



Research Article

Volume 7 Issue 1 - July 2023
DOI: 10.19080/GJARM.2023.07.555707

Glob J Addict Rehabil Med

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Divining Drug Court Success: Characteristics Predicting Graduation and Recidivism Across 34 Statewide Adult Drug Courts



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Submission: June 27, 2023; Published: July 12, 2023

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Abstract

Limitations from prior research on predictors of adult drug court graduation outcomes were addressed by examining the largest sample to-date of 3,062 participants from 34 rural and urban drug courts. Fifty-two percent of the participants successfully completed drug court. Two-year recidivism for the drug court graduates was low (16%). Graduates were more likely to be female, Caucasian, an older age, employed, have received at least a high-school education, to have a marital relationship, to not have engaged in suicidal behaviors, and to have primarily used marijuana instead of methamphetamine or opiates. No difference emerged among predictors in rural versus urban settings. In this unique study with a large sample and a multi-year recidivism period, graduates who recidivated were more likely to be younger, and to not have a driver's license. Implications for tailoring of drug court treatment and case management plans are discussed.

Keywords: Drug court; Substance abuse; Recidivism; Predictors; Marijuana; Fewer juvenile; Pain relievers; Tranquilizers; Methamphetamine; Heroin; Stimulants; Cocaine; Inhalants; Illicit drugs

Introduction

Substance use disorder is a major public health problem in the United States, as it negatively affects the health care and criminal justice systems, resulting in costs of \$740 billion each year [1]. Nearly 32 million people aged 12 and older were users in 2018 of some kind of illicit drug, including marijuana, misuse of prescription drugs (pain relievers, tranquilizers, sedatives and stimulants), cocaine, inhalants, methamphetamine, and heroin [2]. There is a concerning link between the use of drugs and criminal behavior, with drug users being 3 to 4 times more likely than non-drug users to engage in criminal behavior [3]. Despite the evident public health burdens, effective healthcare treatment programs for substance use disorder are limited and underused [4].

To increase drug offenders' access to effective treatment, and to reduce the burdens placed on the criminal justice system by drug users, the community-based drug court model was first developed for nonviolent drug offenders in the late 1980s, and since then has spread nationwide [5,6]. While many offenders have an offense related to illicit drugs, drug court clients nationally identify

alcohol as their primary drug of choice [4]. As an alternative to incarceration, drug courts were designed to provide supervised community-based treatment. In contrast to traditional probation, drug courts rely on a non-adversarial approach to supervision through the use of a drug court team often consisting of probation officers, police officers, treatment providers, and the judiciary [7,8]. The drug court team promotes program compliance through the use of drug testing, supervision hearings, and a graduated system of sanctions and reinforcements [8].

Across Drug Courts, 10-70 percent of clients successfully complete program requirements and graduate from drug court [9,6,10]. Early studies had shown that drug courts reduced subsequent criminal activity of adult clients [11], and meta-analyses of drug court evaluation studies have indicated that drug courts have modest, statistically significant reductions in recidivism rates for up to three years after graduation [6]. A more extensive meta-analysis of a large number of experimental and quasi-experimental evaluations of drug courts has supported this conclusion and found that the significant reduction in general and

drug-related recidivism was equivalent to the difference between 38% for adult drug court participants and 50% for comparable adult nonparticipants, and that these effects indeed persisted for at least three years after program entry [12].

Predictors of Drug Court Outcomes

Because of the wide range of completion rates of drug court requirements [6] and of subsequent recidivism [6], a focus of research in the past decade has been on determining individual-level factors that predict drug court graduation and subsequent recidivism [13]. Although the regression findings emerging from regression analyses to predict graduation may have considerable relevance for the local drug court being assessed, they have widely varying findings, and have not been very useful at providing broadly generalizable results. For example, [4] used multiple regression with one drug court's participants (N=310), and found graduation was predicted by lower urine drug screens, being female, and higher education (high school and up); other univariate predictors, including race and employment, became nonsignificant predictors in the regression analysis [14]. [4] used logistic regression with one drug court (N=248), and found participants' graduation was predicted by higher employment, less use of opiates, and fewer violations in the first 30 days; other factors, including age, education, race, and gender, did not predict graduation in the regression analysis [15]. [15] used logistic regression within one drug court (N=99), and found graduation was predicted by higher employment and lower IV drug use, but was not predicted by age, education, ethnicity, gender, or marital status. Hicket and colleagues (2009) used logistic regression with one drug court's participants (N=284) and found younger age and cocaine use predicted termination from drug court.

