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THE ROLE OF THE SOCIAL ENVIRONMENT IN ALCOHOL OR DRUG RELAPSE OF PROBATIONERS RECENTLY RELEASED FROM JAIL

Mandy Owens

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Running head: SOCIAL ENVIRONMENT OF PROBATIONERS

**The Role of the Social Environment in Alcohol or Drug Relapse of Probationers
Recently Released from Jail**

By

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**B.S., Biology, University of Washington, 2008
B.S., Psychology, University of Washington, 2008
M.S., Psychology, University of New Mexico, 2013**

THESIS

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Requirements for the Degree of

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Abstract

The current research study looked at the social networks of adult male alcohol or drug offending probationers recently released from jail, assessed if and how social networks change from pre- to post-incarceration, and tested whether changes in social networks were related to alcohol or drug use. Forty adult male probationers were recruited from the New Mexico Corrections Department, Probation Parole Division, and two to seven months after release from jail were administered a single assessment battery that measured social networks, motivation, self-help group involvement, substance use, and other potential correlates of relapse. Results showed that there were significant changes in social networks, including decreases in social network size, decreases in percentage of network members that were heavy drinkers, decreases in percentage of network members that were heavy drug users, decreases in percentage of network members that were users of any kind, and increases in percentage of network members that were abstainers. Additionally, social networks were related to concurrent substance use and changes in social networks significantly predicted substance use after release from jail, even after

Social Environment of Probationers

controlling for substance use prior to incarceration. The results provided evidence that social networks and social support may operate as dynamic factors in models of relapse, and highlighted an area for potential intervention for adult males with substance use disorders being released from jail.

Keywords: relapse, social networks, criminal justice, incarceration, social support

TABLE OF CONTENTS

LIST OF FIGURES viii

LIST OF TABLES ix

INTRODUCTION 1

 Criminal Justice System..... 1

 Relapse Models..... 3

 Social Support..... 5

 Current Study 10

METHOD 13

 Recruitment..... 14

 Measures 15

 Procedures..... 21

 Data Analysis 24

RESULTS 28

 Participants..... 28

 Social Network Variables 29

 Changes in Social Networks 30

 Associations Between Social Networks and Substance Use 31

 Correlates of PDA and PDH..... 37

DISCUSSION 42

 Limitations 50

 Future Directions 51

Conclusion	53
REFERENCES.....	55
APPENDICES.....	66
APPENDIX A RECRUITMENT POSTER	66
APPENDIX B RECRUITMENT FLYER	67
APPENDIX C SCREENING FORM	68

LIST OF FIGURES

Figure 1. Flow chart of individuals who were included in and excluded from the study..77

Figure 2. Mediation model of percentage of social networks that were heavy drug users
from T1 to T2 (using the Baron and Kenny method) 78

Figure 3. Changes in T1 to T2 and T2 to T3 social network variables as predictors T2 and
T3 PDA, respectively (after controlling for T1 and T2 PDA, respectively).....79

Figure 4. Changes in T1 to T2 and T2 to T3 PDA as predictors T2 and T3 social network
variables, respectively (after controlling for T1 and T2 social network variables,
respectively).....80

LIST OF TABLES

Table 1. Descriptive Information71

Table 2. Descriptive Information for Social Network Variables74

Table 3. Changes in Social Network Variables (β and t values) and Effect Sizes (Cohen's d) of Changes75

Table 4. Criminal History76

The Role of the Social Environment in Alcohol or Drug Relapse of Probationers Recently
Released from Jail

Criminal Justice Population

In 2009, more than seven million Americans were involved currently with the criminal justice system (CJS) in some capacity, including incarceration in prisons or jails, being on probation or parole, or awaiting trial (Bureau of Justice Statistics, 2009). Nearly 70% of those involved with the CJS met criteria for an alcohol or other substance use disorder. In federal prisons 60% of inmates are incarcerated for a drug offense, as are 23% of inmates in state prisons, and 22% of inmates in jail (Harrison, 2001). Many studies have found that a substance use disorder (SUD) increases the chances of illegal behaviors, arrests, and incarcerations (White & Gorman, 2000).

Much of the research focusing on individuals with SUDS involved with the CJS has involved prisoners. Most individuals involved with the CJS (84%), however, are under supervision (probation or parole) and living in the community (Bureau of Justice Statistics, 2009). Many studies have looked at the ways supervision by the CJS could increase accountability and abstinence and decrease recidivism for individuals on probation who meet criteria for a SUD. Petersilia (1998) reported that increasing the frequency of urine analyses did not lower the incidence of substance use or recidivism in probationers or parolees, but that engagement in alcohol or drug treatment did. Petersilia (1998) also emphasized that supervision alone was not sufficient, but that the addition of mandated treatment reduced recidivism rate measures by 15%. These findings highlighted the potential effectiveness of substance abuse treatment for individuals involved with the CJS and led to the development of drug courts in 1989 (Hiller et al.,

2010). By the end of 2009, almost 2,500 drug court systems were operating across the country, mandating over four hundred thousand individuals to substance abuse treatment since the start of drug courts (National Drug Court Institute, 2009). In California, site of 12% of the nation's drug courts, costs of processing an individual through drug court saved an average of \$15,000 per person when accounting for costs for anticipated incarceration and recidivism. While these costs save the government and taxpayers an estimated \$9 million in California alone, the upfront costs make it difficult to engage all individuals on probation with an SUD in substance abuse treatment (Administrative Office of the Courts, 2006).

Research with the CJS population has focused on alcohol or drug use or recidivism rates. Less research has focused on the mechanisms or predictors of relapse for substance abusing individuals involved with the CJS. The positive relationship between substance use and illegal behaviors (White & Gorman, 2000) suggests that decreasing the probability of relapse may decrease the incidence of illegal behaviors and arrests.

