THE EFFECTS OF DRUG TREATMENT AND SUPERVISION ON TIME TO REARREST AMONG DRUG TREATMENT COURT PARTICIPANTS

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Past research has generally shown that drug courts are reaching their target offenders and that program participants are rearrested at a lower or equivalent rate than comparison offenders. Few analyses have been conducted to test the relative effects of different drug court elements, however. The current research takes a closer look at the two main components of the drug court, supervision and treatment, to determine whether one is more effective at preventing failure, or whether the combination of both is necessary to observe a decreased risk of failure. Attending treatment significantly decreased the risk of failure over a two-year follow-up period, while receiving supervision did not. Offenders who received both supervision and treatment had the longest survival times, but not significantly longer than those who received treatment only. Implications for drug courts in general are discussed, as well as avenues for future research in this field.

INTRODUCTION

Rehabilitation has received waves of support throughout modern history. Each wave was followed by a backlash, overcrowded prisons, and then renewed support. The latter part of the twentieth century in particular reflects this cycle. The rehabilitative ideal lost favor in the mid to late 1970s, largely due to the famous

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"nothing works" conclusion reached by a meta-analysis of correctional treatment programs (Martinson, 1974). The next several years saw a return to deterrence- and just desserts-based punishment. This shift in punishment focus, coupled with the War on Drugs in the 1980s, led to vast changes at all stages of the criminal justice system. Increases in drug arrest, conviction, and incarceration rates led to a court system clogged with drug-involved offenders and a skyrocketing prison population (Belenko, 1998; Bureau of Justice Statistics, 1993; Bureau of Justice Statistics, 1999; Hart & Reaves, 1999).

Penalties such as mandatory minimums, intensive supervision, and court-imposed special conditions all designed to get tough on crime, however, do not address the underlying addiction problem. Drug prices fell in the 1980s as the penalties for drug crimes increased (Reuter & Kleiman, 1986), and drug use levels in general peaked years before the stiffer penalties were implemented (Bureau of Justice Statistics, 1993). Drug offenders also seem to be the most likely recidivists (Belenko, 1998), and represent the greatest threat of failure on probation and parole (Lipton, 1996). If stiffer penalties alone cannot reduce drug crimes, perhaps coupling them with drug treatment will. The drug court is one correctional intervention that combines deterrence-based penalties with rehabilitation by relying on two main components: supervision and treatment. One of the goals of the drug court is to provide a comprehensive rehabilitation program that not only targets addiction, but also promotes prosocial behavior and successful reentry into the community. Supervision, on the other hand, provides the offender with an incentive to remain in treatment, through deferred prosecution and/or deferred sentencing, coupled with sanctions for noncompliance. The drug court seeks to achieve greater coordination between those two components – the justice system and the treatment providers – while also increasing the accountability of the offender. This evaluation takes a closer look at the treatment and supervision components of the drug court model to determine the effect of receiving one or both of those components on time to rearrest among a sample of drug court participants.

PRIOR STUDIES

The drug court seeks to prevent recidivism and drug use through a combination of intensive supervision and treatment, including drug testing and judicial monitoring with graduated sanctions. The current research focuses on the intensive supervision and drug treatment components of the drug court program.

INTENSIVE SUPERVISION PROGRAMS

Intensive supervision programs (ISPs) generally emphasize reduced caseloads, close surveillance, urinalysis testing, treatment, and employment, but they are

distinguished by their increased contact between the offender and his/her probation officer. Early ISP evaluations concluded that increased contact with a probation officer did not have an impact on recidivism rates, but did result in higher technical violations, and were also likely to result in net-widening (Carter, Robinson, & Wilkins, 1967; Banks, Porter, Rardin, Silver, & Unger, 1977). Despite these discouraging findings, intensive supervision was widely adopted in most states in the 1980s and 1990s. The more recent ISP evaluations have reached similar conclusions (Petersilia & Turner, 1991, 1993; Petersilia, Turner, & Deschenes, 1992). In general, ISP participants have comparable recidivism rates and higher rates of technical violations. ISP may therefore be a viable alternative to prison but runs the risk of net-widening unless it successfully captures prison-bound offenders.

DRUG TREATMENT

Evaluations of drug treatment programs have reached more positive conclusions but generally suffer from methodological problems, most notably self-selection into treatment. Meta-analyses published in the 1980s often refuted the "nothing works" conclusion (Martinson, 1974) and instead supported the notion that certain treatment programs "work" with certain types of offenders (e.g., Garrett, 1985; Gendreau & Ross, 1987; Whitehead & Lab, 1989; Andrews, Zinger, Hoge, Bonta, Gendreau & Cullen, 1990; Logan & Gaes, 1993; Lipsey, 1992). Mieczkowski et al. (1992) found that, to varying degrees, all the major forms of drug treatment have been shown to reduce drug use, criminal behavior, and other antisocial behavior. Positive treatment results did not depend on how a person entered treatment, but instead on how long they remained in treatment (Wish & Johnson, 1986; Anglin & Hser, 1990; MacKenzie, 1997; Hser, Grella, Chou, & Anglin, 1998). Not only was an increased time in treatment an important predictor of success, but studies also found that there may be some minimum threshold necessary, likely three months, to observe positive results. However, most studies also found that many clients dropped out of treatment long before reaching this minimum threshold (Hubbard, Craddock, Flynn, Anderson, & Etheridge, 1997; Hser et al., 1998; Simpson, Joe, & Brown, 1997).

In her review of the drug treatment literature, Taxman (1999) concluded that effective treatment programs benefited by using the leverage of the criminal justice system to retain offenders. Studies examining the effect of court-ordered treatment often used treatment retention as the outcome variable and found that legally coerced clients remained in treatment longer (Rosenberg & Liftik, 1976; Schnoll, Goldstein, Antes, & Rinella, 1980; Collins & Allison, 1983). There is no convincing evidence that increased time in treatment will translate into treatment success; however, due to the potential for selection bias among persons who do remain in treatment. Evaluations that used relapse or recidivism as outcome variables found that clients

who were legally coerced into treatment had no better outcomes than clients who entered voluntarily (Anglin, Brecht, & Maddahian, 1989; Brecht & Anglin, 1993; McLellan & Druley, 1977; Simpson & Friend, 1988). One study that did find positive recidivism results concluded that legal coercion translated into post-treatment success (as measured through drug use frequency, arrest during and after treatment, drug abstinence, and time worked on the job) only in certain instances (Salmon & Salmon, 1983).