Studies have also examined multiple predictors of recidivism [10]. [10] used logistic regression with one drug court in Canada (N=659) and found lower recidivism for females and Aboriginal participants [5]. [5] used latent class analysis (LCA) followed by regression analyses. Two drug courts with data from 1,043 individuals were included. The sample was 50% female, and primarily Caucasian and Hispanic, with only 3% of the sample being African-American. The LCA analysis yielded three groups. In the subsequent regression analysis, the worst outcomes in graduation rates (38% graduation) and recidivism at 12 months post-graduation (29%) occurred for the early delinquency group of participants, in comparison to the psychological problems group of participants (53% graduation, 16% recidivism) and subthreshold group of participants (57% graduation, 17% recidivism).

Although all studies of graduation, and most studies of recidivism, assessed participants from only a limited number of drug courts, there have been two exceptions in the research literature in the prediction of recidivism. These two studies examined recidivism for only six months after graduation and

had produced some differences in identified predictors [13]. [13] examined predictors of six-month recidivism after completion of Drug Court for 2,295 participants from 23 primarily urban sites across 12 states, and found in regression analyses that female, older, and employed participants had lower rates of recidivism. Level of education did not predict recidivism. In another large study with 1,577 participants in 23 drug courts, the Multi-Site Adult Drug Court Evaluation, [16] examined baseline and court practice predictors of crimes committed in the 18-months after participants entry into, and during their involvement in, Drug Court. The three participant characteristics of younger age, more prior arrests, and presence of Antisocial Personality Disorder predicted higher rates of crimes during the participants planned period of Drug Court involvement. Other participant characteristics which were not predictive of crime were race, education level, gender, marriage, having minor children, and the primary drug of choice. These examples of varying findings across studies are likely due to variations in the types of participants included in specific drug courts. It is evident that research using a large number of drug courts, with long-term follow-up, and examining variations in drug court locations, is important to increasing the generalization of findings. One key difference in the location of drug courts which may affect outcomes is whether the drug court serves urban versus rural counties.

Separate regression analyses for urban versus rural contexts for drug courts.

Because of variations in characteristics of the participants and of available and accessible services in rural drug courts [17], it is important to determine whether the predictors of drug court graduation and subsequent recidivism vary by the urban versus rural setting of the drug court [18]. [18] ran separate regression analyses predicting graduation rates for participants from one rural drug court and participants from one urban drug court, with a total sample of 500 participants. Different predictors emerged in the separate analyses for the two courts, with better graduation rates being predicted by older age and fewer juvenile incarcerations for the rural drug court, and by being married, being employed, and having less cocaine use and criminal activity for the urban drug court. However, despite these different patterns in the study by [18], it is not clear if the within-court predictors in this study had significantly different predictive abilities between the urban versus rural drug courts, and whether these findings would be evident with a larger sample of drug courts. To determine if there were significant differences in the predictive abilities of participant characteristics, a single regression analysis could include interactions between urban-rural status and the participant characteristics and indicate if there were significant interactions by urban-rural court status. No studies have been located which have examined moderation by urban-rural status (or by interactions of participant characteristics) on drug court graduation or subsequent recidivism.

The Current Study

Although research has rapidly grown on drug court effectiveness, and on predictors of drug court effects, there have been primary limitations in the studies to-date. First, no studies have examined how participant characteristics could significantly moderate urban versus rural drug court status in predicting court outcomes. Second, and very importantly, the analyses in published papers of predictor variables for graduation have been conducted with participants from only one or a small number of drug courts, and research on recidivism from studies using larger sets of drug courts has only limited length of follow-up for recidivism. Thus, when mixed findings occur across studies, or differences are found between one rural drug court and one urban drug court in one study, the findings might be limited to the specific drug courts examined, with their specific patterns of services and court protocols. To have more generalizable findings, more drug courts, with a longer follow-up period to assess for recidivism, would need to be included in the analyses.

As a result, the current study will examine in regression analyses how involvement in rural versus urban drug courts, and a set of participant characteristics that exist prior to drug court involvement (sex, age, race, drug of choice, employment, education level, marital status, having custody of a child, suicidal ideation, driver's license possession, transportation availability) all predict participants' graduation from drug court and subsequent recidivism rates for up to two-and-a-half years after graduation. The interaction between urban-rural court status and the participant characteristics will be examined in the analyses, to determine if there are significantly different predictors in rural versus urban drug courts. The analyses will include participants from 34 drug courts across one state (8 urban, 26 rural).