Additional research done with probationers with SUDs has been conducted in the context of general substance abuse treatment seeking individuals. In 2006, SAMSHA estimated that 38% and 53% of individuals discharged from in- and outpatient treatments, respectively, were referred by the CJS. Due to the overlap of individuals court-mandated to treatment and those voluntarily seeking treatment for SUDs, it is difficult to differentiate results from outcome studies sampling from substance abuse treatment centers. This overlap in study samples presents a need to clarify the results of studies on substance use relapses in terms of individuals involved in the CJS instead of combining

these individuals with the general substance abuse treatment seeking population. To do this, studies need to test predictors of relapse and the generalizability of relapse models to individuals with SUDs involved in the CJS, or include measures of CJS involvement in all studies on individuals with SUDs.

Relapse Models

In 2004, Witkiewitz and Marlatt published an integrated and updated model of relapse for persons with SUDs in the general (non-CJS) population. Their new model reconceptualized the relapse process into three dynamic areas: (a) *tonic processes*, which include more stable, distal risk factors (family history, social support, dependence), cognitive processes (self-efficacy, outcome expectancies, craving, motivation), and physical withdrawal; (b) *phasic responses*, which interact with an individual's environment, and include affect states, coping behaviors (behavioral/cognitive coping, self-regulation), substance use behavior (quantity or frequency), and perceived effects (reinforcement, abstinence violation effect); and (c) *high-risk situations (contextual factors)*, which overlap with both tonic processes and phasic responses (Witkiewitz & Marlatt, 2004, pg. 230). The updated relapse model focuses on the overlapping relationships among an individual's characteristics, environments, and experiences. It also emphasizes the interactive qualities of phasic responses and an individual's context.

Included in this model are specific components that may influence substance use outcomes. These components include: (a) *self-efficacy*, which is determined by an individual's self-perceived abilities to exhibit certain behaviors given a specific environment, where increased levels of self-efficacy may indicate better alcohol treatment outcomes (Project Match Research Group, 1997); (b) *outcome expectancies*,

which describe what an individual anticipates will occur in situations with alcohol, where negative substance use outcome expectancies are associated with favorable outcomes (Jones, Corbin, & Frommes, 2001); (c) *cravings*, the anticipation of positive feelings resulting from the substance use, where the literature on cravings as a predictor of outcomes has been inconsistent (Drummond, Litten, Lowman, & Hunt, 2000; Lowman, Hunt, Litten, & Drummond, 2000); (d) *motivation*, which speaks to both the motivation to resist and motivation to engage in the use of substances, where motivation to resist substances is associated with positive outcomes (Schnoll et al., 2005); (e) *coping*, which includes responses to stress and temptations, and has been found to be predictive of treatment completion (Litt, Kaden, Cooney, and Kabela, 2003); (f) *emotional states*, specifically negative affect, which have been associated with higher incidences of relapse (Baker et al., 2004); and (g) *interpersonal determinants*, which pertain to functional and emotional support, where high levels of support are indicative of longer periods of abstinence (Beattie & Longabaugh, 1997; Zywiak, Longabaugh, & Wirtz, 2002).

There are two distal factors that are salient in the offender population: substance abuse (Bureau of Justice Statistics, 2009) and psychopathy (Clements, 1996). Substance abuse has been shown to increase the likelihood of criminal behavior (White & Gorman, 2000), which is consistent with surveys approximating that 70% of inmates meet criteria for a SUD (Bureau of Justice Statistics, 2009). Measures of psychopathy have been found to have strong associations with criminal behaviors (Leistico, Salekin, DeCoster, & Rogers, 2008; Swogger, Walsh, Lejuez, & Kosson, 2010). Low self-control, which is a symptom of psychopathy, has also been shown to be associated with criminal behaviors (Benda, 2005), as well as substance abuse (Gossop, Trakada, Stewart, & Witton, 2005;

Packer, Best, Day, & Wood, 2009). As distal factors of Witkiewitz and Marlatt's (2004) relapse model, substance use severity and psychopathy may affect the phasic responses in predicting relapses. The majority of the research studies supporting the components of Witkiewitz and Marlatt's model, however, have not reported results in terms of court-mandated individuals versus individuals self-referred to substance abuse treatment. This makes it difficult to generalize these components of the relapse model to the CJS population, and identifies a need to test these components with substance abusing individuals who are supervised by the CJS.

Social Support

In Witkiewitz and Marlatt's (2004) updated relapse model, social support is categorized as a distal factor, which implies that social support is a static variable influencing an individual's relapse. Others, however, have stressed the importance of the social network as a dynamic predictor of substance use that interacts with individual and environmental factors (Stanton, 2005). Hunter-Reel, McCrady, and Hildebrandt (2009) offered an elaboration of the interpersonal determinants section of Witkiewitz and Marlatt's relapse model, and cited evidence for the dynamic roles social support plays in an individual's potential relapse. These interactions with social support included: (a) *self-efficacy*: members of an individual's social network may provide support for the person's abilities to abstain from alcohol or drugs, or individuals may associate with persons who encourage drinking or who support abstinence; (b) *outcome expectancies*: if an individual anticipates conflicts with network members as a result of alcohol or drug use, this may reinforce abstinence; (c) *cravings*: cravings are highly dependent on an individual's environment and may be cued by network members; (d) *motivation*: interpersonal

conflicts due to substance use may increase an individual's motivation to abstain, or heavy using network members may make it difficult for an individual to quit drinking or using drugs; (e) *coping behaviors*: seeking out network members for advice or to talk can be an effective form of behavioral coping, and may reduce cravings and the potential to relapse; (f) *affective states*: problematic interactions with network members may induce negative affects, which have been strong predictors of relapse; and (g) *substance use*: if an individual consistently has used substances with particular network members, he/she may have developed a conditioned physiological response to anticipate substance use in the presence particular network members, thus increasing the likelihood of relapse (Hunter-Reel et al., 2009). These interactions between an individual's social network and predictors of relapse provide evidence for research examining social support as a dynamic predictor of relapse that interacts with an individual's environment. Consistent with this perspective, the proposed study will assess social support as a dynamic fluctuating variable in an individual's life.