DRUG COURTS

A 1997 report of "What Works" in corrections concluded that drug courts that combine both rehabilitation and criminal justice control, and drug treatment combined with urine testing, both "worked" to reduce recidivism (MacKenzie, 1997). The report further found that research has not revealed a significant relationship between increased surveillance and recidivism and that there was some evidence that increased treatment of offenders in ISP may be related to significant reductions in recidivism. This treatment plus supervision hypothesis has not been rigorously evaluated, however.

The drug court combines the supervisory and rehabilitative elements into one model, but few drug court evaluations have studied the effectiveness of these individual components against one another. Instead, most studies have examined the overall effect of the drug court, or the cumulative effect of all drug court components. In general, the drug court has been found to be at least as effective as more traditional options. A few studies found no difference between the drug court and control samples (Granfield, Eby, & Brewster, 1998; Peters & Murrin, 1998; Truitt, Rhodes, Seeherman, Carrigan, & Finn, 2000). Most, however, found that drug court participants had significantly lower rearrest rates than comparison samples (Goldkamp & Weiland, 1993; Roberts-Gray, 1994; Sechrest, Shichor, Artist, Briceno, 1998; Gottfredson, Coblentz, & Harmon, 1997; Finigan, 1998; Truitt et al., 2000; Gottfredson, Najaka, & Kearley, 2003; Gottfredson & Exum, 2002). These general findings persisted across studies of varying methodological rigor, and through use of a variety of statistical techniques.

Like the treatment literature, however, the drug court literature has several shortcomings. The General Accounting Office (1998) pointed out that important data is missing in this body of literature, including information on program participants after they leave the drug court and on comparison sample activities. Other common problems that can hinder any conclusions about the effectiveness of the drug court include evaluating a program in its startup phase (Gottfredson et al., 1997; Peters & Murrin, 1998), and a small sample size (Roberts-Gray, 1994; Anspach & Ferguson, 1999). Many studies have a follow-up period that mostly or wholly overlaps with

the treatment program and so provide no information on the long-term effects of the drug court (Gottfredson et al., 1997; Anspach & Ferguson, 1999; Deschenes, Turner, & Greenwood, 1995). Some evaluations have utilized an experimental sample that includes only program graduates or successes (Anspach & Ferguson, 1999; Peters & Murrin, 1998) or have given an inadequate accounting of the comparison sample experience (Anspach & Ferguson, 1999). Failure to control for time at risk also clouds some evaluation findings (Finigan, 1998; Anspach & Ferguson, 1999). Finally, drug court evaluations tend to focus on the treatment component of the program and do not give equal attention to the supervisory component (e.g., Sechrest et al., 1998).

Only two studies have specifically evaluated the impact of the various drug court components against each other. Deschenes et al. (1995) compared offenders who were randomly assigned to either the drug court or to one of three samples with varying levels of drug testing coupled with supervision. Drug court participants were more involved in treatment and counseling during the one-year follow-up period, but less involved in other constructive activities, such as employment, mandatory community service, payments of fines and restitution, and formal education training. The drug court was therefore less successful at offender reintegration into the community compared to regular probation. There was no difference in rearrest rates between the drug court and the comparison samples (which had no treatment component). The drug court did produce fewer offenders who were incarcerated after their initial arrest, however.

Harrell, Cavanagh, and Roman (1998) evaluated the Washington, D.C. pretrial drug court by comparing offenders who were randomly assigned to receive either drug treatment, drug testing, and judicial monitoring (the drug court); drug testing with graduated sanctions and judicial monitoring; or drug testing and judicial monitoring only. There were a large number of offenders who refused study participation, especially among those assigned to the drug court with its more stringent pretrial requirements. The defendants on both the drug court docket and on the docket that included graduated sanctions were significantly less likely to test negative for drugs in the month before sentencing compared with offenders who were not subjected to the sanctions for noncompliance. Therefore, the graduated sanctions element of the drug court program may be as effective with pretrial releasees, regardless of whether or not it is coupled with drug treatment.

The evidence on intensive supervision, drug treatment, and the combination of both in the drug court is still emerging. Intensive supervision programs are unlikely to reduce recidivism beyond regular probation and may result in net-widening rather than diversion. Treatment programs appear to be successful, especially when combined with legal coercion, but methodological issues make this general finding

far from conclusive. Drug court evaluations show that drug court participants are at least as successful as offenders in more traditional correctional alternatives. The few studies that have specifically examined the effectiveness of the drug court components against each other have found that drug treatment adds little, if anything, to the drug court model. These studies found that the supervisory components (drug testing and graduated sanctions) alone were sufficient to observe a reduction in recidivism or pretrial misbehavior.

The current study examines which drug court component, or combination of components, is most effective at increasing time to failure. The evaluation is a continuation of a previous study that examined the effect of participation in drug court on time to failure, compared to a randomly assigned control sample (Banks & Gottfredson, 2002). That study found that the drug court sample had a significantly lower risk of failure than the control sample. The current evaluation takes a closer look at the drug court sample in an effort to determine what drug court component (or combination of components) predicted that lower risk of failure.

METHODS

The experimental drug court was established in 1994 in an effort to reduce the number of drug-related crimes in the city. Defendants originating from both the circuit (felony) and district (misdemeanor) courts were eligible for the drug court program if they showed evidence of recent or past substance abuse and did not have a violent criminal history. All eligible drug court clients were screened for program suitability and were accepted by the drug court if they did not pose a high recidivism risk and showed a need for treatment. Final approval for admission rested with the drug court judge, who agreed to comply with the random assignment of all eligible drug court defendants. Once assigned to the drug court, offenders were then assigned to one of two tracks depending on their prior criminal history. Diversion track cases had their charges dropped upon successful completion of the program, while probation track cases plea-bargained to receive no more jail time upon successful program completion. The diversion track was discontinued midway through the study period, however, due to problems tracking the activities of those offenders.

