carroll, 2007; Luchansky, He, Krupski, & Stark, 2000; Luchansky, Krupski, & Stark, 2007).

At the same time, individuals with a recent criminal justice history may be more likely to enter and remain in specialty substance abuse treatment because of being mandated to treatment as a condition of parole or probation supervision. In fact, criminal justice involvement has been associated with receiving substance abuse treatment and the criminal justice system is the largest referral source for treatment admissions reported to state treatment agencies, accounting for more than a third of treatment referrals (Cook & Alegria, 2011; Substance Abuse and Mental Health Services Administration & Office of Applied Studies, 2009). In addition, most studies have found reduced recidivism through drug courts, in which, judges mandate clients to treatment, monitor how well they follow the rules of the court and impose rewards or sanctions (Wilson, Mitchell, & MacKenzie, 2006). Recent results reported from a study supported by the National Institute of Justice, the *Multi-Site Adult Drug Court Evaluation (MADCE)*, showed that 83 percent of drug court offenders received at least some treatment during the initial six months although more than a third of the comparison sample also reported receiving at least some treatment (Rossman et al.,

2011). Moreover, in the first six months of follow up, drug court offenders were significantly less likely than the comparison group to self-report engaging in any criminal behavior (28 percent vs. 40 percent), but the differences in re-arrest rates were not significant.

1.3 Association of treatment engagement and criminal justice outcomes

Most previous studies of the association of treatment and criminal justice outcomes have not focused on treatment engagement. Substance abuse treatment has been shown to result in fewer arrests (Luchansky et al., 2006), lower risk of felony convictions (Luchansky, He, Longhi, Krupski, & Stark, 2006; Luchansky, Nordlund, et al., 2006), declines in self-reported illegal activities (Hubbard, Craddock, & Anderson, 2003), lower re-arrests among clients participating in treatment in lieu of incarceration for drug-related offenses (Evans, Huang, & Hser, 2011), lower conviction rates (Gossop, et al., 2005), and lower arrests for both all types of crimes and specifically property and drug-related crimes (Evans, Li, & Hser, 2008).

The few studies that did relate engagement and criminal justice outcomes show lower arrests and incarcerations in Oklahoma (Garnick et al., 2007), lower arrest rates in Washington state (Campbell, 2009) and improved individual level legal outcomes and reduced substance use among outpatients in the Veterans Administration (VA) (Harris, et al., 2010). Among adolescents in outpatient treatment, however, those engaging did not have significantly lower likelihoods of reporting trouble controlling behavior or illegal activities at six months after beginning treatment (Garnick et al., 2012).

This study expands previous research on the association of treatment engagement and criminal justice outcomes in three ways. First, we explore the generalizability of previous findings that used data only from Oklahoma in 2001 by including an additional three states that were involved in the Workgroup that adapted the engagement measure for the public sector, as well as updating the results for Oklahoma using 2008 data. Second, we refine our analyses of treatment engagement's influence on the likelihood of arrests by using any arrest as our outcome and examining the effect on arrests in general, but also examining specific categories of arrests. Third, we create both client-level and facility-level measures of treatment engagement, and use them to examine two separate aspects of treatment engagement: the effect of an individual client's engagement on likelihood of arrest and the effect of the facility's rate of treatment engagement.

2. Methods

2.1 Data

This study focused on adult clients who received publicly-funded substance abuse treatment in specialty settings in 2008 in the states of Connecticut, New York, Oklahoma, and Washington. Substance abuse treatment data for treatment clients were linked by matching with arrest and incarceration data from each state's criminal justice agencies. This included data from the states Department of Corrections (Washington and Oklahoma), state patrol (Washington), Division of Criminal Justice Services (New York), Department of Public Safety (Oklahoma), State Bureau of Investigation (Oklahoma), and Administrative Office of the Courts (Washington). In Washington and Connecticut, the Link King software was used for matching (Campbell, Deck, & Krupski, 2008). In Oklahoma probabilistic matching was used based on last name, first name, social security number, date of birth, gender, and race. and in New York deterministic matching was used including date of birth, gender, and parts of the social security number. After matching, the resulting merged, integrated datasets in each state were stripped of all personally identifying information before being provided to the study's analytic team. Except in New York which did not provide data on individual

encounters, the substance abuse treatment data generally included both admission intake information such as client demographics (e.g., age, gender, race/ethnicity), living situation, treatment referral source, and self-reported substance use, and encounter data which included dates and types of services the client received.

2.2 Sample Selection

The study sample was made up of adult clients (ages 18+) who began a new outpatient substance abuse treatment episode in 2008. A new outpatient treatment episode is triggered by receipt of outpatient treatment (called the index), which follows a period of at least 60 days, during which no treatment services are received. Under this rule, detoxification services were not considered treatment and could occur during the intervening period of at least 60-days. In Connecticut and Oklahoma, the index was based on the date of the first documented service while in New York and Washington the index was based on the date of an outpatient treatment admission following a no service period. Treatment admission was used as the index date for New York because it does not collect encounter data and thus date of first treatment service was not recorded and for Washington because a therapeutic activity usually takes place on the same date as the outpatient treatment admission. To avoid possible correlations from multiple episodes within the same subject, in all states, if a client had more than one outpatient treatment episode during the year 2008, only the first episode was used in the analyses.

A total of 120,381 adult clients across the four states had a new treatment episode in 2008 (Table 1). We excluded clients admitted for over two days to a residential treatment program within 45 days of the outpatient index as their outpatient treatment service would not be indicative of the beginning of an outpatient treatment episode. Due to data and modeling considerations, we also excluded clients who did not have an admission record within 30 days around the index date, were incarcerated after the index without an arrest because they were likely to have been incarcerated due to previous involvement with the criminal justice system (e.g., for violation of probation or parole, had missing data in any of the variables of interest, died within the year after discharge, or were the only client with a new treatment episode in 2008 at their facility after other exclusions). In addition, rather than considering the incarceration period to be a timeout as we do for shorter confinements, we also dropped from our study all clients who were incarcerated for 30 days or more within 45 days after their index dates. Clients in such controlled environments could not engage in treatment during their incarceration due to circumstances beyond their control, and incarcerations of 30 days or more were considered long enough to undo any benefit from the short amount of treatment before the incarceration began. Finally, to avoid an important, but often overlooked bias that could impact our estimates, “immortal time bias” (Suissa, 2007), we also excluded clients who were arrested before they had a full opportunity to engage or not engage. After these exclusions, the final analytic sample consisted of 106,662 clients (CT = 5,324, NY = 85,211, OK = 7,939, WA = 8,188).