Social support can be categorized into two constructs - general support and alcohol-specific support. To assess social support for Project COMBINE, a recent multisite study of pharmacotherapies and psychosocial treatments for alcohol use disorders (AUDs), Longabaugh, Wirtz, Zywiak, and O'Malley (2010, pg. 838) defined general support as "the extent to which a person is generally supportive of you, by being sensitive to your personal needs, helping you to think about things, solve problems, and by giving you the moral support you need". This kind of support, however, has been found to be predictive only of improved short term drinking outcomes following treatment (Beattie & Longabaugh, 1999).

The second type of social support, alcohol-specific support, also has been found to be predictive of drinking outcomes (Longabaugh, Wirtz, Zweben, & Stout, 1998; Wu & Witkiewitz, 2008), and has been linked to motivation in predicting drinking outcomes (Hunter-Reel, McCrady, Hildebrandt, & Epstein, 2010). Alcohol-specific support can be broken down into network members' drinking and network members' responses to the participant's drinking. Network members' drinking was operationalized by Longabaugh et al. (2010, pg. 838) as: "(a) percentage of heavy drinkers, (b) percentage of abstainers, and (c) the frequency of drinking in the network". Members were then classified into one of two categories: members who support and members who oppose the individual's drinking.

Social support can come from spouses, family members, friends, twelve-step groups, coworkers, and other self-help groups. The role of the social network in relapse can be tested by looking at the size of the social network, importance of the social network members, amount of contact, and types of support offered (general or alcohol-specific). Some types of network members have been shown to have more influence on relapses than others when comparing network members' support for substance use to the potential for relapse. Supportive families are directly and indirectly associated with less alcohol use and relapse (Gordon & Zrull, 1991; Mason & Windle, 2001). Additionally, being married and having a supportive spouse are related to positive outcomes, with marriage offering more positive support for men than women (Havassy, Hall, & Wasserman, 1995). Groh, Jason, Davis, Olson, and Ferrari (2007) found that friends and peers have the most effect on relapse and long-term use. Specifically, support for abstinence by friends (Beattie & Longabaugh, 1997) and a larger percentage of non-

drinking friends in the network (Zywiak, Longabaugh, & Wirtz, 2002) have been shown to improve substance use treatment outcomes. Conversely, poorer outcomes are associated with having a larger number of drinking friends in the network (Mohr, Avena, Kenny, & Del Boca, 2001).

Several studies have found that participation in Alcoholics Anonymous (AA) and other self-help groups has been associated with reductions in drinking. Specifically, research has attributed some of these positive results to effects AA can have on changes in social support, particularly changes in network members' support for drinking (Kaskutas, Bond, & Humphreys, 2002). Litt, Kadden, Kabela-Cormier, and Petry (2009) found that AA involvement often resulted in an increase in the number of abstinent members in an individual's social network, rather than a reduction in drinking members of the network. Montgomery, Miller, and Tonigan (1995) found that AA involvement, rather than simply AA attendance, was the better predictor of drinking outcomes, which contrasts with the findings of Litt et al. (2009). This contrast may have occurred due to differences in measurement (Litt et al., 2009), and suggests the need to assess for both attendance and involvement when looking at AA as a potential effect on changes in social support.

Research also has shown that spouses, families, friends, and coworkers play a role in coping with incarceration and prisoner reentry (Shirvy, Wu, Moon, Mann, Holland, & Eacho, 2007), and relationships may suffer as a result of substance use. Lemieux (2002) found that three quarters of prisoners experienced interpersonal problems prior to incarceration as a result of drug use, with men experiencing more problems than women. Additionally, Lemieux found that two thirds reported problems with friends; of the

respondents with children, half experienced conflicts with them; and of the respondents with partners, two thirds reported that their relationships experienced problems as a result of drug use. Consistent with Lemieux (2002), Biggam and Power (1997) found that young men experienced social problems prior to incarceration, and that prisoners benefited from social support while incarcerated. The high number of social problems of incarcerated individuals with SUDs led Lemieux (2002) to identify social support, largely from spouses and families, as an unaddressed area in inmates' rehabilitation during and after incarceration. Other studies also have found that unstable social networks, such as marriages or employment, were associated with drug relapses of parolees released from prison (Bahr, Armstrong, Gibbs, Harris, & Fisher, 2005; Kandel & Yamaguchi, 1987). Slaght (1999) supported the need to address families in treatment, and found that dissatisfaction with family life was strongly correlated with drug use. These findings provide evidence that social support plays a role in the lives of recently incarcerated offenders, and may suggest a beneficial area of treatment for this population.

The number of individuals involved with the CJS is increasing, which presents a need to identify efficient strategies for supervising and treating individuals with SUDs after incarceration. Individuals involved with the CJS comprise a large portion of the clients referred to substance abuse treatment, and yet few studies have reported treatment and relapse outcomes in terms of this population. Additionally, researchers have not addressed how social support changes and what role network members may play in predicting relapse for individuals involved with the CJS, despite arguments stressing the importance of social support in this population. The current study followed the perspective of Hunter-Reel et al. (2009) and addressed the need for research on social

support for individuals involved with the CJS by examining social support as a dynamic factor in predicting alcohol or drug use for probationers recently released from jail.

Current Study

A large body of research has examined individuals supervised by the CJS with SUDs in the contexts of drug courts or as a part of the general substance abuse treatment seeking population. Little research, however, has systematically studied the applicability of a formal conceptual framework, such as the relapse model presented by Witkiewitz and Marlatt (2004), to individuals involved with the CJS with SUDs. Given the conceptual framework and evidence described by Hunter-Reel et al. (2009), the current study focused on distal factors and the social support dimensions of the Witkiewitz and Marlatt model in predicting relapse among individuals with SUDs who recently were released from jail and were currently on probation for an alcohol or drug offense. Data on the social networks of individuals with SUDs recently released from jail as a predictor of relapses may help to inform future policies or interventions for this population.

Aims. The first aim of this study was to examine the social networks of alcohol or drug offending male probationers. The composition of alcohol or drug offending probationers' social networks pre- and post-incarceration were assessed and included: (a) the number of alcohol or drug users in the network, (b) number of abstainers, (c) frequency of substance use by network members, and (d) support for abstinence or substance use. For this aim, there were no a priori hypotheses, and data were analyzed in an exploratory fashion.