Method

Design

This paper reports on secondary analyses conducted on data collected from legal records and drug courts in the State of Alabama. As of July 2021, there were 55 drug courts in Alabama, representing 66 of the State's 67 counties. Drug courts that receive funding through the Alabama Administrative Office of Courts (AOC) are required to submit data through the State's Model Integrated Defendant Access System (MIDAS). While a majority of drug courts use MIDAS, several capture data through other mechanisms. Only drug courts that provided data through MIDAS are included in analyses for this project. Of the 34 Alabama drug courts included in this study's analyses, 8 served areas classified as "urban" (Baldwin, Calhoun, Lauderdale, Madison, Montgomery, and Morgan Counties, and two serving Shelby County) using the National Cancer Institute SEERS criteria for the State of Alabama provided by [19].

Sample

The sample includes 3062 individuals accepted into the Alabama Drug Court program whose status was closed between 2018 and 2020, out of which 52.1% graduated. Sample descriptive statistics using available-case data were reported in Table 1. The sample included men (62.9%) and women (37.1%) who identified as African American (18.5%), and Caucasian (81.5%). Participant age averaged 35.3 years (± 9.7) and reported less than HS education (28.3%), HS graduate or GED (42.2%), some college (23.1%), and college graduate (6.5%). Reported drug of choice included: marijuana (34.2%), methamphetamine (30.6%), opiates (14.3%), other drugs (20.8%). Suicidal ideation or intent was identified for 16.4% of participants. A majority were employed (53.8%), had a current valid driver's license (62.8%), had transportation (89.3%), lived without a partner (73.0%) and had no child in custody (76.1%).

Table 1 also reported the percentage of participants with missing data for each of the variables. Missing data was most commonly due to staff at the various drug court sites not having sufficient time to enter all of the data for the MIDAS system, described below, because of competing job responsibilities. The percentage of missing data ranged from a low of 0% (graduation status, rurality) to a high of 62.4% (drugs of choice). The rate of missing data was 40.5% across all variables combined. Overall, 70% of participants had missing data on at least 1 variable. There was meaningful difference in graduation status and rurality between those with complete data and those with missing data. Of those with complete data, 65.9% graduated, while of those with missing data, 46.2% graduated. Of those with complete data, 59.7% were admitted to rural drug courts, while of those with missing data, 67.5% were admitted to rural drug courts.

Measures

MIDAS. MIDAS (Model Integrated Defendant Access System; [20]) is a case management application used by Alabama Court Referral Officers, Drug Courts, District Attorneys, and Community Corrections Officers. MIDAS includes comprehensive court record, criminal, driving, and case management information, which allows tracking, monitoring, and evaluation of drug court participants. Baseline MIDAS data, used in this paper, are collected and entered by designated drug court personnel at the time of participants' entry into the drug court.

Independent variables were derived from MIDAS and from archival records. *Race* was categorized into Caucasian versus African American. There were only 12 participants with other races, and they were not included in the sample. *Age* was a continuous variable, and indicated age at entry into the drug court. *Gender* was male or female. *Education* included less than HS education, HS graduate or GED, some college and college graduate. *Employment* status was employed versus unemployed. *Marital status* was grouped into living with a partner (e.g., married, single with partner) versus without a partner (e.g., single, separated,

divorced, widowed). *Driver's license* was indicative of whether a participant had a current, valid driver's license. *Transportation* indicated whether or not the participant had transportation.

Suicide documented whether a participant had suicidal ideation or intent. *Child in custody* documented whether a participant had children in their personal custody.

Table 1: Sample descriptive statistics.

Variable	Category	%	# of subjects with available data	# of subjects with missing data	% of subjects with missing data
Status	Graduated	52.1	3062	0	0
	Not graduated	47.9			
Rurality	Rural	65.2	3062	0	0
	Urban	34.8			
Race	African American	18.5	2292	770	25.2
	Caucasian	81.5			
Education	Less than HS	28.3	1345	1714	56
	HS grads	42.2			
	Some college	23.1			
	College degree	6.5			
Gender	Female	37.1	2296	766	25
	Male	62.9			
Employment	Employed	53.8	1429	1633	53.3
	Unemployed	46.2			
Drugs	Marijuana	34.2	1152	1910	62.4
	Methamphetamine	30.6			
	Opiates	14.3			
	Others	20.8			
Suicide	No	83.6	1282	1780	55.8
	Yes	16.4			
Marital status	With partner	27	1393	1669	54.5
	Without partner	73			
Transportation	No	10.7	1347	1715	56
	Yes	89.3			
Driver's license	No	62.8	1376	1686	55.1
	Yes	37.2			
Child in custody	No	76.1	1332	1730	56.5
	Yes	23.9			
Age		35.3 (9.7)	2291	771	25.2

Graduation

The first outcome analysis had *graduation* from AOC drug courts as the dependent variable. The AOC Drug Court Guidelines specify that graduation requirements should include, but are not limited to: (1) Willingness to participate; (2) Maintaining stable employment unless disabled (proof required); (3) Involvement in an appropriate education or literacy program; (4) Attendance at all court reviews and monitoring/supervision appointments;

(5) Payment of all fines, fees, court costs and restitution, when applicable; (6) Completion of community service hours; (7) Completion of an assigned substance abuse treatment/education program and case management plan including self-help attendance (each case management plan will be tailored to the individual participant and will vary); (8) Abstinence from drug and alcohol use as demonstrated by negative drug tests for a period of no less than six (6) months prior to graduation; and (9) Abstinence from further criminal activity.