The drug court program combined intensive supervision, judicial monitoring, and frequent drug testing to monitor each client during and after a period of drug treatment. Successful participants could complete the drug court program in as little as a year, but most remained in the program for about two years. The drug treatment programs employed a variety of approaches, including intensive outpatient care, methadone maintenance, inpatient facilities, and transitional housing. Drug court participants were initially required to attend status hearings once every two weeks. They were

also required to have at least three face-to-face contacts with their probation agent or diversion supervisor each month – although probation officers generally met with their clients on a more frequent basis (often twice a week). A positive urinalysis or failure to comply with other program requirements could result in a variety of sanctions, such as increased court reporting, temporary incarceration, or community service. In extreme cases of noncompliance, the judge could reimpose the originally suspended incarceration sentence, which was nearly always stricter than what might have been imposed under traditional case processing situations (Gottfredson & Exum, 2002).

An earlier evaluation of the drug court found that some components of the program were being implemented as planned, while others were not (Gottfredson et al., 2003). That original study followed 235 offenders who were randomly assigned to the drug court or control sample for two years. As expected, drug court participants were less likely to be sentenced to incarceration time following case disposition once suspended and credited days were taken into account. Drug court clients were significantly more likely to participate in drug treatment and to attend status hearings. A similar percentage of drug court and control samples underwent a period of probationary supervision. Participation in the various drug court components was not as high as hoped within the drug court sample, however. In the two-year follow-up period, only 52% of the drug court sample attended at least 10 consecutive days of a certified drug treatment program, compared to 22% of the control sample. Although drug court participants were more likely to receive judicial monitoring, some (16%) did not attend any status hearings at all. Of those who did attend at least one hearing, the average number attended was 11. About three fourths of both drug court and control samples were supervised on probation during the follow-up period, although the drug court sample was more likely to receive a period of intensive supervision.

DATA AND MEASURES

The original evaluation of the drug treatment court randomly assigned offenders to drug court and control samples and found that the drug court sample had a significantly lower risk of failure during the two-year follow-up period (Banks & Gottfredson, 2002). In an effort to determine why the drug court sample was more successful at avoiding rearrest, the current study evaluates the risk of failure for the drug court sample only. The control sample from the original evaluation is used for descriptive purposes with some analyses to show how the drug court participants might have behaved if the drug court had not been an option for them. The randomization process created a sample of 139 drug court participants, which were assigned to either the diversion (N = 52) or probation track (N = 87), depending on

their prior criminal history. Randomization was halted periodically during the study period, but the study sample did not did not differ significantly in terms of race, gender, or age from cases who were not randomly assigned (and therefore excluded from the study) during the study period (Gottfredson & Exum, 2002). The sample therefore appears to reflect the larger population of drug court clients in the Baltimore City Drug Treatment Court.

This research evaluated the effectiveness of two drug court components: a multi-phasal drug treatment program and supervision through the Maryland Division of Parole and Probation. Information on the content of status hearings, the timing of intensive supervision, and the results of drug tests was missing for a substantial portion of the sample, so no analyses could be conducted on these drug court components. Whether or not drug court sample members received supervision and/or attended treatment while at risk for failure were used to predict time until failure using survival analysis.

Time at risk for failure began on the randomization date for all drug court clients and ended two years later for those offenders who survived (were not rearrested) throughout the follow-up period. For those who failed, the time at risk ended on the date of the first rearrest after randomization. Time at risk was further adjusted for any incarceration time occurring between the start (randomization) and end (failure date or two years hence) dates. Incarceration data was compiled from the department of corrections, jail, and district and circuit court records. The incarceration start and end dates were then checked against arrest, drug treatment, and supervision records. One sample member was incarcerated for the entire follow-up period and so was excluded from all analyses because s/he was not at risk for failure during the study period (resulting N = 138).

The independent variables were defined by the drug court components received while at risk for failure. Whether or not an offender received any supervision and whether s/he received any treatment lasting at least 10 days were each used to predict time to failure. Each independent variable is binary and reflects whether or not the drug court participant received a particular component (that is, they are not mutually exclusive). Supervision start and end dates were collected from the Maryland Division of Parole and Probation. If any period of supervision occurred while the offender was at risk for failure, s/he was considered to be supervised. That supervision may therefore be the result of the initial arrest, or simply have occurred during the time when the drug court supervision was expected. Some supervision periods were not able to be linked to a specific arrest or case, but had valid start and end dates which occurred during the follow-up period. These supervision periods were therefore included in these analyses. However, most supervision periods were able to be linked to the initial arrest, so all of the survival

analyses were calculated based on both definitions of supervision: any supervision while at risk for failure, and initial arrest supervision while at risk only. Both sets of analyses resulted in similar findings, so only those based on the broader definition of supervision are reported below. Sixty-two percent of the sample received supervision while at risk for failure.

Treatment start and end dates were collected from an agency that monitors and maintains records on all drug treatment vendors who receive city funds. Treatment programs included outpatient, intensive outpatient, methadone maintenance, detoxification, residential, correctional, and some acupuncture programs. Again, if the treatment period occurred while the offender was at risk for failure, s/he was considered treated. The definition of treated further excluded any individuals who spent less than 10 consecutive days in treatment. Ten days was set as the minimum treatment exposure time so that the treatment program could have a chance to affect sample members. Furthermore, treatment end dates were generally recorded slightly later than the "actual" end date when individuals dropped out of a treatment program. In other words, the end date was not the last time a dropout actually attended, but the last time they were *expected* to attend (or the point at which the treatment staff "gave up" on them). Therefore, individuals who spent less than 10 days in treatment most likely attended treatment only once and then never returned. Thirty-six percent of the sample received at least 10 days of treatment while at risk for failure.

The research design introduced the possibility of selection bias. The sample members were expected to receive all drug court components, but inevitably self-selected themselves into compliant and noncompliant groups. Therefore, it is entirely likely that some preexisting characteristic drove study outcomes rather than, or in addition to, the independent variables of interest. Though many potentially confounding variables were identified in the current study, only a few measures contained reliable data for the majority of the study sample. Independent variable sample groups were compared on demographic, prior criminal history, and initial arrest characteristics. Any variables that were significantly different across independent variable sample groups were controlled to reduce the possibility of selection bias in all relevant outcome analyses. Sample members who received supervision while at risk for failure were significantly more likely to originate in the circuit court, to be African-American, and to be initially charged with a drug crime compared to individuals who were not supervised (Tables 1 and 2). When comparing treatment groups, sample members who received treatment were significantly more likely to originate in the circuit court and to be arrested for a drug crime compared to those who received no treatment while at risk for failure (Tables 3 and 4).