The second aim was to examine changes in social networks from the time prior to incarceration until 60 to 210 days after release, and identify whether social support was a

dynamic factor in this population (consistent with the conceptualization proposed by Hunter-Reel et al., 2009). This aim used the Important People Interview (described below) to assess social network structures retrospectively across three time periods: networks in the 30 days prior to incarceration, 30 days after release from jail, and networks from 31 days after release from jail until the day before the study assessment. A number of factors may explain fluctuations in an individual's social network, which is a concept consistent with Witkiewitz and Marlatt's relapse model that distal factors can affect phasic responses. Twelve-step involvement and attendance were assessed as potential predictors of future social network variables, as supported by evidence of Kaskutas, Bond, and Humphreys (2002) and Litt et al. (2009). Additionally, psychopathy was examined as a potential correlate of averaged levels of general social support.

The third aim was to test the relationship between social networks and substance use using three methods. Examining the relationship between social networks and substance abuse began by testing the correlations between social network variables and concurrent substance use. It was hypothesized that the social network variables (network size, percent heavy drinkers, percent heavy drug users, percent users, and percent abstainers) would all be significantly and positively (excluding network size and percent abstainers) related to substance use during the same time period.

Next, the five social network variables used in previous hypotheses (network size, percent heavy drinkers, percent heavy drug users, percent users, and percent abstainers) were tested as mediators of substance use across time. It was hypothesized that substance use pre-incarceration would predict post-incarceration substance use, and that this relationship would be mediated by post-incarceration social network variables. Similarly,

it was hypothesized that substance use post-incarceration would predict present substance use, and that this association would be mediated by present social network variables.

Social network variables each were examined as a predictor of subsequent substance use in a time-lagged model. It was hypothesized that social network variables would predict substance use in the subsequent time period beyond what substance use in the previous time period predicted. These specific pathways include: social network variables pre-incarceration to predict substance use in the 30 days post-incarceration, and social network variables post-incarceration to predict substance use in the present time period. Twelve-step attendance also was considered as a potential predictor of social network variables if it was a significant predictor of social network change.

To examine if social support is a dynamic rather than static predictor of relapse, as proposed by Witkiewitz and Marlatt (2004), difference scores between pre- and post-incarceration social network variables were used to predict post-incarceration substance use. Further, the difference scores between post-incarceration and present social network variables were used to predict present substance use. The reciprocals of each model also were tested. For example, the difference score between pre- and post-incarceration substance use was used to predict post-incarceration social network variables.

The fourth aim was to identify correlates of post-incarceration alcohol or drug use in the study population. These variables included: (a) *motivation*, because individuals mandated to substance abuse treatment may differ in motivation from the general substance abuse treatment seeking population; (b) *previous and current substance use treatment involvement*, because the majority of individuals supervised by the CJS (57.5%) have been found to have been in treatment at least one time before (SAMHSA,

2011); (c) *criminal history*, because individuals who abuse substances are more likely to engage in illegal behavior (White & Gorman, 2000), previous arrests and incarcerations may be a correlate of recent alcohol or drug use; (d) *substance use severity*, as defined by percent days of alcohol and/or drug use, was assessed to see if changes and levels of social support predicted current alcohol or drug use after controlling for prior substance use severity; (e) *psychopathy*, which is associated with criminal behavior (Leistico et al., 2008; Swogger et al., 2010); and (f) *demographic information, including ethnicity, employment, and education*, because SAMHSA (2011) found that the majority of probationers and parolees were non-Hispanic White (52.3%), many were unemployed (36.8%), and over one third had less than a high school education (39.6%).

Motivation was examined as a dynamic response; while treatment and criminal history, substance use severity, psychopathy, and demographic information were examined as static factors. The following correlations were predicted: (a) positive correlations between present motivation and percent days abstinent from alcohol and drugs (PDA), (b) negative correlations between previous treatment involvement and PDA, (c) negative correlations between number of arrests and PDA, (d) negative correlations between substance use severity and PDA, and (e) exploratory correlations of psychopathy and demographic information compared to alcohol or drug use after incarceration will be performed.

Method

Recruitment

Participants were recruited from the New Mexico Corrections Department, Probation Parole Division. To reduce potential coercion, probation officers were

informed of the current study, but did not recruit or offer referrals. These study procedures were consistent with the regulations of the department. Posters (see Appendix A) were displayed in the waiting rooms of two district offices in the same building, at the entrance, and in the male restrooms, and take-home flyers (see Appendix B) were available in the waiting areas and at the entrance.

Recruitment began in the fall, 2011. With an average of 1-2 participants recruited per week, 40 participants were recruited by fall, 2012. A sample size of $n = 40$ provided adequate power for many of the planned data analyses to achieve significant results (particularly aim 2), however many analyses were underpowered ($\beta < .80$).

Inclusion criteria. Potential participants were screened prior to consent (see Appendix C). The inclusion criteria included: (a) *gender*: because 74% of those involved in the CJS are male (Bureau of Justice Statistics, 2009), only males were recruited; (b) *current probation involvement with the New Mexico Correctional Department*; (c) *recent incarceration*, defined for this study as incarceration in jail from 60 to 210 days prior to screenings; (d) *reason for incarceration or probation was related to alcohol or drugs*, which included but was not limited to probation violations for alcohol or drug use, driving under the influence, possession of illicit drugs, and violent acts while under the influence; (e) *alcohol or drug use 30 days prior to incarceration*, to target individuals who abstained from alcohol or drug during incarceration; (f) *scores indicating moderate or high risk substance users per the NIDA Modified ASSIST* (see description below), as a means of targeting probationers with a SUD; (g) *no current psychotic symptoms, as indicated by the SCID psychotic screening questions* (see description below), as current psychotic symptoms may have inhibited individuals' abilities to complete self-report

measures accurately; (h) *no gross cognitive impairment, as measured by the MMSE* (see description below), which may have interfered with the accuracy of the data collected.