Recidivism

The second outcome examined in the analyses was *recidivism*. [21] define recidivism as “subsequent conviction or plea of guilty in this or any other state or federal court of the United States within five years of successful completion of Drug Court for any offense carrying a sentence of one year or more.” These offenses are entered into an AOC database by the circuit clerk and their staff.

Alabama Drug Court Program

In 1985, Alabama established a Court Referral program as an alternative for non-violent, substance-abusing offenders, with the goal of reducing recidivism through treatment rather than punishment. Since its inception, the program has expanded and developed into the present drug court system which is based on the Adult Drug Court 10 Key Components and follows the National Association of Drug Court Professionals (NADCP) Adult Drug Court 10 Best Practice Standards [22]. Alabama’s Drug

Court program encompasses court supervision, drug testing, individualized assessment, substance abuse treatment services, substance education, behavior modification, and social services.

Analytic Strategy

Multiple imputation

Multiple imputation was conducted using the MICE algorithm with the use of PROC MI in SAS (SAS/STAT v14.1). The cumulative logit model was used for the imputation of education; generalized logit model for drugs of choice, binary logit model for dichotomous variables (e.g. race, sex), and regression predictive matching for age. All variables were included in the imputation models (with the obvious exception of the variable that was being imputed). Table 2 presented descriptive statistics from imputed data. Each point estimate was the average over 80 imputed datasets. Overall, the distribution of the imputed values was similar to that of the observed values of the variable.

Table 2: Descriptive statistics in the imputed datasets.

Variable	Category	Available-case data	Imputed data
		% or Mean	% or Mean
Race	African American	18.5	18.7
	Caucasian	81.5	81.3
Education	Less than HS	28.3	30.8
	HS grads	42.2	41.6
	Some college	23.1	21.6
	College degree	6.5	6
Gender	Female	37.1	37.3
	Male	62.9	62.7
Employment	Employed	53.8	50.7
	Unemployed	46.2	49.3
Drugs	Marijuana	34.2	33.7
	Methamphetamine	30.6	32
	Opiates	14.3	14.4
	Others	20.8	20
Suicide	No	83.6	81.9
	Yes	16.4	18.1
Marital status	With partner	27	26.2
	Without partner	73	73.8
Transportation	No	10.7	12.8
	Yes	89.3	87.2

Logistic regression analysis

To account for potential clustering effect (i.e., participants nested in drug courts), a marginal GEE-type model was used to

examine whether the odds of graduation from drug courts was associated with participant characteristics that existed prior to drug court involvement. PROC GLIMMIX in SAS was used for estimation purpose. In addition to the set of participant

characteristics, drug courts were grouped into rural versus urban, depending on whether the areas they served were classified as rural or urban using the criteria provided by [19]. All independent variables plus graduation status, the dependent variable, were included in the imputation models to generate 80 imputed data sets. Analysis was performed in each of 80 imputed data sets. Regression coefficients and their standard errors were pooled over 80 imputed data sets using Rubin's (1987) rules. PROC MIANALYZE in SAS was used for this purpose. Drugs of choice had the largest Fraction Missing Information (FMI) which was 0.679. Using von Hippel's (2018) formula, the standard error estimate would change by 5% if the data were imputed again.

Time-to-event analysis

For the analysis of recidivism, 1060 individuals who graduated between 2018 and 2019 were followed up and their recidivism was recorded. For the current study, the observation period was from graduation date to September 15th, 2020. For participants who had recorded offense(s) within the observation period, their time-to-recidivism (months from graduation to first offense) was computed. For participants who had no recorded offense within the observation period, their time-to-recidivism was equal to the duration between graduation to September 15th, 2020 (i.e. censored time). Out of 1060 participants, 149 had recorded recidivism within the observation period. More specifically, 52 participants had recorded recidivism within 6 months after graduation; 103 within 12 months; 129 within 18 months; and 144 within 24 months. The shortest uncensored time-to-recidivism was less than 1 month, and longest was 29 months. Out of 1060 participants, 911 did not have recorded recidivism within the observation period. The shortest censored time-to-recidivism was 8 months, longest 32 months.