2.3 Variables

2.3.1 Outcome variables—The main outcome variable was time to an arrest as measured by the number of days between time 0 (defined in section 2.3.5 below) and the client’s first arrest, censored at 365 days for those without an arrest in the following year. In order to examine arrests in more detail, we also examined time to arrests for specific type of crimes: substance-related (e.g., drug trafficking and possession, DUI), and property (e.g., theft, burglary, destruction of property) or violent (e.g., assaults, homicides, rape). Classification of arrests into these three categories were performed in accordance with the Bureau of Justice Statistics codebook for the 2004 Survey of Inmates in State and Federal Correctional Facilities (U.S. Department of Justice, n.d.). Property and violent crimes were combined

because of relatively low numbers of arrests for violent crimes. We did not use incarceration as an outcome because incarceration is highly subject to differences across states, local courts and race/ethnicity in the extent of plea bargaining and because it proved difficult to determine if an incarceration after treatment related to new criminal activity or to past events (Alexander, 2010; Guerino, Harrison, & Sabol, 2011; Human Rights Watch, 2009).

2.3.2 Treatment Engagement—We used the Washington Circle (WC) public sector specifications for initiation and engagement (Garnick, et al., 2009) to create the analytic variable indicating whether a client engages in outpatient treatment or not. A client who receives at least one service within 14 days after the index is considered to have initiated treatment. Treatment engagement is then defined as receiving at least two additional services within 30 days after the initiation visit. New York does not collect encounter data, but facilities report at discharge the total number of treatment visits provided to each client during the treatment episode. Thus, a client was considered engaged if providers reported that the client had had at least four treatment visits and either their length of stay, defined as the number of days between admission and discharge, was longer than 30 days or had another treatment admission within 30 days of the first admission. To test the sensitivity of New York's measure, encounter data from Washington state was used to determine clients engagement status by both New York's and the Washington Circle's definitions of engagement. The results showed that using the two definitions of engagement, there was a match in engagement status for 83% of the clients.

We also included in our models a facility-level variable for the proportion of outpatient adult clients (before exclusions) admitted in 2008, who engaged in treatment. Facility engagement rates were calculated by dividing the number of 2008 clients in the facility who met the engagement criteria by the total number of 2008 clients in the facility.

2.3.3 Covariates—Our theoretical framework for regression analyses is the Behavioral Model of Health Services Use (Andersen & Davidson, 2007), which suggests that the relationship between health services utilization and outcomes is further influenced by additional individual and contextual factors. Covariates used in our models consist of client variables (demographic characteristics and substance use and treatment referral source) and facility factors (prevalence of use of hard drugs and prevalence of prior year arrest or incarceration among clients).

Unless noted, the data used to determine the client characteristics were collected by staff at the treatment facilities at treatment admission and are based on client self-report. To continue receiving Federal Block Grant funding, states are required to include these data in their annual reports to the Substance Abuse and Mental Health Services Administration (SAMHSA). These data allow for meaningful comparisons of common benchmarks among the states, although some variation by state in level of detail does remain. As a result, SAMHSA in consultation with the agency staff of each individual state has developed a crosswalk to collapse the state's original coding schemes into uniformly recognized categories. For example, Connecticut and Oklahoma collect information on years of formal education, whereas New York and Washington collect information on level of education with answers noting final obtained degree (e.g., high school, Associate's, or Bachelor's), "some college", or years of education if less than high school graduate (New York only). Thus, "13 or more years" of education in Connecticut or Oklahoma were categorized as "more than high school", as were "some college", and Associate's or higher degrees from the other states. To avoid certain bias issues for regressions which use covariates with very small categories, we required that all categories of all variables have at least 5 % representation and combined categories into "other" to meet this requirement (e.g.,

American Indian in New York or Addiction Service as referral source in Oklahoma and Washington).

Client demographics: Demographic variables included gender, age, race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic/Latino, American Indian, Other race/ethnicity), education (less than high school, high school degree, more than high school), homelessness (yes/no), marital status (married/living as married vs. unmarried), and employment status (unemployed/not in labor force vs. employed). Connecticut had high rates of missing data in the marital status and employment status variables, and thus we excluded these variables in our models for this state. We also linked each client's zip code of residence to its corresponding Rural Urban Commuting Area Code (WWAMI Rural Health Research Center, 2007) to create an indicator for whether the client resided in an rural or urban area. Our models also included a covariate for clients criminal justice involvement in year prior to treatment defined as clients for whom the data from state criminal justice agencies showed an arrest or incarceration at any point in the 365 days prior to their index. Because we were interested in testing whether predictive relationships between engagement and criminal justice outcomes are moderated by clients pre-treatment criminal justice involvement, our models also included the interaction between these two variables.

Substance use and treatment referral: Two covariates were created to reflect the client's substance use: first, a set of indicators for whether they reported using substances in particular groups within the month prior to treatment admission, and second, the earliest age of use of substances within the groups. We also included referral source with categories for self/family, community agency or group (e.g., child protective services), addiction service (e.g., another substance abuse treatment program), other health professional (e.g., mental health or medical provider), criminal justice system (e.g., department of corrections, drug court), and other (e.g., employer, school personnel, clergy). Referral source was excluded in Connecticut because a high proportion of clients were missing data on this variable.

Client characteristics aggregated at the facility level: In addition to a variable for the engagement rate at the facility where the client received treatment, we also included the proportion of clients at the facility who had an arrest or incarceration in the year prior to the index and the proportion of clients at the facility whose admission records indicated use of hard drugs in the prior month (i.e., drugs other than alcohol and marijuana). Proportions were calculated prior to the client exclusions noted in Section 2.2. In order to reduce the possible effect of multi-collinearity between client-level variable and the facility-level variables, client-level engagement and client-level prior year arrest or incarceration were centered around their respective mean facility-level proportions. We did not create a centered variable for hard drugs, because the facility variable is a composite of the specific drug variables and is not highly correlated with any of the individual level drug variables.