Exclusion criteria. Individuals were excluded for the following reasons: (a) *not fluent in English*: all measures were administered in English, and required all potential participants to be fluent in written and spoken English; (b) *if recent incarceration was imprisonment or was in a treatment facility such as residential rehabilitation or detoxification*: this exclusion criterion excluded individuals with longer periods of abstinence, and helped generalize outcomes to individuals with short-term incarceration; and (c) *if recent incarceration was for 6 or less days*: this criterion was to establish a minimum period of abstinence due to confinement in a restricted environment. Figure 1 shows a chart describing individuals who were included and excluded from the study.

Measures

National Institute on Drug Abuse-Modified Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST). The ASSIST was administered to screen out individuals without alcohol or drug related problems prior to incarceration. This assessment recorded lifetime and more recent use of alcohol and various drugs, such as cannabis, cocaine, prescription opioids; and provides a Substance Involvement cutoff score for measuring Low, Moderate, and High Risk of the individual. For the purposes of this study, the three months prior to incarceration were assessed with the screening tool, and only individuals with scores of Moderate or High Risk were eligible to participate in the study. The ASSIST has been used as a prescreening tool in medical health settings and has shown strong Cronbach's alpha reliability for assessing alcohol (0.75), marijuana

(0.86), opiates (0.87), and amphetamines (0.88) (Hides et al., 2009). These were the substances most likely to be endorsed by potential participants for the current study.

Test of Blood Alcohol Content (BAC). Prior to beginning the research interview, an individual's BAC was tested using either a digital breathalyzer or BAC strips to verify that he was not intoxicated. This helped to ensure the integrity of the data collected, as well as participant's safety. When using a digital breathalyzer, routine calibrations were done monthly to ensure accuracy. If an individual's BAC was less than 0.02 he continued with the assessment interview normally. No participants' BAC was over 0.02, but there was an explicit study plan to handle participants' with higher BACs. Specifically, if a participant's BACs had been between 0.02 and under 0.08 he would have been asked to reschedule or allowed to wait, and retested until his BAC was less than 0.02. If a participant's BAC was 0.08 or more, they would have been asked to reschedule or allowed to wait, and retested until their BACs were less than 0.02. If he had chosen to reschedule or terminate participation, he would have been allowed to leave if he was walking, taking the bus, or is getting a ride from someone else. If he was driving, he would have been asked to wait until his BAC was under 0.08, asked to call a friend or family member to pick him up, or would have been offered cab fare home to ensure he would not drive under the influence. If his BAC was 0.08 or more and refused to wait, get picked up, or cab fair, and was seen getting in a motor vehicle to drive, research staff would have been required to contact the police, as the participant would have posed a danger to himself or others.

Mini-Mental Status Examination (MMSE). The MMSE was used to identify cognitive impairment, without providing diagnoses (Folstein, Folstein, & McHugh,

1975). Questions were asked to assess seven areas of cognitive functioning: (a) orientation to time, (b) orientation to place, (c) immediate recall, (d) attention, (e) delayed verbal recall, (f) naming, (g) repetition, and (h) 3-stage command (reading, writing, copying). A cutoff score below 20 points indicates cognitive impairment. Smith, Horton, Saitz, and Samet (2006) found support for the use of the MMSE in assessing cognitive functioning in substance abusers, but reliability scores for the MMSE were not reported. No participants scored below 20 on the MMSE.

Demographics. The CASAA Demographic Interview form (CASAA Research Division, 1997) was used to collect demographic information as a self-report measure. This form included questions on age, gender, race/ethnicity, marital status, and income. Additionally, the individual's fluency in English was assessed on the screening form as an exclusion criterion. Information from the demographic form was used to assess generalizability of findings to the larger criminal justice population.

Structured Clinical Interview for DSM-IV Diagnoses (SCID): Substance Use Disorders Modules. Substance abuse and dependence diagnoses both were assessed using the appropriate modules of the SCID (First, Spitzer, Gibbons, & Williams, 2002). Both abuse and dependence symptoms were assessed in anticipation of changes in the updated version of the Diagnostic and Statistical Manual Fourth Edition (American Psychiatric Association [DSM-IV-TR], 2000). Forman, Svikis, Montoya, and Blaine (2004) found that the SCID was the preferable instrument for assessing SUDs for clinicians involved in the National Institutes on Drug Abuse's Clinical Trial Networks. Peters et al. (2000) found strong reliability of the substance use modules of the SCID-IV with prisoners, with percent agreements for 30-day substance use diagnoses ranging from

85.4% to 100.0%, and lifetime substance use diagnoses ranging from 76.7% to 100.0%.

Abuse versus dependence was tested as a predictor of social support (aim two).

Important People Inventory (IPI). The IPI is a revised version of the Important People and Activities interview (Beattie & Longabaugh, 1999) that assesses members of the participant's social network, substance use in his social network, network members' support for his substance use, and a number of additional factors, assessed in an interview format. Longabaugh et al. (1998) found the IPI to have high 2-3 day test-retest reliability ($r = 0.95$). The following subscales were calculated: (a) total number of members in the social network, (b) average general support received from the network members, (c) percentage of network members who are heavy drinkers, (d) percentage of network members who are abstainers or recovering alcoholics, (e) average frequency of drinking in the social networks, (f) number of people in the network who accept or encourage the participant's drinking or drug use, (g) number of network members who do not accept the participant's drinking or drug use, (h) spouse/partner's levels of support for the participant's drinking or drug use, and (i) number of network members supportive of treatment (Zywiak, Longabaugh, & Wirtz, 2002).

Readiness Ruler. Motivation has been shown to be a strong predictor of relapse among the general substance abuse treatment seeking population (Witkiewitz & Marlatt, 2004). LaBrie, Quinan, Schiffman, and Earleywine (2005) created and validated the Readiness Ruler from the Readiness to Change Questionnaire, which is based on the stages of change (DiClemente & Prochaska, 1998). The Readiness Ruler is a brief, 12-item, self-report measure of readiness to change from alcohol and other drugs using a visual representation of a ruler, and has shown high internal consistency with the

Readiness to Change Questionnaire (Pearson's $r = 0.95$, LaBrie et al., 2005). Here, the Readiness Ruler was used to indicate if motivation was a predictor of alcohol or drug use post-incarceration.