Introducing a propensity score as a control variable in the main analysis can also reduce the risk of selection bias by exposing any relationships between confounding variables and the independent and dependent variables. A propensity score approach uses several background covariates, such as employment and having children, to predict compliance with the drug court program. These covariates may introduce selection bias into the model by influencing both compliance with the drug court program and the time until failure. Once identified, the variables are entered into a logit model to predict whether or not an individual complied with the various components (i.e., treatment, supervision, or both). The predicted probability of drug court compliance resulting from the logit model is the propensity score, or the probability of program compliance conditional on the individual's covariate values. The propensity score was used with only a subset of the sample – those assigned to the probation track – because of the amount of missing data for diversion track offenders. The only background characteristics that were available for the entire sample – age, race, age, and prior criminal history – were not very useful in predicting compliance with drug court requirements. Therefore, efforts to reduce selection bias using the propensity score approach were only run with the drug court participants assigned to the probation track.

ANALYSES

The effect of each drug court component on time until failure was evaluated through survival analysis, which examines the relationship among offender characteristics, intervention type, offense-related variables, and time until failure. Knowing the time until failure allows one to predict the rate of recidivism for any particular period after release, not just for the follow-up period found in the data used to estimate the survival model. Static models are insufficient because they assume that a failure on the first day of release from the drug court or prison is the same as a failure on the last day of the observation period. It is more likely, though, that those who fail at the beginning of the follow-up period have very different characteristics than those who remain arrest-free for much longer. Survival analysis is very useful at uncovering this heterogeneity among offenders with respect to the risk of recidivism and identifying the factors associated with time to failure. Furthermore, survival analysis accommodates censored data, in which we do not observe the outcome of interest due to follow-up period end. For those who survive throughout the follow-up period, we have no way of knowing how long their survival time will be, or if they will fail at all. We can only say that they have survived as long as the study follow-up period. Survival functions, however, use maximum likelihood techniques that can differentiate between censored and uncensored cases and treat them appropriately.

TABLE 1
SAMPLE BACKGROUND AND INITIAL ARREST CHARACTERISTICS BY SUPERVISION

	Drug Court Sample (N = 138)				
	Supervision (N = 85)		No Supervision (N = 53)		Chi Square
	N	%	N	%	
Gender					2.768
Male	67	78.8%	35	66.0%	
Female	18	21.2%	18	34.0%	
Race/Ethnicity					5.682*
African-American	80	94.1%	43	81.1%	
Other	5	5.9%	10	18.9%	
Original Court					24.277*
District	38	44.7%	46	86.8%	
Circuit	47	55.3%	7	13.2%	
Most serious initial arrest charge					
Personal crime	0	0.0%	1	1.9%	1.615
Property crime	13	15.3%	11	20.8%	0.678
Drug crime	64	75.3%	31	58.5%	4.297*

* $p \leq 0.05$

TABLE 2
SAMPLE BACKGROUND AND INITIAL ARREST CHARACTERISTICS BY SUPERVISION

	Drug Court Sample (N = 138)						
	Supervision			No Supervision			
	Mean	N	SD	Mean	N	SD	*t* statistic
Age at randomization	36.404	85	7.516	34.049	53	7.272	-1.813
Number of prior arrests	13.020	85	9.430	10.420	53	7.642	-1.696
Number of prior convictions	5.720	85	4.561	4.510	51	3.657	-1.606

Survival analysis is especially well suited to evaluating samples with varying times at risk, as is often found when comparing groups who receive different correctional treatments. Survival analysis handles time at risk by subdividing the follow-up period into smaller observation points. At each of these points, the proportion of the sample that is at-risk for rearrest is used to estimate the probability of surviving beyond that point. Individuals are considered at-risk for rearrest at a

TABLE 3
SAMPLE BACKGROUND AND INITIAL ARREST CHARACTERISTICS BY TREATMENT

	Drug Court Sample (N = 138)				
	Treatment (N = 49)		No Treatment (N = 89)		Chi
	N	%	N	%	Square
Gender					0.008
Male	36	73.5%	66	74.2%	
Female	13	26.5%	23	25.8%	
Race/Ethnicity					1.767
African-American	46	93.9%	77	86.5%	
Other	3	6.1%	12	13.5%	
Original Court					8.137*
District	22	44.9%	62	69.7%	
Circuit	27	55.1%	27	30.3%	
Most serious initial arrest charge					
Personal crime	0	0.0%	1	1.1%	0.555
Property crime	6	12.2%	18	20.2%	1.401
Drug crime	40	81.6%	55	61.8%	5.796*

* $p \leq 0.05$

Table 2b: Sample background and initial arrest characteristics by treatment

TABLE 4
SAMPLE BACKGROUND AND INITIAL ARREST CHARACTERISTICS BY TREATMENT

	Drug Court Sample (N = 138)						
	Treatment			No Treatment			
	Mean	N	SD	Mean	N	SD	*t* statistic
Age at randomization	35.455	49	6.850	35.525	89	7.851	0.052
Number of prior arrests	11.630	49	8.187	12.240	89	9.232	0.382
Number of prior convictions	4.800	49	4.541	5.530	87	4.114	0.960

given point in time if they (1) are not incarcerated and (2) have not been rearrested (failed already). This method insures that only the characteristics of the population still at risk are used to estimate the time until failure, thereby providing a more accurate prediction of failure.

The current study utilized two methods of survival analysis. First, the time until failure was compared using life tables. Life tables evaluated the risk of failure in a particular month and the cumulative proportion of each group failing after each month to determine whether there was a significant difference in the time until failure between the drug court groups. Cox regression, the second method of survival analysis, took a closer look at the many factors that may contribute to time until failure, and controlled for potentially confounding variables (such as whether or not the drug court client originated in circuit or district court). The influence of each covariate was evaluated in terms of its effect on the hazard rate, or the risk of failure at a specific point in time, given that the individual had survived up until that point. Cox regression also allowed closer examination of the changing effects of the drug court components over time. The difference in hazard rates at various points in the follow-up period was examined to determine whether receipt of treatment and/or supervision had a more pronounced effect immediately following randomization, and/or a lasting effect throughout the follow-up period. Time-dependent covariates were then entered into the model. Whether an individual received a particular drug court component during the preceding month was evaluated to determine its effect on the risk of failure.