2.3.4 Analysis—Following examination of the characteristics of the clients and the facilities where they were treated, we utilized shared frailty models (Therneau & Grambsch, 2000), which are the survival analysis equivalent of random effects models, to examine the relationship between outpatient engagement and three time-to-event outcomes related to arrest: days to any arrest, days to a substance-related arrest, and days to a property/violent arrest. We conducted analyses to examine substance abuse arrests and property or violent arrests as separate outcomes since our main independent variables are performance measures for substance abuse treatment. We wanted to examine the specific effects of meeting the performance measures on substance-related arrests. Furthermore, there was a relatively low number of arrests for violent crimes in our data set, thus they were combined with arrests for property crimes.

One key decision in our time-to-event survival analyses concerns identification of the starting time, or “time 0”. It would seem simple and reasonable enough to choose each client’s index date as “time 0” in our models, as it would measure each time to arrest from beginning of treatment. However, such a choice would also provide a basis for “immortal time bias” (Lash & Cole, 2009; Levesque, Hanley, Kezouh, & Suissa, 2010; Suissa, 2008; Zhou, Rahme, Abrahamowicz, & Pilote, 2005). Immortal time refers to the time during which “death” cannot occur for a client under study. For a time-to-event analysis to be fair, the immortal times for clients in the two groups, engaged and non-engaged, need to be balanced. For our particular choice of starting time, the immortal time between the two groups will not be balanced, because engaged clients cannot be arrested until they are engaged (which could occur up to 45 days after index), while non-engaged clients can be arrested immediately. The lack of balance in immortal times between our two groups will bias results. Even if engagement provides no true benefit to clients, selection alone will make non-engaged clients appear to have shorter average times to arrest, and thereby increasing the possibility of rejection of the null hypothesis. In light of the many factors for and against various starting times for our study, we chose the earliest time at which each client’s engagement status could be determined (Zhou, et al., 2005). This depends on their index dates, and initiation and engagement status: 1) for clients who did not initiate or engage, time 0 was chosen to be day 14 after the index (because if client had not initiated by then, he/she would not have been able to engage); 2) If a client had initiated only, time 0 was 30 days after the initiation (to allow for possible engagement); 3) For clients who engaged, time 0 was the time of the visit that met the engagement criteria. As a sensitivity test, we also ran our analyses defining time 0 as 45 days after index date, the latest date by which engagement status can be determined. Results of these parallel analyses were quite similar - the only difference was that engagement’s effect on arrest for violent crime lost significance for one state, Washington. As such, only results of our main analyses are provided.

For the most part, when no arrest was found for a client within 365 days of the starting time, the client’s time-to-event was censored at 365 days. The exception concerns clients who, due to incarceration (without corresponding arrest) or admission to residential substance abuse treatment during the year, have their likelihood of arrest temporarily curtailed. In those cases, the days in residential treatment or incarceration that are under 30 days are considered a “time-out,” and their total is not included in the time-to-event value. In consideration of the “time out” periods, the follow-up is expanded by the same number of days, so that the maximum time-to-event for clients remains 365 days (marked as censored, however, if the client was not arrested during the expanded time period). In cases where the new follow-up period necessitated by time in a controlled setting did not allow for 365 days between the origin and December 31, 2009, the last day for which data are available, the clients times-to-event were censored at December 31, 2009. For clients whose length of stay went beyond December 31, 2009, the times-to-event were censored at the beginning of the incarceration or residential stay.

The shared frailty models we use for our analyses represent a version of multivariate Cox proportional hazards regression (Therneau & Grambsch, 2000), which examines the effect of treatment engagement status on the hazard of arrest, after accounting for potential clustering of outcomes by facility and adjusting for other confounding covariates at both the client and facility levels. The facility-level variables in our models include percentage of clients engaging in treatment, percentage having prior arrest or incarceration, and percentage using hard-core drugs other than marijuana. The traditional Cox model, which assumes independence of survival times among all clients, will ignore any potential correlations among clients from within the same cluster. This may lead to exaggerated significance and the potential for drawing incorrect conclusions. The shared frailty model, on the other hand,

accounts for clustering of outcomes among clients from the same facility, by introducing an additional parameter into the hazard rate function to reflect the assumption that clients within the same facility have a component of shared risk of arrest.

3. Results

3.1 Descriptive and Bivariate Results

Characteristics of clients beginning new episodes of treatment are shown for each state in Table 2. For some demographic characteristics the characteristics across states were similar. For example, in all states clients were predominantly men and the most prevalent age group is 31–44 with about twenty percent or more over age 45. Also, in all states except Connecticut, where marital status and employment were excluded from the analysis due to missing data, about a quarter of clients were married and unemployment rates were high, almost sixty percent or more. The distributions of other important client characteristics, however, varied extensively across the four states. In New York, for example, White clients represented a lower proportion of clients than in the other states, while Black clients represented a substantially higher proportion. Oklahoma had the highest proportion of white clients among the four states. In Oklahoma and Washington there were much higher proportions of American Indian clients than in New York and Connecticut. Across all four states, about a third of clients did not finish high school. In New York, however, the remaining clients split almost evenly between high school and more than high school, while in the remaining states the ratio was closer to 3:1 or more. There was a higher proportion of homeless clients in Washington (8.3%) compared with the other states, while in Oklahoma far more clients lived in rural areas (44.1%). During the year prior to their new episode of outpatient treatment for substance abuse, about half of the clients in Connecticut, Oklahoma and Washington, but only 17.7% of clients in New York had a prior arrest or incarceration.

As self-reported on admission, across all states a third of clients had used alcohol and about a quarter had used marijuana in the past month. More clients in New York reported using cocaine (14.7%) than in the other states and methamphetamines were reported by a substantial proportion of clients only in Oklahoma (7.7%) and Washington (5.28%). Age at first use of any substance was most common during adolescence with fifteen percent or less of clients reporting first use at age twenty one or older. About half of clients were referred from the criminal justice system.

Regarding facility level variables, the median client engagement in a new episode of outpatient treatment for substance abuse was higher in New York and Washington, although there was considerable range across facilities in all states (Table 3). The proportion of clients with arrest or incarceration in the year prior to treatment was lower in New York and the median proportion of clients using hard drugs was lower in Connecticut and Washington than the other states.

As shown in Table 4, in all states clients who engaged had lower rates of any arrest in the year following a new episode of outpatient treatment, although the difference was not significant in Connecticut. In addition, in both New York and Oklahoma clients who engaged had significantly lower rates of arrests for a substance-related crime or for a property or violent-related crime than clients who did not engage.