Addiction Severity Index (ASI)

Substance Abuse Treatment Section. The Addiction Severity Index 5th edition (McLellan, Cacciola, Kushner, Peters, Smith, & Pettinati, 1992) assesses seven areas of functioning, including: (a) general, (b) medical, (c) psychiatric, (d) alcohol and drug use, (e) substance abuse treatment history, (f) criminal history, and (g) family and social relationships. It has been used with populations similar to the proposed study target population, including criminal justice populations (Hiller et al., 2009), homeless individuals (Zanis, McLellan, Cnaan, & Randall, 1994), and in substance abuse treatment settings (French, Salome, Sindelar, & McLellan, 2002). Leonhard, Mulvey, Gastfriend, and Shwartz (2000) found modest internal consistency Cronbach's alphas for the alcohol (0.84) and drug (0.69) sections of the ASI. This section of the ASI assesses previous detoxifications, inpatient, and outpatient experiences. For the purposes of this study, the treatment history section was administered and used as a potential predictor of alcohol or drug use post-incarceration.

Criminal History Section. A participant's criminal history also was assessed using the criminal history section of the ASI 5th edition (McLellan et al., 1992). Leonhard and colleagues (2000) found a Cronbach's alpha of 0.65 for the legal section of the ASI. This section inquires about number of incarcerations, time spent incarcerated, and number of arrests and charges, broken down by type of offense (shoplifting, drug related,

theft, etc.). Criminal history was tested as a potential predictor of alcohol or drug use after release from jail.

Levenson's Self-Report Psychopathy Scale (LSRP). Psychopathy is associated with remorselessness, certain interpersonal characteristics, recklessness, and often times antisocial conduct. The LSRP is a 26-item self-report scale that asks questions regarding a participant's goals, how they cope with emotions, interpersonal relationships, and assessing consequences. It is comprised of two scales: Primary Psychopathy Scale (selfish and narcissistic tendencies) and the Second Psychopathy Scale (impulsivity). Levenson, Kiehl, and Kirkpatrick (1995) used the LSRP with an offender population and provided a method of scoring the measure. Poythress et al. (2010) found a Cronbach's alpha of 0.86 of the total score of the LSRP. Psychopathy was assessed and used as a potential correlate of social network size.

Twelve-Step Participation Questionnaire-2 (TSPQ-2I). The TSPQ-2I is a 14-question, self-report measure that assesses a participant's lifetime and current attendance and involvement in Twelve-step programs (Alcoholics Anonymous, Narcotics Anonymous, Al-Anon, etc.). The TSPQ has shown strong internal item consistency (Cronbach's alpha $\alpha = 0.85$, Tonigan, Connors, & Miller, 1996) and has been used in studies finding a positive relationship between increased twelve-step involvement and improved substance use treatment outcomes (Timko, Sutkowi, & Moos, 2010).

Alcohol and Substance Use Form-90 DF & QFV (Form-90). The adapted Form-90 has been used to assess alcohol and drug use 90 days prior to the individual's most recent use. The Form-90 has shown consistent results for retests with the same interviewer, with correlation coefficients of 0.93-0.99 for the recent alcohol and drug use

assessment sections (Tonigan, Miller, & Brown, 1997). The Form-90 incorporates two elements to assess substance use: a calendar format, similar to that of the Timeline Followback interview (Sobell & Sobell, 1992); and a grid format to calculate regular patterns of use. The Form-90 also quantifies days of incarceration and residential treatment, health care utilization, employment, and twelve-step meeting attendance. Only the pattern format, calculated by quantity and frequency of drinks and illicit drug use, was used to assess to match the time periods of the IPI. These time periods included the 30 days prior to incarceration (T1), the first 30 days post-release from jail (T2), and the time 31 days after release to the time of the study assessment (T3). The Form-90 provided a basis for quantifying alcohol or drug use before and after incarceration, as well as PDA from both alcohol and drugs.

Urine analysis. To corroborate reported abstinence or alcohol or drug use, a urine analysis (Six Drug (THC/Coc/Opi/Amph/Mamph/Benzo) Dip Test) was performed on-site to detect recent drug use. Prescription drug use reported by the participant was assessed, but was excluded from the participant's total days of drug use, unless he was taking the medication other than as prescribed. Types of prescription drugs that potentially were not included in a participant's total days of drug use were psychotropic medication, sleeping medication, pain relievers, and medicinal marijuana.

Procedures

When an individual called the study phone number, he or she was connected to a secure voicemail at the Center on Alcoholism, Substance Abuse, and Addictions (CASAA) at the University of New Mexico. When a member of the research staff

contacted individuals the research staff answered any questions about the study and went over the initial screening questions with the individual.

Screening. The screening form was used to determine the individual's involvement with the CJS, recent or current alcohol or drug use, and the individual's ability to answer questions presented in the assessment battery. When contacted, a member of the research staff reviewed the initial screening questions with the individual (see Appendix C), verified consent to answer questions about sensitive information, and proceeded to the inclusion and exclusion criteria. For the purposes of the screening form, verbal consent was required as a waiver of documentation of consent. This protected the identity of individuals who were screened but did not participate in the study.

Assessment procedures. Interviews were held at either the New Mexico Corrections Department, Probation Parole Division (3010 Monte Vista NE, Albuquerque, NM; $n = 3$) or at CASAA ($n = 37$). An individual was given the choice of completing the assessment at either location when both locations were available. Both locations provided a quiet, private room to complete the computer and interview assessments. When an individual came in for his assessment appointments, research staff answered any questions and went over the informed consent with the individual. The research staff highlighted the following elements of the consent form: (a) *participation is at all times voluntary, if at any time the participant does not wish to answer a question or continue participation, no repercussions will result*; (b) *participation in the study will in no way affect the individual's involvement with probation*; (c) *participation in the study and all information are kept confidential within the research study staff, unless the individual expresses intent to harm himself or others, the abuse or neglect of a child or elderly*

person, or if the individual decides to file a grievance against the New Mexico Corrections Department about participation in the current study; (d) all reports of alcohol or drug use are kept confidential from the courts, the New Mexico Corrections Department, and the probation officers (unless there is intent to over-dose); and (e) there will be a urine analysis administered at the end of the assessment, and results will not be disclosed to anyone outside of the research study staff. Once an individual fully understood the content of the consent form and agreed to participate, he was instructed to sign the informed consent. The Health Insurance Portability and Accountability Act (HIPAA) consent was not required for the current study. After the consent form was signed and any questions were clarified, research staff members offered the participant a copy of the consent form.