A separate multiple imputation was carried out. All independent variables plus the time-to-event variable transformed using the cumulative survivor function (White and Royston, 2009) and the censoring indicator were included in the imputation models to generate 80 imputed data sets. Cox regression with robust covariance matrix was performed in each imputed data set. PROC PHREG in SAS was used for estimation purpose. Regression coefficients and their standard errors were pooled over 80 imputed data sets using Rubin's rules. Drugs of choice had the largest FMI which was 0.629. Using von Hippel's formula, the standard error estimate would change by 5% if the data were imputed again.

Results

Preliminary Analysis

In preliminary analyses, we examined associations among the predictors using available-case data, using marginal models for clustered data. Participants in areas with urban drug courts were significantly more likely to have higher education

($p=.008$) but less likely to live with a partner ($p=.009$) and to use marijuana ($p<.001$) or methamphetamine ($p=.017$) than other drugs. African American participants were more likely to be male ($p<.001$) and to use marijuana rather than other drugs, but less likely to use methamphetamine ($p<.001$) or opiates ($p<.001$) rather than other drugs, to have suicidal intent ($p=.022$), and to have a valid driver's license ($p<.001$); however, African American and Caucasian participants did not significantly vary in education, employment status, marital status, child custody or in transportation. Male participants tended to have lower education than female participants ($p=.001$), were less likely to have suicidal intent ($p<.001$) and to have children in their custody ($p=.001$), but more likely to be employed ($p<.001$) and to use marijuana rather than other drugs ($p=.003$).

Compared to those with less than high school, participants with a high school diploma, some college, or a college degree or higher were more likely have a driver's license ($p<.010$) and to use marijuana rather than other drugs ($p<.050$). Participants with a high school diploma or with a college degree or higher ($p<.02$) were more likely than those with less than high school to be employed. Participants with a high school diploma were less likely than those with less than high school to have suicidal intent ($p=.031$) and to live with a partner ($p=.037$).

Participants who were employed were less likely to have suicidal intent ($p=.010$) but were more likely to have transportation ($p<.001$), to have a driver's license ($p<.001$), and to use marijuana ($p=.024$) or opiates ($p=.023$) rather than other drugs. Participants who reported having suicidal intent were less likely to use opiates rather than other drugs ($p=.035$), and to have transportation ($p=.002$). Participants who lived with a partner were more likely to have children in their custody ($p<.001$), and to have transportation ($p=.007$). Participants who had a valid driver's license were more likely to have transportation, ($p<.001$), and to use marijuana ($p<.001$) or opiates ($p=.002$) rather than other drugs.

African American participants on average were younger than Caucasians ($p<.001$). Older participants were more likely to live with a partner ($p=.002$), but less likely to use marijuana rather than other drugs ($p=.016$), (reference=none). The mean age of the sample was 35.2 years, and for illustrative purposes when describing age effects, younger participants were in a relatively young adult range, and older participants were in an early to late middle age range.

Logistic regression analysis

Table 3 reported estimation results for the analysis on graduation from drug courts. The odds of graduation were higher among Caucasian than African American participants (OR =1.48, $p=.021$). Females were more likely to graduate than males (OR =1.69, $p<.001$). Participants who were employed had higher

odds of graduation than the unemployed (OR =1.98, p <.001). Participants who lived with a partner were more likely to graduate than those who lived without a partner (OR=1.78, p<.001). Higher education significantly heightened the odds of graduation. More specifically, participants with either a HS diploma (OR =1.36, p =.006) or some college (OR =1.65 , p =.002) or a college degree (OR =1.78 , p =.024) were more likely to graduate than those who did not finish HS education. There was no significant difference between college degree grads vs. some college, college degree grads vs. HS diploma, or some college vs. HS diploma. Compared

to those who reported using marijuana, the odds of graduation for methamphetamine users was about 62% as large (OR =.62, p=.047). There was no difference between opiates or other drugs vs. marijuana. Participants who reported having suicide ideation had lower odds of graduation (OR=.72, p=.047). Older participants were more likely to graduate. Each additional year of age increased the odds of graduation by 2% (OR =1.02, p <.001). Having a current valid driver’s license was associated with higher odds of graduation from drug court (OR =1.91, p <.001).

Table 3: Logistic regression for graduation from drug courts.