3.2 Survival Analysis Results

Engagement, prior year arrest or incarceration, and their interaction—Table 5 shows the results of the time-to event survival analysis for the any arrest outcome. For each state, engaged outpatient treatment clients had a significantly lower hazard of an arrest than non-engaged outpatient treatment clients (Connecticut hazard ratio = 0.82; 95% confidence

interval [95% CI] = 0.71 – 0.94, New York HR = 0.78; CI = 0.71–0.87, Oklahoma HR = 0.73; CI = 0.65–0.82, Washington HR = 0.83; CI = 0.76–0.92). Thus, at any point in time after beginning outpatient treatment in New York, clients who had not yet been arrested had 22% less likelihood of arrest if they were engaged, than if they were not engaged. Similarly, Connecticut clients who engaged had 18% less likelihood of arrest, Oklahoma clients who engaged had 27% less likelihood of arrest, and Washington clients who engaged were at 17% less risk of arrest than clients who did not engage.

Being treated in New York or Oklahoma facilities with higher proportions of engaged clients also predicted lower hazards of arrest (New York HR = 0.56; CI = (0.35–0.91) and Oklahoma HR = 0.54; CI = (0.32 – 0.90)). These coefficients imply, for example, that compared to being treated in a New York facility with a 60% engagement rate, clients treated in a New York facility with a 70% engagement rate have a 5.6% lower hazard of arrests in the year following treatment.

Similarly, being engaged predicts a significantly lower hazard of an arrest for a property or violence-related crime (Table 7), and in New York and Oklahoma for a substance-related crime (Table 6). The facility-level engagement rate is significantly in Washington for substance-related arrests (Table 6) and in Oklahoma for property or violence-related arrests (Table 7).

Table 5 also shows that for each state, the strongest predictor of arrests after treatment was arrest or incarceration in the year prior (Connecticut HR = 3.01; CI = 2.65–3.42, New York HR = 9.66; CI = 9.05–10.32, Oklahoma HR = 1.85; CI = 1.66–2.06, Washington HR = 2.18; CI = 1.99–2.39). In New York, clients with arrest or incarceration in the prior year have a 9.6 times higher hazard of arrest than those without this prior criminal justice involvement. Being treated in a facility with a higher proportion of clients with arrest or incarceration in the prior year also predicts a significantly higher likelihood of any arrest in Connecticut, New York and Washington. For outcomes involving substance-related arrests (Table 6) or property or violence-related arrests (Table 7), clients arrests or incarceration in the prior year were always significant predictors of higher hazards of arrests, while facility-level proportions of clients with this prior criminal justice involvement were also significant in Connecticut, New York and Washington.

Focusing on the interaction between the client-level variables for engagement in treatment and prior arrest or incarceration, our models found that in New York, this interaction provided additional protection against any arrest. In particular, compared with the estimate of hazard of arrest based only on the main effects of engagement in treatment and prior year arrest or incarceration, the interaction in our model for New York predicts an additional 17% percent reduction in hazard of arrest for clients who have both characteristics. Together with the main effect of 22% lower hazard of arrest, which all New York clients should enjoy if they engage, New York clients who had a prior year arrest or incarceration should expect an additional 17% lower hazard of arrest if they engage in treatment, compared with similar clients who do not engage. This additional protection from the interaction between client-level variables, however, is not observed in models of the separate outcomes of substance-related arrests or property or violence-related arrests (Tables 6 and 7). These non-significant results are probably due to fewer arrest outcomes in these latter analyses.

Other Characteristics Predicting Arrest—Other client characteristics which significantly affected the hazard of arrests were sex, education, and marital status. Being female predicted a lower hazard of any arrest than being male in New York, Oklahoma and Washington. Similarly, having a high school degree or higher education and being married in New York and Washington states predicted lower hazard as well (Table 5). Compared

with clients aged 45 and over, all the younger age groups had a significantly greater hazard of arrest as did those who were homeless and unemployed in New York and Washington states. The impact of a client's race or ethnicity varied across states. Black clients had a higher hazard of arrest in Connecticut (HR = 1.29; CI = 1.11–1.49), New York (HR = 1.14; CI = 1.05–1.24) and Washington (HR = 1.52; CI = 1.33 – 1.74) compared with White clients. In Washington, clients who were American Indians had a higher hazard of arrest (HR = 1.31; CI = 1.15–1.48) compared with White clients. Clients living in rural areas had a higher hazard of arrest in Connecticut (HR = 1.25; CI = 1.02–1.53) and New York (HR = 1.15; CI = 1.04 – 1.28) but a lower hazard of arrest in Washington (HR = 0.82; CI = 0.73 – 0.93) compared with clients living in urban or suburban areas.

The impact of substances used at admission, facility proportion of clients reporting using hard drugs at admission, and referral source also varied by state. While the significance levels varied, reporting each of the substances as either a primary or other drug at admission as well as using the substance in the past month, compared with not reporting use of that specific substance in the past month always showed a higher hazard of arrest. Being treated in a facility that treated a higher proportion of clients reporting using hard drugs at admission only significantly predicted higher hazard of arrest in Washington state. Across all states, clients reporting younger age at first use had higher hazards of arrest compared with those reporting first use at age 21 or over. Finally, referral source only predicted a higher hazard of arrest for those referred by a community organization or agency in New York compared with self-referral.

4. Discussion

4.1 Impact of treatment engagement on criminal justice outcomes

Across four states, our analysis shows that being engaged in treatment predicts a lower hazard of arrest following the beginning of an episode of outpatient treatment. Moreover, the magnitude of this effect is substantial, ranging from 17% to 27% across states. These results confirm the findings of prior studies in Oklahoma and the Veterans Administration (Garnick, et al., 2007; Harris, et al., 2010). However, the results varied across states when we examined different types of arrests and compared client-level with facility-level specification of treatment engagement. Thus, both the development of process-focused performance measures and the testing of the relationship of process measures and outcomes should be conducted using a variety of settings, use a range of outcomes, and include both individual and aggregate levels of the process measures.

The results for substance related arrests and property or violence related arrests vary across states, however. The influence of engagement on substance-related arrests is statistically significant only in New York and Oklahoma while the influence of engagement is significant for property or violence related arrests in all four states. These findings justify our decision to analyze the data for each state separately, a decision made because we knew there are differences across states in their treatment systems, law enforcement procedures and data procedures.