Excluding the interviews (MMSE, SCID, IPI, ASI, Form-90, and urine analysis screen), all other assessments were administered via the computer. Before the assessments were administered, blood alcohol content was tested using a digital breathalyzer or BAC strips. The order of assessments was: (a) MMSE via interview; (b) SCID for substance use disorders via interview; (c) demographics via computer; (d) IPI via interview, assessed for three time points: 30 days prior to incarceration (T1), 30 days post-release (T2), and 31-days post-release until the day before the assessment (T3); (e) Readiness Ruler via computer, assessed for two time points: prior to incarceration and present; (f) ASI – substance use treatment and criminal history sections via interview; (g) LSRP via computer; (h) TSPQ-2I via computer; (i) Adapted Alcohol and Substance Use Form-90 and Form-90 QF via interview, assessed for three time points: 30 days prior to incarceration (T1), 30 days post-release (T2), and 31-days post-release until the day

before the assessment (T3); and (j) the urine analysis screen. The IPI, Form-90, and Readiness Ruler were assessed for multiple time points. These multiple data points were used to examine if social support levels and motivation to change were potential predictors of alcohol or drug use after incarceration. Once all assessments were completed, the participant signed a receipt and received a \$25 gift card for participation. All payments were made in gift cards for K-Mart ($n = 27$) or Target ($n = 13$), which were chosen because neither alcohol nor tobacco is sold at either store. Any additional questions were answered and the participant was thanked for participating.

Data Analysis

Data management. No participant scored below 20 on the MMSE, therefore all participants' data were included in the analyses.

In previous studies, results of urine analyses have been consistent with self-reports of alcohol or drug use (Napper, Fisher, Johnson, & Wood, 2010; Project MATCH Research Group, 1997; Weiss et al., 2008), and usually discrepancies have been the result of negative urine analyses when the participant reported drug use (Project MATCH Research Group, 1997). If a participant reported drug use, but the urine analysis results were negative, the participant's self-reported data were used for analyses. Actions for dealing with positive urine analysis inconsistent with self-report would have been dealt with according to the number of incidences. However, the results from participants' urine analyses were consistent with their reports of substance use, so self-reported alcohol and drug data were used for all analyses.

Participants with alcohol use disorders were compared with participants with other substance use disorders to determine if individuals differed by substances of abuse.

Social Environment of Probationers

Participants were compared on demographic information and the composition of participants' social networks. If there were significant differences between groups of substance abusers, appropriate considerations were made regarding data analyses and the generalizability of results.

Potential issues with the distributions of each of the variables were examined for outliers (± 2.5 standard deviations from the mean) and non-normality, and were dealt with properly (e.g., removal from analyses, transformations.). For example, skewness and kurtosis statistics were examined for each time period for social network size (skewness statistics ranged from .347 to .543, kurtosis statistics ranged from -.368 to -1.107), and percentages of social network members who were heavy drinkers (skewness statistics ranged from 1.585 to 3.165, kurtosis statistics ranged from 2.045 to 11.565), heavy drug users (skewness statistics ranged from 1.126 to 2.142, kurtosis statistics ranged from .364 to 3.825), users of any kind (skewness statistics ranged from .003 to -.250, kurtosis statistics ranged from -.439 to -1.021), and abstainers (skewness statistics ranged from -.003 to .250, kurtosis statistics ranged from .439 to 1.021). To adjust for threats to non-normality, all percentage variables (heavy drinkers, heavy drug users, users, and abstainers) were transformed (arcsine square root) and analyses for aim two that tested changes in social network variables were reexamined. Because results with the transformed data matched the results with the non-transformed data, all results are presented with the non-transformed data. Due to measurement error at the start of the study (complete abstinence from both alcohol and drugs was not recorded), PDA was unavailable for three participants for pre-incarceration and post-incarceration, and for four participants for the present time period.

Hypothesis testing. To answer the first aim, describing the social networks of alcohol or drug offending probationers, the following subscales of the IPI were scored: (a) total number of members in social network, (b) average general support received from the network member, (c) percentage of network members who are heavy drinkers, (d) percentage of network members who are abstainers or recovering alcoholics, (e) average frequency of drinking in social network, (f) number of people in network who accept or encourage participant's drinking or drug use, (g) number of network members who do not accept participant's drinking or drug use, (h) spouse's level of support for participant's drinking or drug use, and (i) number of network members supportive of treatment.

The second aim of the study examined if and how social networks changed over time from T1 to T2 to T3. First, paired sample *t* tests were used to determine whether there were changes in the social network variables from T1 to T2, T1 to T3, and T2 to T3, on the following variables: (a) total number of members in social network, (b) percentage of network members who are heavy alcohol or drug users, and (c) percentage of network members who are abstainers or recovering alcoholics. Since there were at least some changes in the social network, regression models were used to examine if additional variables could predict future social network variables after controlling for the previous time period's social network variable. The additional variables included in the regression models were: alcohol versus drug use disorder only diagnosis, abuse only versus dependence diagnosis, and single versus in a relationship (i.e., if a participant reported having a spouse or significant other in his social network). A comparison then was made between the trends observed in the data and the a priori hypotheses. Additionally, twelve-step meeting attendance was assessed for each of the three time

periods (T1, T2, T3) using the *Form-90*. Psychopathy also was assessed as a potential correlate of the size of an individual's social network and mean levels of general support using the *LSRP*.

The third aim examined the relationship between social network variables and alcohol or drug use after incarceration. To test social network variables as mediators of substance use outcomes, correlations between pre- and post-incarceration, and post-incarceration and present substance use were performed to identify significant relationships. Correlations between T1 substance use and social network variables then were performed, and this was repeated for the T2 and T3 time periods. Because correlations were significant, social network variables were tested as mediators of the pathway between T1 and T2 substance use, and T2 and T3 substance use.