RESULTS

About one-third of the drug court sample survived throughout the two-year follow-up period. Table 5 describes the survival rates of the drug court sample based on whether or not they received supervision, treatment, or both while at risk for failure. Among those who were supervised, the survival rate was slightly higher than that of the entire sample (38% vs. 33%, respectively). Among those who received treatment, however, the survival rate was much higher: 59% of those who attended treatment survived, compared to only 19% of those who did not receive treatment. Individuals who received both supervision and treatment had the highest survival rate (61%).

SUPERVISION

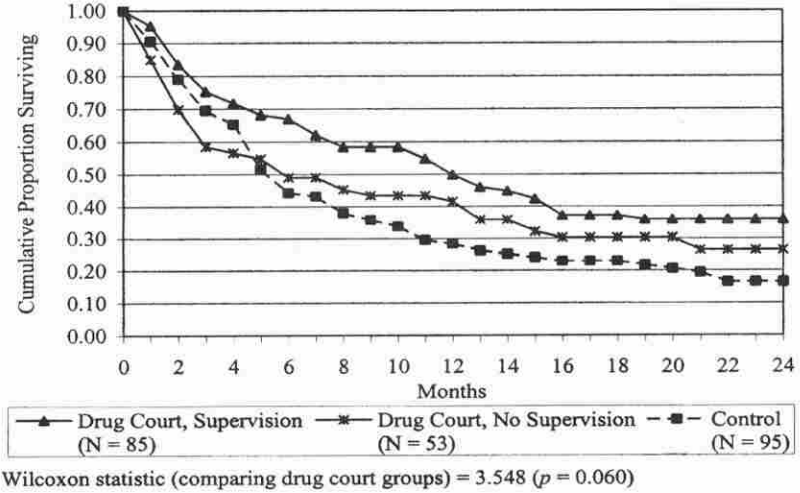
Each survival analysis evaluated the effect of the drug court components on time until failure. The life tables compared the cumulative proportion surviving throughout the follow-up period, based on whether the sample received the drug court component or not. In each life tables figure, the survival curve (cumulative proportion surviving) of the control sample (from the original study: Banks & Gottfredson, 2002) was also included to describe how the study sample might have behaved if they had not been assigned to the drug court. The effect of supervision is displayed in Figure 1. The survival curves of the drug court supervision, drug

TABLE 5
RECEIPT OF DRUG COURT COMPONENTS BY FAILURE STATUS

	Survived		Failed	
	N	%	N	%
Entire drug court sample	46	33.3%	92	66.7%
Drug court component				
Supervised?				
Yes	32	37.6%	53	62.4%
No	14	26.4%	39	73.6%
Attended treatment?*				
Yes	29	59.2%	20	40.8%
No	17	19.1%	72	80.9%
Supervised and attended treatment?*				
Yes	22	61.1%	14	38.9%
No	24	23.5%	78	76.5%

* $p \leq 0.01$

FIGURE 1
DRUG COURT CUMULATIVE PROPORTION SURVIVING BY SUPERVISION RECEIVED



Wilcoxon statistic (comparing drug court groups) = 3.548 ($p = 0.060$)

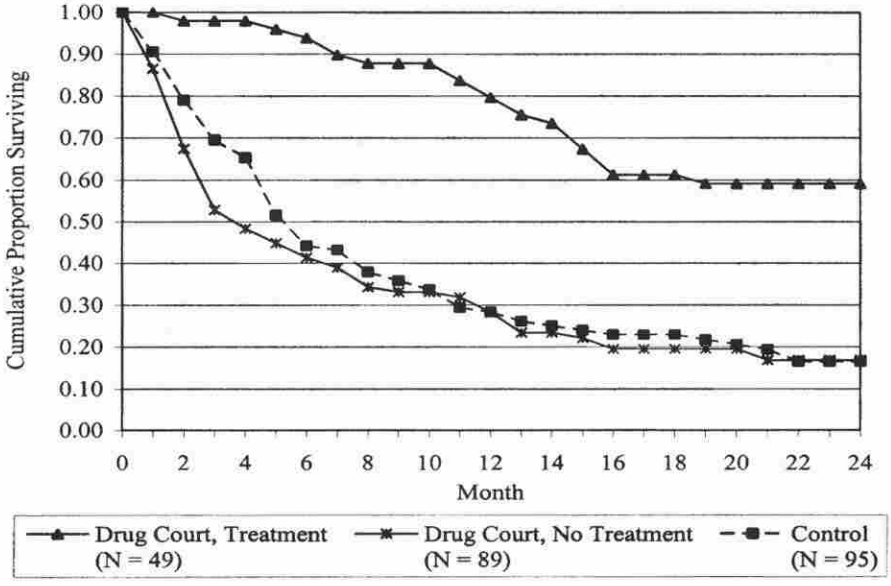
court no supervision, and control sample remained proportional throughout the follow-up period. Drug court participants who received supervision had a longer time until failure compared to drug court participants who received no supervision (the difference approached significance). Half of the no-supervision group failed by month six, while half of the supervision group did not fail until month 12. Both drug court groups had a longer time until failure than the control sample. The difference in time to failure between the drug court supervision and no supervision groups approached significance (Wilcoxon statistic = 3.548, $p = 0.060$).

TREATMENT

The next life tables analysis broke apart the drug court sample by whether or not they received treatment and again plotted both the drug court groups against the control sample (Figure 2). The drug court no treatment survival curve behaved almost exactly as the control sample survival curve did. Both had a rapid decline until about month eight, when two thirds of both groups had failed. In contrast, the drug court treatment group had about 60% of its members surviving at the end of the follow-up period. The difference in time to failure between the drug court treatment and no treatment groups was significant. The difference in outcome between drug court members who received treatment and those who did not may have been due to selection bias, however, where some unmeasured characteristic predicted both treatment and time until failure. If, for example, motivation to change were impacting both the independent and dependent variable, we would expect that the drug court treated sample was motivated to change, while the no treatment sample was not motivated to change. Due to the random assignment into drug court and control samples, however, we could assume that the control group had a random distribution of individuals who were and were not motivated to change. If motivation to change were confounding the relationship of interest, we would expect the control sample's time to failure to be longer than the no-treatment group, but shorter than the treatment group. This was not the case, however, as Figure 2 clearly shows that the "unmotivated" drug court group had a time to failure similar to that of the control sample, which had an equal distribution of motivated and unmotivated members. In other words, we would not expect the survival curve attributable to selection (drug court, no treatment) to behave like the survival curve without selection bias (control). Therefore, the effect of treatment on time until failure among the drug court sample did not appear to be driven entirely by self-selection into treatment and no-treatment groups. The threat of selection bias will be further explored through the propensity score approach in later analyses.