Including facility-level engagement is key, both to focus on the question of whether it makes a difference in outcomes to be treated at a higher performing facility, as well as to avoid bias (Finney, Humphreys, Kivlahan, & Harris, 2011). In two of the four states, New York and Oklahoma, being treated in a facility with a higher engagement rate also matters, conferring additional protection from subsequent arrest.

These robust results suggest that state agencies and treatment facilities can use the performance measure of treatment engagement to monitor provision of services to their

clients, include the measures in continuous quality improvement activities, and consider them for incentive programs. Currently, the state agency in Oklahoma includes engagement as part of a standard provider performance report for all public behavioral health providers. Focusing on individual clients, providers might take steps to get clients who are at risk of not becoming engaged in treatment to return for more treatment during the early stage of a treatment episode. One action that they can take, for example, is making follow-up phone calls to clients. At the facility level, lower engagement rates may indicate that the facility needs to examine why engagement is low and try to improve its rates. Improvement collaboratives under the NIATx model suggest interest circle calls, clinic-level coaching, and learning sessions as ways to increase treatment access (reducing waiting time, and increasing the number of clients) and retention (defined similarly to engagement). A recent study indicates that some of these components are helpful in significantly increasing treatment access, although not significantly improving treatment retention (Gustafson et al., e-pub 2013)

While our results related to treatment engagement and arrests are consistent across states, we recognize that whether a client is arrested may be biased by race/ethnicity (Alexander, 2010; Eith & Durose, 2011; Human Rights Watch, 2008; Kochel, Wilson, & Mastrofski, 2011). According to Human Rights Watch's analysis of arrest data obtained from the FBI, blacks arrest rates nationwide for drug charges are higher than white arrest rates, relative to their proportion in the population, although blacks and whites engage in drug offenses at roughly comparable rates (Human Rights Watch, 2009). In the states we studied, the black to white ratio of drug arrests in 2006 ranged from 2.6 in Oklahoma and New York, to 4.5 in Connecticut and 5.1 in Washington state (Human Rights Watch, 2009). In addition, recent studies have identified Law enforcement's use of racial profiling to determine who is searched for drugs during traffic or pedestrian stops is well-documented (Birzer & Birzer, 2006; DeLisi, 2011). Once stopped, blacks are more likely to be searched and arrested (Human Rights Watch, 2008).

4.2 Impact of prior criminal justice involvement

Our results corroborate earlier findings in the literature that history of prior arrests or incarceration is the strongest predictor of arrest in the time period following substance abuse treatment (Calsyn, et al., 2005; Easton, et al., 2007; Luchansky, et al., 2000; Luchansky, et al., 2007). However, among outpatient treatment clients in New York, engagement provides additional protection for those with prior arrests or incarcerations. In other states, treatment engagement was not significantly strong to have an additional impact on criminal justice outcomes among this population. In addition, being treated in a facility with a higher proportion of clients who also had prior arrest or incarceration was associated with a higher hazard of arrests (with the exception of Oklahoma). These two complementary results are particularly important, because half of the clients treated in the public sector in three states had a prior arrest or incarceration history in the year before they began their episode of treatment.

For clients with prior criminal justice involvement, engagement may not be enough to bring about positive changes and sustain outcomes. These clients may need more resources as they transition back to the community, such as relapse prevention, employment services, vocational training, housing, and connections to social networks of non-users. To address the high costs associated with incarceration and the high rates of recidivism among ex-offenders once released, many states have implemented reentry initiatives that usually entail collaborative relationships between correctional institutions and partnering community service providers who provide varied health and supportive social services to individuals transitioning from incarceration back into the community. Currently, Connecticut has several programs in place designed to assess and address inmates substance abuse, mental

health and medical treatment service needs prior to release, as well as to coordinate appropriate aftercare with community partners upon their release from incarceration. In New York, the full impact of amendments to the Rockefeller Drug Laws in April 2009 that expanded judicial discretion to offer drug court alternatives for certain addicted nonviolent offenders are still being studied (Division of Criminal Justice Services, 2012).

4.3 Study Limitations

Working collaboratively, the state and academic co-authors were able to take advantage of the rich opportunity for research offered by linking information from the substance abuse treatment agencies and the criminal justice agencies. As previously reported by other researchers, despite the best efforts of everyone involved and our previous collaboration through the Washington Circle Public Sector Workgroup (Garnick, et al., 2011; Garnick, et al., 2009), the data sharing process was difficult and time consuming (Hser & Evans, 2008). Within each state, we had to take into account each agency's Institutional Review Board, data sharing agreements, and security procedures. On average, it took over a year from the initial data request for merged files to be transmitted to the academic co-authors. Despite the rich information we obtained from this serious investment of effort, we recognize several limitations to the analytic databases that we built.

First, there may be some missing data on arrests or incarcerations from the administrative sources, and this issue may vary in magnitude across states. Clients new to the state treatment system (e.g. recently moved to the state) may have incomplete prior year treatment or criminal justice data. The four states differed in the level of detail about arrests that they could make available for this study. Particularly, in New York, only the "top charge" was listed for each arrest whereas in other states multiple charges were coded for each arrest. This results in lower rates of specific types of arrests for New York.

Moreover, although we used the best possible methodology for linking administrative data, we cannot claim that all matches between state treatment systems and state criminal justice systems were entirely correct. Issues in the underlying data such as missing data on key matching variables, the use of multiple identifiers (social security numbers) by some clients, and errors in the data (e.g., misspelling or partial information for names) existed for all states to some degree. Of particular concern was New York's linkage algorithm which had to rely on more limited data and probably had lower accuracy. Washington State research suggests that New York's lower accuracy may, in part, explain its higher hazard ratio for prior arrest or incarceration. To test the impact of linkage accuracy on analytic results, a Washington State researcher conducted "what if" analyses under a variety of scenarios, including one similar to our particular model (Campbell, 2009). If a variable for a prior status is included as a predictor of a subsequent status, such as the status of criminal justice involvement as in our case, and if the source for the status relied on the same linkage and thus often miscoded the same subjects in both the pre- and post- time periods, it would produce biased results (i.e., hazard ratios of large magnitude). Furthermore, if an independent source was used to determine the prior status, results were far less biased. To test the sensitivity of our results to this issue, we re-ran the analyses for NY, using self-reported criminal justice involvement in the past six months instead of arrest status based on administrative data. As suggested by Campbell (2009), the hazard ratio for the self-reported prior criminal justice involvement, while still significant, was much lower in the model and the interaction between individual engagement and self-reported criminal justice involvement was no longer significant. Perhaps most importantly, however, the hazard ratio for individual engagement, our key variable of interest, remained the same.