Variable	β	p-value	OR	95% CI
Race (Caucasian vs. African American)	0.393	0.021	1.48	[1.06, 2.07]
Education (HS grads vs. < HS)	0.308	0.006	1.36	[1.09, 1.69]
Education (some college vs. < HS)	0.502	0.002	1.65	[1.21, 2.26]
Education (college grads vs. < HS)	0.577	0.024	1.78	[1.08, 2.93]
Gender (female vs. male)	0.523	<.001	1.69	[1.34, 2.13]
Employment (employed vs. unemployed)	0.681	<.001	1.98	[1.45, 2.69]
Drugs (meth vs. marijuana)	-0.476	0.047	0.62	[.39, .99]
Drugs (opiates vs. marijuana)	-0.386	0.1	0.68	[.43, 1.08]
Drugs (others vs. marijuana)	0.008	0.968	1.01	[.68, 1.49]
Suicide (yes vs. no)	-0.326	0.047	0.72	[.52, .99]
Marital status (with vs. w/o a partner)	0.578	<.001	1.78	[1.33, 2.40]
Transportation (yes vs. no)	0.165	0.428	1.18	[.78, 1.78]
Child in custody (yes vs. no)	0.179	0.327	1.2	[.84, 1.71]
Age	0.02	<.001	1.02	[1.01, 1.03]
Urban (urban vs. rural)	0.247	0.222	1.28	[.86, 1.90]
Driver’s license (yes vs. no)	0.649	<.001	1.91	[1.44, 2.54]

Time-to-event analysis

Figure 1 presents the Kaplan-Meier survival curve for recidivism for participants following their graduation from drug court. The probability of no recidivism beyond 6 months after graduation was 95.1%, beyond 12 months 90%, beyond 18 months 86.8%, and beyond 24 months 83.6%. Table 4 reports results from Cox regression for recidivism. Having a current valid driver’s license (prior to drug court admission) was associated with lower hazard of recidivism (HR =.50, p =.003). Older participants had lower hazard of recidivism. Each additional year of age reduced the hazard of recidivism by 3% (HR =.97, p =.023).

Discussion

The results of this study, using regression analyses with data from a large number of state-wide drug courts, indicate that adult drug court outcomes vary for different participants across a number of characteristics of the individuals. 52.1% percent

of the 3062 participants who were initially enrolled in 34 adult drug courts successfully completed the program and graduated between 2018-2020. This rate of graduation was within the range typically seen for drug courts [9], and suggests that these drug courts were able to engage the bulk of their participants. Whether participants graduated or not from drug court varied by a wide range of characteristics, including the participants’ sex, race, age, employment status, education level, presence of an adult partner, possession of a driver’s license, a history of suicidal behaviors, and initial drug-of-choice. Although employment status and participant sex emerged as slightly more important predictors, according to odds ratios, the odds ratios of the significant predictors were notably all within a similar range. The unique explanatory power of each of these variables to predict this major outcome was remarkable, given the potential association between the predictors, and indicates that it can be important to consider all of these characteristics to predict initial enrollees’ likelihood of graduation. Of the set of variables examined in this study,

only having a child in custody, having transportation, and being from urban versus rural drug court settings were not predictive of graduation. Of those individuals who graduated, 14.1% had another criminal conviction within the observation period between graduation and September 15th, 2020. Fewer participant

characteristics predicted likelihood of recidivism among those who graduated, in comparison to prediction of graduation, and these characteristics were participants' age, and possession of a driver's license.