It is also possible that the significantly longer time until failure among the treated group was driven by its greater proportion of members who survived throughout

FIGURE 2
DRUG COURT CUMULATIVE PROPORTION SURVIVING BY TREATMENT RECEIVED



Wilcoxon statistic (comparing drug court groups) = 39.742 ($p = 0.000$)

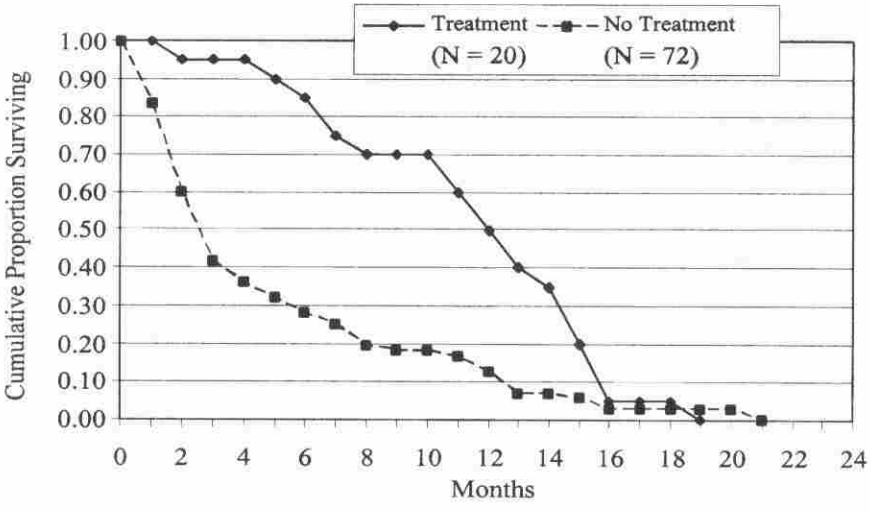
the follow-up period, rather than its ability to prolong failure. The life tables were therefore rerun, including only those offenders who failed at some point during their time at risk. The significant difference in time to failure persisted – and appeared to become even more pronounced – between drug court sample failures who received treatment and those who did not. The no treatment survival curve descended rapidly until month eight when 80% of those who would fail had done so. In contrast, the survival curve of failures for those who had received treatment followed a slow decline until month 11, when only a third of the failures had done so. After month 11, the survival curve declined rapidly, however, to catch up with the no treatment survival curve in month 16, after which less than 10% of both groups survived. Figure 3 suggests that drug treatment was having its greatest effect in months zero through 10 of the follow-up period, most likely when the sample members were undergoing treatment. In other words, among those who would eventually fail, being in treatment appeared to have prolonged that failure.

SUPERVISION AND TREATMENT

To evaluate the cumulative effect of receiving more than one drug court component, the next analysis compared all possible drug court trajectories,

FIGURE 3

DRUG COURT CUMULATIVE PROPORTION SURVIVING BY TREATMENT RECEIVED FOR FAILURE CASES ONLY



Wilcoxon statistic = 20.564 (p = 0.000)

differentiated by whether or not the sample received treatment only, supervision only, or both treatment and supervision. The control sample survival curve was again included for descriptive purposes. Drug court participants who received treatment, whether alone or in conjunction with supervision, had significantly longer survival times than the other groups (supervision only, neither supervision nor treatment, and control). Both drug court trajectories lacking treatment behaved more like the control sample survival curve than the other drug court curves. There was a significant difference in the survival curves of the four drug court trajectories. Half of both the supervision only and the neither supervision nor treatment groups had failed by month four. In contrast, half of the treatment only group did not fail until month 16, and more than 60% of the treatment and supervision group survived throughout the follow-up period.

Comparing the survival curves of the supervision only and the supervision plus treatment groups revealed that the latter group had a significantly longer time until failure. This finding suggests that the combination of supervision and treatment was more effective than supervision alone. A final test determined whether there was a significant difference in the survival curves of the treatment only group and the treatment plus supervision group. The difference was not significant, yet there was

still a meaningful difference between the two survival curves: 45% of the treatment only group survived at the end of the follow-up period, compared to 61% of the treatment plus supervision group. The data therefore suggested that receipt of treatment alone was sufficient to observe a significantly longer time until failure within the drug court sample. But the longest time until failure was found among drug court participants who received both treatment and supervision. Compared to supervision, however, treatment was the drug court component most often associated with a longer time until failure. Drug court participants who did not receive treatment (regardless of whether they received supervision) had a survival curve similar to the control sample.

Cox Regression Analyses

The life tables analyses described above served as the starting point for the Cox Regression analyses that took a closer look at the effect of the drug court on the risk of failure. Several regression models were constructed to evaluate the effect of receiving one or both of the drug court components on the risk of failure. These survival analyses sought first to determine whether receiving any supervision, receiving any treatment, or receiving both supervision and treatment was most effective in reducing the risk of failure. If any of the drug court components significantly predicted the risk of failure, background characteristics were then introduced into the regression model to uncover any confounding relationships between the risk of failure and the independent variable(s) of interest. The final regression models utilized a time-dependent covariate to predict the risk of failure. That is, whether or not an individual participated in a drug court component during the previous month was used to predict the risk of failure. These models were also intended to take a closer look at any significant relationships uncovered between one (or both) of the drug court components and the risk of failure. Table 6 displays the results of these regression models, each of which is described in detail below.