Second, this study used information on arrests obtained from linking to states criminal justice agencies. Thus, we examined the impact of treatment engagement on official

encounters with the criminal justice system, but did not measure the impact on criminal behavior itself. In particular, we were not able to link arrests with their adjudication, so we do not know if clients who were arrested were later found not culpable of any crime, and of course, we were unable to use criminal behavior that was unrecorded. Also, by using a one year period for prior history of arrest or incarceration, we did not make use of criminal justice involvement from a more distant prior period. We selected a one year period because of concerns about not being able to differentiate between those with no real criminal justice activity from those not residing in the state.

Third, as in other non-randomized, observational studies, there may be unobserved or uncollected variables that, if included in the models would influence both engagement and outcomes. For example, clients with stronger motivation at entrance to treatment may have both higher engagement and better outcomes. The potential effect of unobserved variables on outcomes is probably lessened because the study included a substantial collection of clients clinical and behavioral characteristics in the regression models. The variables we used were consistent with the Behavioral Model of Health Services Use (Andersen & Davidson, 2007) which posits that a rich array of individual and contextual characteristics may influence health services use.

4.4 Implications for use of treatment engagement as a performance measure

Performance measures, such as engagement in substance abuse treatment, are a starting point in improving the quality of treatment of people who are not receiving adequate treatment for their addiction problems. The acceptance of measures that focus on process of care, such as engagement in substance abuse treatment, often rests on their association with outcomes. Previous research on the effect of treatment engagement on outcomes generally has focused on its ability to reduce substance use. Client's own engagement in outpatient treatment was shown to be associated with reduced substance use among outpatients in the Veterans Administration (Harris, et al., 2010). Similar measures (2–6 visits in the first month of treatment among veterans) were associated with both individual and facility-level positive outcomes at outpatient and intensive outpatient clinics for patients with alcohol use disorders (Harris, et al., 2009). Among adolescents in public sector treatment, those engaging in outpatient treatment had significantly lower likelihoods of reporting any substance use, alcohol use, heavy alcohol use, and marijuana use, although facility-level engagement rates were not significantly associated with any outcomes (Garnick, et al., 2012). In Washington State, engagement as a main effect was not significant for employment outcomes; however, for clients with prior criminal justice involvement, engagement was associated with both having any employment and with higher wages following treatment (Dunigan et al., in press).

Results of the current study add to existing research by identifying a significant association between engagement in specialty outpatient treatment in public sector settings in four states and criminal justice outcomes. These results are particularly important in an environment where there is a renewed focus on performance measures driven, in part, by recent legislative initiatives such as the 2010 Patient Protection and Affordable Care Act, which may open up treatment for substance use disorders for more Americans; and the 2008 Mental Health Parity and Addiction Equity Act, which expands benefits for mental and substance use disorders. Moreover, performance measures play a key role in incentive-based approaches to paying for treatment services. With this focus on performance measures, therefore, further studies are crucial to better understand if the associations between improvements in process-based performance measures and improvements in clients outcomes extend to other populations and types of outcomes.

Acknowledgments

This research was supported by the National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health under award number # R01AA017177-01A2. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or of the participating states. The authors appreciate the contributions to developing analytic datasets from Deborah Henault, Patrick Hynes, and Mary Lansing (Connecticut Department of Correction), Lois Desmarais and Thomas Myers (Connecticut Department of Emergency Services and Public Protection), and David Van Alstyne (New York State Division of Criminal Justice Services). We would also like to acknowledge Steve Davis (formerly at the Oklahoma Department of Mental Health and Substance Abuse Services) and Robert J. Gallati (formerly at the New York Office of Alcoholism and Substance Abuse Services).

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Table 1

Information on clients in analytic file

	Connecticut	New York	Oklahoma	Washington
Clients with new OP episode in 2008	7,978	89,750	13,195	9,458
Residential stay LOS > 2 first 45 days	69	1,728	704	437
Incarceration after index without arrest	492	---	61	---
Incarceration within 45 days of index, LOS >30	20	190	0	16
Admission data > 30 days from index	0	0	3,767	0
Arrest before time 0	245	1,231	122	244
Death after index	8	79	25	8
Missing data on independent variables	1,806	1,127	575	548
Only one client in agency after other exclusions	23	4	2	17
Final Sample used in Regressions	5,324	85,211	7,939	8,188
Mean Number of Days to Arrest ^I	310.7	349.0	320.9	294.0

^I Means based on truncated information. Clients not arrested within year after discharge are assigned values of 365 days.

Table 2

Client characteristics at beginning of new episode of outpatient treatment by state (%)

Characteristic	Connecticut (N = 5,324)	New York (N = 85,211)	Oklahoma (N = 7,939)	Washington (N = 8,188)
Engagement rate	45.4	78.0	50.0	71.1
Client demographics				
Female	30.7	27.0	37.5	37.3
Age				
18–20	9.0	8.8	6.6	9.3
21–25	18.2	16.3	19.6	17.7
26–30	15.9	14.9	19.6	16.6
31–44	34.5	34.4	34.9	34.2
45+	22.5	25.7	19.4	22.2
Race/ethnicity				
White	56.5	48.7	66.5	58.6
Black	20.2	28.9	16.2	8.4
Latino	21.3	19.2	4.0	11.4
American Indian	---	---	12.1	14.0
Other	2.0	3.2	1.2	7.6
Education				
< High school	30.5	32.3	33.0	31.9
High school degree	50.3	37.7	50.0	56.2
> High school	19.3	30.1	17.5	12.0
Homeless	4.1	4.8	0.8	8.3
Married	---	21.5	24.8	23.8
Unemployed	---	59.6	60.2	70.8
Rural	10.4	11.2	44.1	18.6
Arrest or incarceration in prior year	52.5	17.7	46.7	50.6
Substance use and treatment referral				
Substance(s) used in past month ^a				
Alcohol	33.8	37.7	29.9	28.9
Marijuana	19.4	25.8	20.8	16.2
Cocaine	9.0	14.7	6.3	5.9
Opiates	4.0	7.8	8.6	5.7
Methamphetamines	---	---	7.7	5.2
Other Drug	2.7	4.5	5.6	2.0
Age of first use ^b				
10	5.0	6.3	7.7	12.6
11–14	28.6	29.3	29.7	36.4
15–17	36.1	35.7	32.5	31.4
18–20	16.7	16.6	15.0	11.5
21+	13.0	12.1	15.1	8.1