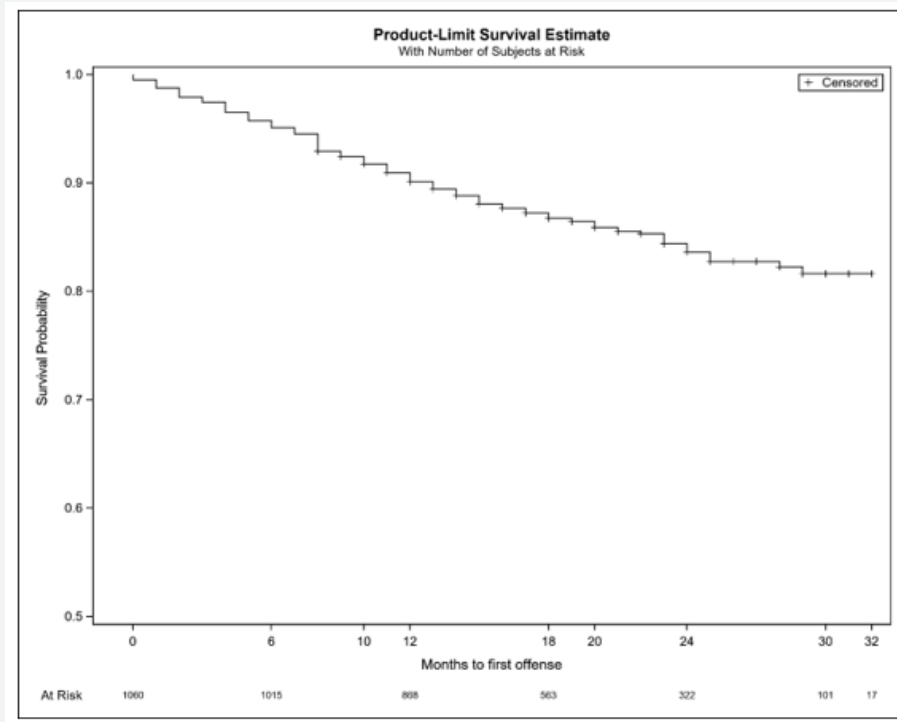


Figure 1: Kaplan-Meier survival curve for recidivism.

Table 4: Cox regression for recidivism.

Variable	β	p-value	HR	95% CI
Race (Caucasian vs. African American)	-0.158	0.606	0.85	[.47, 1.56]
Education (HS grads vs. < HS)	-0.037	0.897	0.96	[.55, 1.69]
Education (some college vs. < HS)	-0.19	0.544	0.83	[.45, 1.53]
Education (college grads vs. < HS)	-0.399	0.443	0.67	[.24, 1.86]
Gender (female vs. male)	-0.476	0.084	0.62	[.36, 1.07]
Employment (employed vs. unemployed)	-0.29	0.25	0.75	[.46, 1.23]
Drugs (meth vs. marijuana)	0.361	0.353	1.43	[.67, 3.08]
Drugs (opiates vs. marijuana)	0.071	0.86	1.07	[.49, 2.37]
Drugs (others vs. marijuana)	0.487	0.227	1.63	[.74, 3.60]
Suicide (yes vs. no)	-0.378	0.292	0.69	[.34, 1.38]
Marital status (with vs. w/o a partner)	0.249	0.322	1.28	[.78, 2.10]
Transportation (yes vs. no)	0.388	0.412	1.47	[.58, 3.73]
Child in custody (yes vs. no)	0.065	0.83	1.07	[.59, 1.93]
Age	-0.027	0.023	0.97	[.95, .99]
Urban (urban vs. rural)	0.181	0.238	1.2	[.89, 1.62]
Driver's license (yes vs. no)	-0.693	0.003	0.5	[.32, .78]

Prediction of Graduation from Drug Court

In terms of basic demographic characteristics, participants who were older, were female, and were Caucasian, were more likely to complete the program. Older participants may have more stable lifestyles, may have begun to “grow out” of their drug use, and may be more likely to intently follow treatment regimens, while younger participants, with earlier drug use, may have more intractable and severe addictions [23,18,]. Younger participants may also have had fewer resources (e.g. savings, stable housing, access to transportation) which may have limited their abilities to profit from the drug court services. Consistent with some prior findings [4], females were also more likely to graduate. Females have been found to have higher motivation than males to seek treatment for substance use disorder (Webster et al., 2006), and thus they may be more engaged with the drug court treatment requirements and to be more likely to successfully complete those requirements. Females’ enhanced motivation for treatment may be facilitated by other goals, such as avoiding loss of custody of their children. Race of participants also predicted drug court graduation, as has been noted in some drug court evaluations in the past, with lower graduation rates for African American participants [24,25]. Although it has been suggested that race may be predictive of graduation because of its association with other variables such as drug of choice, employment or education [25], many of those were controlled in this regression analysis, and thus race’s effect was unique. However, the effect of race may have been due to other unmeasured mediating factors such as limited social supports and low socioeconomic status which have been found to account for race effects on graduation [25] or the limited ability of local treatment providers to successfully engage African American clients.

The regression analysis indicates that participants who began drug court with primary use of methamphetamine or opiates, rather than marijuana, were less likely to graduate from drug court. Thus, participants who presented with primary problems with marijuana were more likely to engage with appropriate assigned treatment services and to comply with drug court requirements. These findings are largely consistent with earlier findings that certain forms of drug-of-choice such as opiates and heroin had predicted poorer graduation than other drugs-of-choice such as marijuana [26].

Several characteristics that were related to participants’ psychological distress, family environment, and access to employment and services emerged as significant predictors of drug court graduation rates. Participants who did not have histories of suicidal behaviors were more likely to graduate. Presumably having a history of suicidal behaviors is an indicator of more psychological distress and of the need for more complex treatment plans. Educational attainment did predict graduation, as long as participants had at least graduated from high school.