Models 1, 2, and 3 show the basic relationship between the drug court components and the risk of failure. Receiving supervision (whether alone or in conjunction with treatment) did not significantly affect the hazard rate (Model 1). In accordance with the life tables analysis above, however, receiving treatment did significantly decrease the risk of failure (by 24.6%). Model 3 utilizes mutually exclusive categories defined by whether an individual received both supervision and treatment, supervision only, or treatment only to predict the risk of failure. Again, the results mirrored those in the life tables analyses (Figure 4). Individuals who received treatment, whether alone or with supervision, had significantly lower hazard rates than those who did not. Receiving supervision only did not have a significant effect on the risk of failure.

TABLE 6

DRUG COURT HAZARD RATE REGRESSED ON RECEIPT OF DRUG COURT COMPONENTS

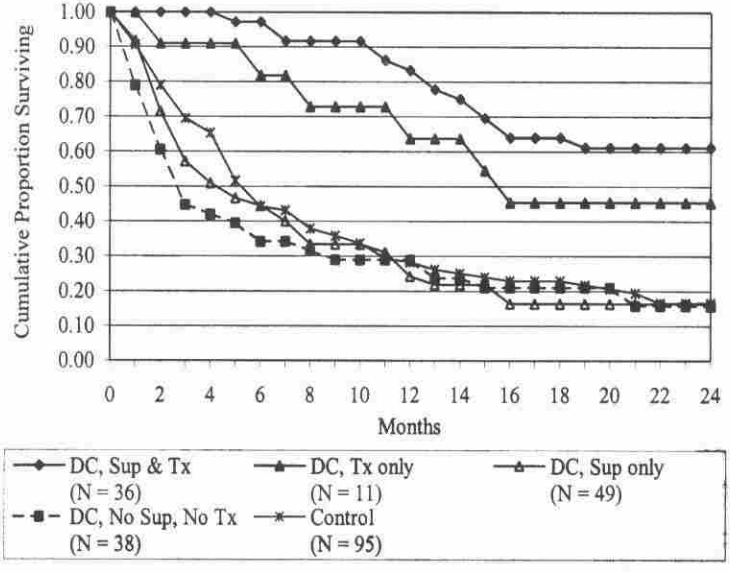
Model No.	N	Variable	B	SE	Wald	Sig	Exp(B)
1	134	Any supervision	-0.331	0.211	2.454	0.117	0.718
2	138	Any treatment	-1.402	0.257	29.837	0.000	0.246
3	134	Supervision and treatment	-1.555	0.323	23.227	0.000	0.211
		Supervision only	-0.084	0.240	0.122	0.727	0.920
		Treatment only	-1.070	0.446	5.753	0.016	0.343
4	138	Any treatment	-1.306	0.263	24.677	0.000	0.271
		Original court	-0.065	0.244	0.071	0.790	0.937
		Initial arrest for a drug crime	-0.493	0.237	4.332	0.037	0.611
5	69	Received treatment	-1.679	0.370	20.616	0.000	0.187
		Propensity score	-1.681	0.771	4.750	0.029	0.186
6	138	In treatment during previous month	-1.236	0.339	13.286	0.000	0.291
7	138	In treatment during previous month	-1.178	0.344	11.744	0.001	0.308
		Age	-0.023	0.016	2.014	0.156	0.977
		Gender	0.153	0.276	0.309	0.578	1.166
		Race	0.543	0.410	1.758	0.185	1.722
		# of prior arrests	-0.034	0.025	1.820	0.177	0.966
		# of prior convictions	0.091	0.046	3.799	0.051	1.095
		Original court	-0.374	0.249	2.252	0.133	0.688
		Initial arrest for a property crime	-0.210	0.370	0.322	0.571	0.811
		Initial arrest for a drug crime	-0.508	0.344	2.184	0.139	0.602

df = 1 in all models.

Receiving treatment was the most consistent and significant indicator of an increased time until failure, so will be the focus in each remaining Cox regression model. As shown in Table 6, Models 4 and 5 attempted to control for background characteristics that may have explained the relationship between receiving treatment and a decreased risk of failure. Of all available background variables, only original court and an initial arrest for a drug crime were distributed unequally among individuals who received treatment and those who did not (see Table 3). Neither covariate changed the relationship between treatment and the hazard rate. In addition to receiving treatment, having an initial arrest for a drug crime significantly reduced the risk of failure by 61.1%.

Additional background characteristics that may have reduced selection bias in the models were available for a subset of the drug court sample. These drug court participants were assigned to the probation track, so they had a more severe criminal history than diversion track sample members. A logistic regression procedure was used to predict receiving treatment based on the background variables available for

FIGURE 4
DRUG COURT CUMULATIVE PROPORTION SURVIVING BY TRAJECTORY TYPE



Wilcoxon statistic (among all drug court groups) = 40.405 ($p = 0.000$)
(comparing Sup & Tx against Sup only) = 29.624 ($p = 0.000$)
(comparing Sup & Tx against Tx only) = 1.440 ($p = 0.230$)

the entire sample (age, gender, race, number of prior arrests, number of prior convictions, original court, and initial arrest type), plus the variables available for the probation track subsample (education, employment, family, and current legal status indicators). This procedure resulted in a propensity score to predict treatment, which was then used as a control variable in the Cox regression model. The logistic regression model was not an extremely good predictor of which drug court sample members received treatment, but it did perform better than a model which did not include these covariates (prediction was improved from 52% to 67%). While this was not a vast improvement, it provided one alternative method to reduce selection bias.

Including the propensity for treatment in the model did not change the effect of receiving treatment on the risk of failure (Model 5). The propensity score was also a significant predictor of the hazard rate, suggesting that actually attending treatment and the likelihood of receiving treatment both significantly reduced the hazard rate. Any preexisting bias to attend treatment (as measured by the propensity score) did not explain the association between attending treatment and a lower risk of failure.

Finally, Models 6 and 7 evaluated whether being in treatment during the previous month had a significant effect on the risk of failure at a particular point in the follow-up period. These models assessed whether being in treatment had an immediate (and perhaps short-lived) effect on the risk of failure, or whether being in treatment (e.g., for a month at the beginning of the time at risk) had a lasting effect on the hazard rate throughout the follow-up period. Being in treatment during the previous month significantly predicted a decrease in the hazard rate (29.1%). Receiving treatment during the previous month remained a significant predictor of the risk of failure when initial arrest and background characteristics were introduced into the model. Having fewer prior convictions was also a significant predictor of a decreased hazard rate.