Characteristic	Connecticut (N = 5,324)	New York (N =85,211)	Oklahoma (N = 7,939)	Washington (N = 8,188)
Referral source				
Self/individual	---	19.1	28.4	9.1
Community	---	13.8	17.3	20.8
Criminal Justice	---	47.5	50.3	55.9
Addiction service	---	6.1	---	---
Health prof.	---	5.8	---	---
Other	---	7.8	4.0	14.2

^a Substance was listed as a primary, secondary, or tertiary drug and frequency of use was one or more times in the past month

^b Earliest age of first use of any of the substances reported as primary, secondary, or tertiary substance of abuse

Table 3

Variables aggregated at the facility level

Variable	Connecticut (N = 58)	New York (N = 457)	Oklahoma (N = 81)	Washington (N = 187)
Facility engagement rate				
25th percentile	0.00	0.74	0.33	0.56
50th percentile	0.42	0.79	0.52	0.71
75th percentile	0.63	0.86	0.72	0.88
Proportion of clients with prior year arrest or incarceration				
25th percentile	0.36	0.08	0.31	0.33
50th percentile	0.50	0.16	0.45	0.45
75th percentile	0.60	0.25	0.55	0.56
Proportion of clients reporting use of hard drugs at start of new episode of treatment ¹				
25th percentile	0.04	0.11	0.08	0.02
50th percentile	0.12	0.18	0.16	0.10
75th percentile	0.25	0.30	0.28	0.20

*Note:*¹ Hard drugs includes any substance other than alcohol or marijuana.

Table 4
Client outcomes in year following a new episode of outpatient treatment by state and engagement status

Outcome	Connecticut (N = 5,234)		New York (N = 85,211)		Oklahoma (N = 7,939)		Washington (N = 8,188)	
	Clients not engaged	Clients engaged	Clients not engaged	Clients engaged	Clients not engaged	Clients engaged	Clients not engaged	Clients engaged
N	2,908	2,416	18,747	66,464	3,969	3,970	2,363	5,825
Any arrest (%)	25.9	24.9	6.5	5.0**	24.4	18.5**	33.0	30.5*
Arrest for substance-related crime (%)	9.3	8.1	2.8	2.3**	14.5	11.7**	12.2	13.2
Arrest for property/violent crime (%)	13.7	12.7	3.4	2.4**	13.4	9.4**	14.1	12.5

Differences by engagement status of proportions significant at

* $p < .05$;

** $p < .01$

Table 5
Time-to-event survival analysis of any arrest following a new episode of outpatient treatment

Variable	Connecticut (N =5,324)			New York (N =85,211)			Oklahoma (N = 7,939)			Washington (N = 8,188)		
	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)
Engagement and prior year arrest or incarceration												
Engagement ^d	0.82**	(0.71, 0.94)	0.78**	(0.71, 0.85)	0.73**	(0.65, 0.82)	0.83**	(0.76, 0.92)				
Prior year arrest or incarceration ^d	3.01**	(2.65, 3.42)	9.66**	(9.05, 10.32)	1.85**	(1.66, 2.06)	2.18**	(1.99, 2.39)				
Engagement X Prior year arrest or incarceration	1.08	(0.81, 1.43)	0.83*	(0.72, 0.96)	1.01	(0.80, 1.28)	0.91	(0.74, 1.12)				
Facility engagement rate	1.28	(0.93, 1.77)	0.56*	(0.35, 0.91)	0.54*	(0.32, 0.90)	1.25	(0.98, 1.60)				
Facility proportion of clients with prior year arrest or incarceration	3.74**	(1.91, 7.30)	10.37**	(6.69, 16.09)	1.32	(0.72, 2.44)	5.51**	(3.98, 7.63)				
Client demographics												
Female	0.84*	(0.74, 0.95)	0.58**	(0.53, 0.63)	0.70**	(0.62, 0.78)	0.72**	(0.66, 0.78)				
Age (reference: 45+)												
18–20	1.69**	(1.35, 2.11)	2.13**	(1.89, 2.41)	2.52**	(2.03, 3.12)	1.60**	(1.36, 1.89)				
21–25	1.53**	(1.27, 1.85)	1.88**	(1.70, 2.10)	1.91**	(1.60, 2.28)	1.48**	(1.29, 1.70)				
26–30	1.28**	(1.05, 1.55)	1.73**	(1.56, 1.93)	1.84**	(1.56, 2.19)	1.42**	(1.24, 1.63)				
31–44	1.38**	(1.17, 1.62)	1.46**	(1.33, 1.60)	1.50**	(1.28, 1.76)	1.38**	(1.23, 1.55)				
Race/ethnicity (reference: White)												
Black	1.29**	(1.11, 1.49)	1.14**	(1.05, 1.24)	1.11	(0.97, 1.28)	1.52**	(1.33, 1.74)				
Latino	1.07	(0.92, 1.24)	1.00	(0.91, 1.10)	1.02	(0.81, 1.30)	0.95	(0.83, 1.10)				
American Indian	---	---	---	---	0.96	(0.83, 1.13)	1.31**	(1.15, 1.48)				
Other	1.12	(0.77, 1.62)	0.95	(0.79, 1.14)	1.13	(0.75, 1.68)	1.23**	(1.07, 1.41)				
Education (reference: no high school degree)												
High school degree	0.90	(0.79, 1.01)	1.04	(0.97, 1.11)	0.86**	(0.77, 0.95)	0.91*	(0.83, 0.99)				
More than high school	0.82*	(0.69, 0.98)	0.79**	(0.73, 0.86)	0.77**	(0.66, 0.90)	0.83*	(0.71, 0.96)				
Homeless	1.44**	(1.11, 1.87)	1.40**	(1.22, 1.60)	1.26	(0.75, 2.13)	1.25**	(1.10, 1.43)				
Married	---	---	0.87**	(0.80, 0.95)	0.92	(0.81, 1.03)	0.87**	(0.79, 0.96)				
Unemployed	---	---	1.45**	(1.35, 1.55)	1.10	(0.99, 1.22)	1.21**	(1.11, 1.33)				