Similar levels of advantages were apparent for achieving graduation whether the participant had completed high school, had some college experience, or had a college degree. Individuals with at least high school education have been found to be more likely to respond to, and complete, substance abuse treatment [27], and would be more likely to have the cognitive skills and ability to focus attention necessary for cognitive-behavioral interventions [28]. Participants who had been employed at the time of entry into drug court are also likely to graduate from drug courts, and the importance of employment history replicated some prior drug court research [14,15]. Presumably, participants with an active job are likely to have more financial resources to assist with their access to prescribed treatments, and to have more to lose from new drug problems and drug charges, and hence may be particularly motivated to complete drug court requirements. Participants’ higher education levels and ability to independently transport themselves by having driver’s licenses may also have been useful in facilitating a good work history, although it is notable that each of these predictors independently predict graduation on their own because they had been entered into one regression analysis.

Characteristics of the participants’ family environments also emerged as predictors of drug court graduation. Participants who were either married or living with a partner were more likely to complete program requirements. Having the social support and social encouragement of family members can be pivotal in motivating participants to change addictive behavior patterns and to be compliant with treatment and court procedures [26]. Participants who lived in rural settings were less as likely to graduate from drug court as participants from urban drug courts. Thus, despite likely variation in resources between urban and rural settings, the wide range of participants’ personal, employment, and social characteristics identified as predictors of graduation operate in similar ways in urban and rural settings.

Prediction of Recidivism of Graduates of Drug Court

The probability of recidivism of participants who had graduated from drug courts gradually increased from 4.9% within the first six months after graduation, to 10% within 12 months, to 13.2% within 18 months, and to 16.4% within 24 months. The rate of recurrence in criminal activity compares favorably with reports from other drug courts and is about half the rate noted in a meta-analysis of drug court studies [12]. Thus, five out of six participants were maintaining positive, non-criminal behavior for a lengthy period after their involvement with drug court, indicating that the self-monitoring and self-structuring initiated during their drug court experience appeared to have become internalized and maintained.

Despite the overall low rate of recidivism, a subset of the participant characteristics that predicted graduation also predicted whether the graduated participant could avoid

recidivism after completion of the drug court program. Likely for similar reasons that may account for older participants being more successful with graduating, graduates who were older were less likely to recidivate through the years following graduation. The results concerning the predictive utility of participant age extended, through our longer follow-up period, prior findings of predictors of six-month recidivism [16,13]. Initial possession of driver's licenses was also found to predict recidivism. Graduates who had driver's licenses may have been better able to seek and maintain employment, as well as continue treatment services. While race, education level, participant sex, employment, having a history of suicidal behavior, and having a partner predicted graduation, they did not predict recidivism. Especially notable is that, among drug court graduates who by definition have received appropriate treatment and case management services, African Americans do not recidivate at a higher rate than white participants. It was also notable that the rural/urban nature of court did not predict recidivism.

Research Strengths and Limitations and Future Directions

The current study has a large sample from an unusually large number of drug courts, with the advantages that the results were not due to idiosyncratic procedures from a single drug court. This issue of studies using only one or a few drug courts may have led to the wide inconsistencies in the literature about prediction of drug court outcomes. However, drug courts from other states, even though following the same national guidelines for drug courts, may have more variability in their implementation of the drug court model, and this could be a limitation that could still affect the generalization of the current results to some degree. A second limitation is that MIDAS data were not available for all of the participants from the drug courts involved, leading to the need to use imputed datasets. Although this does not suggest systematic bias based on availability of data used in the current study, it is a limitation. Third, future research should examine how programmatic factors [29,30], including various courts' abilities to follow Drug Court practice guidelines, could interact with individual participant characteristics to predict participant outcomes.

Implications for Drug Court Practice

Most importantly, even though some of these predictors likely co-vary, the regression results suggest that they still uniquely predict graduation, even when all are included in the analysis together. Each of the predictors of drug court graduation discussed here were found to be uniquely important. Based on these results, drug court teams can anticipate that certain new participants with specific at-risk characteristics (male, younger, non-white, not employed, not a high school graduate, not married, primarily abusing opiates and methamphetamines rather than marijuana),

have a higher risk of not graduating and of recidivating, and thus require additional planning for effective services and for ability to access them. It is plausible that participants with multiple of these risk factors are more at risk and would suggest that drug courts could consider number as well as type of risk predictor when the tailoring drug court treatment and training plan. It is anticipated that drug courts could especially focus on the more malleable of these risk predictors and assist at-risk participants to get a GED (if they have not graduated from high school), receive job training skills, obtain employment [14], and obtain a driver's license so they can access treatment services and work sites.

Acknowledgement

This paper was prepared with support from a grant from the United States Department of Justice (2018-DC-BX-0032) awarded to the Administrative Office of Courts.

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DOI: [10.19080/GJARM.2023.07.555707](https://doi.org/10.19080/GJARM.2023.07.555707)

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