VARYING EFFECT OF TREATMENT

The final survival analyses examined whether drug treatment was exerting a greater influence at certain points in the follow-up period. Individuals who received treatment while at risk for failure averaged 2.4 months from their time at risk start date to their first treatment experience and 4.5 months in that first treatment episode. Based on the time-dependent regression results reported above, treatment was expected to have the greatest influence on the hazard rate when most sample members were actively attending treatment. The survival analyses therefore restricted the follow-up period into four-month intervals to determine whether receiving treatment had a greater effect on the hazard rate during any of these intervals. Table 7 shows the Cox regression results for each follow-up period interval. As expected, treatment exerted its greatest influence on the hazard rate in the first two follow-up period intervals (up to four months, and four up to eight months). After that, the treated group continued to have a higher survival rate, but their treatment status no longer had a significant effect on the hazard rate. Once control variables were introduced into the model for the first follow-up period segment, the results remained the same (Table 8). Treatment continued to significantly decrease the hazard rate during the first four months. None of the background characteristics were significant predictors of the hazard rate during this four-month period. During the second follow-up period interval (months four up to eight), receiving treatment was no longer a significant predictor of the hazard rate when control variables were introduced into the model. Instead, an initial arrest for a drug crime and not being African-American significantly reduced the hazard rate during this period.

DISCUSSION

Earlier analyses of this drug court have shown that it was having a significant impact on recidivism over a two-year follow-up period (Gottfredson et al., 2003;

TABLE 7

DRUG COURT HAZARD RATE REGRESSED ON TREATMENT RECEIVED AT VARIOUS INTERVALS IN THE FOLLOW-UP PERIOD

	N	B	SE	Wald	Sig	Exp(B)
Up to 4 mos.	138	-3.546	1.011	12.295	0.000	0.029
4 up to 8 mos.	90	-1.130	0.533	4.500	0.034	0.323
8 up to 12 mos.	72	-0.676	0.671	1.015	0.314	0.509
12 up to 16 mos.	62	-0.378	0.504	0.560	0.454	0.686
16 or more mos.	45	-1.411	1.225	1.327	0.249	0.244

df = 1

TABLE 8

DRUG COURT HAZARD RATE REGRESSED ON TREATMENT RECEIVED IN THE FIRST FOUR MONTHS OF THE FOLLOW-UP PERIOD

	B	SE	Wald	Sig	Exp(B)
Treatment received	-3.147	1.019	-0.537	0.002	0.043
Age	-0.018	0.021	0.746	0.388	0.982
Gender	0.481	0.429	1.260	0.262	1.618
Race	-0.037	0.543	0.005	0.945	0.963
Original Court	-0.506	0.382	1.756	0.185	0.603
# of prior arrests	-0.026	0.034	0.594	0.441	0.974
# of prior convictions	0.080	0.066	1.461	0.227	1.083
Initial arrest for a drug crime	-0.193	0.449	0.184	0.668	0.825
Initial arrest for a property crime	-0.278	0.484	0.330	0.566	0.757

N = 136, df = 1

Banks & Gottfredson, 2002). Compared to a randomly assigned control sample, drug court participants had a lower proportion of offenders who were rearrested, a lower number of rearrests, and a longer time at risk until they were rearrested. This evaluation took a closer look at the treatment and supervision components of the drug court program to determine whether one component, or the combination of both, was most effective at reducing the risk of failure.

Treatment emerged as the most effective drug court component, compared with receiving supervision while at risk for failure. Individuals who received both treatment and supervision had the longest time until failure, but not significantly more so than offenders who received treatment only. Offenders who received supervision only behaved much like a control sample randomly assigned to traditional case processing. The significant effect of treatment persisted when the analysis was restricted to failures only, suggesting that attending treatment prolonged the failure of this group of offenders. Similarly, being in treatment during the past 30 days significantly lowered the risk of failure. Efforts to control the possibility of bias due to self-selection into treatment did not explain the effect of this drug court component.

The findings in this evaluation differ from those of two earlier studies, which suggested that receiving the supervisory components of the drug court program were sufficient to observe a significant reduction in recidivism (Deschenes et al., 1995; Harrell et al., 1998). In the current study, however, treatment significantly lowered the risk of failure, while supervision did not. Offenders who received both components had the highest survival rates, but those who received treatment only performed nearly as well.

The findings regarding supervision should be interpreted with caution, however, as they may reflect inadequacies in the data used to measure this drug court component. Individuals were considered "supervised" if they had any period of supervision while at risk for failure. Although a substantial proportion of the drug court sample received intensive supervision, the data did not reflect the timing of that intensive supervision. Therefore, this evaluation can only draw conclusions about the effectiveness of regular probation, not the intensive supervision required by the drug court program.

Although several efforts were made to control for selection bias, there are a number of potentially confounding variables that may be causing the observed relationship between attending treatment and a reduced risk of failure. For example, drug use history and prior treatment experience may be associated with treatment and recidivism outcomes. These data were missing for a substantial portion of the study sample and, therefore, could not be utilized in the current evaluation. This study was also limited by the small number of sample members who attended treatment while at risk for failure (N = 49). Many aspects of the treatment experience, such as treatment modality and cumulative treatment lengths may further predict the risk of failure among this group of drug court participants. However, the small number of sample members who fell into such categories prevented any rigorous analyses of treatment characteristics' effect on the risk of failure.

Attending treatment had its greatest impact on the hazard rate during the first four months at risk for failure, after which the effect of treatment appeared to decline through the remainder of the two-year follow-up period. The first four months was also the period during which the study sample as a whole lost the greatest proportion of its members – half of those who would fail at some point during the follow-up period were rearrested during the first four months. Drug court practitioners may therefore want to focus more on the treatment component to have a greater impact on recidivism. Getting offenders into treatment quickly could prevent the high failure rate observed during the first few months these offenders were free in the community. It is also possible that attending treatment helped these offenders to form stronger social bonds with employment, family, and other conventional institutions. These informal social controls may have been exerting a

greater influence on the risk of failure later in the follow-up period, where receiving treatment did not have a significant impact. Future research should investigate these intervening mechanisms that may also be affecting the time to failure among drug court participants.

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