Variable	Connecticut (N = 5,324)		New York (N = 85,211)		Oklahoma (N = 7,939)		Washington (N = 8,188)	
	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)
Rural	1.25*	(1.02, 1.53)	1.15**	(1.04, 1.28)	1.04	(0.91, 1.20)	0.82**	(0.73, 0.93)
<i>Substance use and treatment referral source</i>								
Substance(s) used in past month ^b								
Alcohol	1.04	(0.92, 1.17)	0.88**	(0.82, 0.93)	1.00	(0.90, 1.13)	1.06	(0.97, 1.16)
Marijuana	1.15*	(1.00, 1.33)	1.13**	(1.06, 1.21)	1.00	(0.88, 1.13)	1.00	(0.90, 1.12)
Cocaine	1.31**	(1.09, 1.57)	1.57**	(1.44, 1.71)	1.15	(0.94, 1.40)	1.30**	(1.11, 1.53)
Opiates	1.36*	(1.05, 1.77)	1.57**	(1.42, 1.74)	1.06	(0.87, 1.28)	1.29**	(1.09, 1.52)
Methamphetamines	---	---	---	---	1.45**	(1.23, 1.72)	1.80**	(1.55, 2.10)
Other Drug	1.13	(0.81, 1.56)	1.08	(0.93, 1.26)	1.07	(0.88, 1.31)	1.04	(0.78, 1.38)
Facility proportion of clients reporting use of hard drugs	1.78	(0.89, 3.57)	1.22	(0.91, 1.65)	1.06	(0.54, 2.09)	1.77*	(1.09, 2.88)
Age of first use ^c (reference: 21+)								
10	1.16	(0.89, 1.51)	1.40**	(1.21, 1.63)	1.15	(0.92, 1.44)	1.29**	(1.07, 1.55)
11–14	1.15	(0.95, 1.39)	1.30**	(1.15, 1.46)	1.14	(0.96, 1.35)	1.12	(0.95, 1.32)
15–17	0.87	(0.72, 1.05)	1.08	(0.96, 1.21)	1.11	(0.93, 1.31)	1.09	(0.92, 1.29)
18–20	0.92	(0.75, 1.14)	0.91	(0.80, 1.03)	0.97	(0.80, 1.17)	1.00	(0.82, 1.21)
Referral source (reference: self/individual)								
Community organization/agency	---	---	1.14*	(1.02, 1.28)	0.99	(0.81, 1.20)	1.08	(0.91, 1.28)
Criminal Justice	---	---	0.98	(0.90, 1.07)	1.03	(0.88, 1.21)	1.18*	(1.01, 1.39)
Addiction service	---	---	1.13	(0.98, 1.31)	---	---	---	---
Health prof.	---	---	0.91	(0.76, 1.08)	---	---	---	---
Other	---	---	0.90	(0.78, 1.04)	0.65*	(0.47, 0.91)	0.96	(0.80, 1.16)

Notes:

^a Engagement and prior year arrest or incarceration are centered around the facility mean.

^b Substance was listed as a primary, secondary, or tertiary drug and frequency of use was one or more times in the past month

^c Earliest age of first use of any of the substances reported as primary, secondary, or tertiary substance of abuse

* p < .05;

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Table 6
Time-to-event analysis of arrest for a substance-related crime following a new episode of outpatient treatment

Variable	Connecticut (N = 5,324)		New York (N = 85,211)		Oklahoma (N = 7,939)		Washington (N = 8,188)	
	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)
Engagement ^d	0.82	(0.65, 1.03)	0.83**	(0.73, 0.95)	0.74**	(0.64, 0.86)	0.92	(0.79, 1.09)
Prior year arrest or incarceration ^a	2.37**	(1.92, 2.94)	8.20**	(7.45, 9.03)	1.85**	(1.61, 2.12)	2.07**	(1.79, 2.39)
Engagement X prior year arrest or incarceration	0.96	(0.59, 1.55)	0.88	(0.71, 1.09)	0.81	(0.60, 1.10)	1.08	(0.75, 1.57)
Facility engagement rate	0.85	(0.50, 1.45)	0.58	(0.29, 1.14)	0.73	(0.40, 1.32)	1.82*	(1.13, 2.93)
Proportion of clients with prior year arrest or incarceration	4.52**	(1.44, 14.20)	9.19**	(4.96, 17.03)	1.56	(0.76, 3.19)	4.26**	(2.31, 7.84)

Notes: Controlling for other client-level covariates included in Table 4.

* p < .05;

** p < .01

^aEngagement and prior year arrest or incarceration are centered around the facility mean.

Table 7
Time-to-event survival analysis of arrest for a property/violent crime following a new episode of outpatient treatment

Variable	Connecticut (N = 5,324)			New York (N = 85,211)			Oklahoma (N = 7,939)			Washington (N = 8,188)		
	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)	H.R.	(95% CI)
Engagement ^d	0.71 ^{**}	(0.59, 0.87)	0.71 ^{**}	(0.63, 0.81)	0.71 ^{**}	(0.61, 0.83)	0.84 [*]	(0.72, 0.98)				
Prior year arrest or incarceration ^d	3.18 ^{**}	(2.64, 3.82)	10.41 ^{**}	(9.47, 11.44)	1.91 ^{**}	(1.65, 2.21)	2.21 ^{**}	(1.92, 2.55)				
Engagement X prior year arrest or incarceration	1.65 [*]	(1.10, 2.47)	0.91	(0.74, 1.11)	1.23	(0.89, 1.69)	1.21	(0.88, 1.67)				
Facility engagement rate	1.34	(0.94, 1.91)	0.75	(0.41, 1.40)	0.50 [*]	(0.26, 0.94)	0.93	(0.58, 1.48)				
Proportion of clients with prior year arrest or incarceration	2.54 [*]	(1.19, 5.43)	7.18 ^{**}	(3.99, 12.91)	1.17	(0.55, 2.48)	4.82 ^{**}	(2.59, 8.96)				

Notes: Controlling for other client-level covariates included in Table 4.

* p < .05;

** p < .01

^dEngagement and prior year arrest or incarceration are centered around the facility mean.