The next step was to examine social support as a predictor of subsequent substance use in a time-lagged model analysis. This time-lagged analysis used social network variables pre-incarceration to predict substance use during T2, and social support during T2 to predict T3 substance use. Because twelve-step attendance was not a significant predictor in social network changes, it was not included in these models.

Difference scores of social network variables and PDA between T1 and T2, and T2 and T3 were computed. Next, the regression models used to analyze social support as a dynamic predictor of substance used the computed difference scores between T1 and T2 social network variables to predict T2 and T3 substance use. Similarly, the difference scores between T2 and T3 social network variables were used to predict T3 substance use. The reciprocals of each model also were tested. For example, the difference scores between T1 and T2 social network variables were used to predict T2 PDA, and the

difference score between T1 and T2 PDA was used to predict T2 social network variables.

The fourth aim assessed potential associations between other individual difference variables and PDA. These differences include: demographics such as ethnicity, employment, and education; motivation; previous substance use history; criminal history; and twelve-step involvement (as defined as the number of twelve-step meetings in the last ninety-days, last year, and lifetime). Results were then compared to the a priori hypotheses. Because ethnicity, employment, and education all are categorical variables, each of them was dummy coded and used in a regression model to predict PDA and PDH at T1, T2, and T3 time periods. For ethnicity, the base group was White, Non-Hispanic participants, and subgroups of Hispanics were collapsed into one group. Employment status used unemployed as the base group, combined retired and homemakers into one group, and also examined if family income was a correlate of PDA or PDH at any time period. Education was both dummy coded with no high school diploma as the base group, and also examined the number of years of formal education completed as a correlate of PDA or PDH at any time period.

Results

Participants

Descriptive statistics on participants ($N = 40$) are provided in Table 1, and include ethnicity, marital status, employment status, education, and other information. Of note are the sample's overrepresentation of minorities, a large proportion without a high school diploma, and low median income, as compared to both the state and national levels (United States Census Bureau, 2010). Also presented in Table 1 are the mean number of

days of incarceration; mean number of days since release from jail; mean percent days abstinent from both alcohol and drugs (PDA) and percent days of heavy drinking (PDH) from T1, T2, and T3 time periods; and mean ratings for motivation to cut down or stop using substances from T1 and T3.

Results were consistent with previous studies in that there were no discrepancies between urine analysis results and self-reported substance use. Because urine samples were tested on site, analyses that indicated an “invalid” result ($n = 3$) were retested again until results were valid. Only one participant refused to do the urine analysis.

Social Network Variables

The variables from participants’ social networks were averaged from each of the time periods (T1, T2, and T3), and are presented in Table 2. On average, the number of members in a network were approximately 7 (at T1 and T3) or 6 (at T2), general support ranged from 3.9 (“4” being “supportive” to 4.7 (“5” being “very supportive”), percentage of heavy drinkers varied across time periods from 15.6% (T1) to 6.5% (T3), percentage of heavy drug users decreased from 24.8% (T1) to 13.5% (T3), percentage of abstainers increased from 44.1% (T1) to 55.5% (T2) and then decreased to 52.8% (T3), average frequency of drinking and drug use was around 1.7 (where “2” was “less often than monthly”) to 2.7 (where “3” was “monthly”), number of network members who accepted the individuals’ substance use decreased from 2 members (T1) to 1 (T3) and percentage of members who accepted substance use also decreased from T1 to T2. The number of members who were against the individual’s substance use increased from T1 to T2 and as did the percentage of members who were against the individual’s substance use; the percentage of spouses who accepted substance use decreased from 33.3% (T1, $n = 21$) to

11.1% (T3, $n = 18$), and the number and percentage of network members who were supportive of substance use treatment both increased from T1 to T2. There were no hypotheses for this aim, and all analyses were exploratory.

Changes in Social Networks.

As predicted, using hierarchical level modeling (HLM) and paired t tests, there were significant changes in most of the social network variables across time, and between many paired time points (using paired t tests) from T1 to T2, T2 to T3, and T1 to T3. Specifically, the: (a) total number of network members decreased from T1 to T2 and increased from T2 to T3, (b) percent of members who were heavy drinkers decreased from T1 to T2 and T2 to T3, (c) percent of members who were heavy drug users decreased from T1 to T2 and T2 to T3, (d) percent of members who were users of any kind decreased from T1 to T2 and T2 to T3, and (e) percent of members who were abstainers or in recovery increased from T1 to T2 and T2 to T3 (see Table 3). All HLM models were consistent with the paired t tests (excluding social network size given its quadratic change), which help to reduce the chance of a Type I error associated with the multiple analyses of the paired t tests. The effect sizes for these changes in social network variables also are presented in Table 3. For changes in network variables that were significant across two time periods, Cohen's d effect sizes were small and ranged from 0.351 to 0.453, with one medium-sized effect of 0.521 (percent heavy drinkers from T1 to T3).

Predictors of social network changes. Contrary to the hypotheses, twelve-step attendance, alcohol versus drug use diagnoses, abuse versus dependence diagnoses, and current marital status were not significant predictors of changes in the five social

networks variables (network size, percent heavy drinkers and drug users, percent users of any kind, percent abstainers). Because twelve-step attendance was not a significant predictor of change, it was not included in future models as a control variable. There were two trend-like associations between the predictor variables and changes in social networks. Marital status approached significance as a predictor of percentage of networks with heavy drug users in the T3 period ($p = .054$). Abuse versus dependence diagnosis also exhibited a trend-like positive association with T2 percentage of users of any kind and T2 percentage of abstainers ($p = .052$). None of the scores from the LSRP Primary Psychopathy Scale, Secondary Psychopathy Scale, and total score were related to network size or mean levels of general support at the T1, T2, or T3 time periods.

Associations Between Social Networks and Substance Use

Correlations. PDA was significantly correlated for T1 and T2, and T2 and T3 ($r = .441, p < .01$; $r = .468, p < .01$, respectively). Correlations between substance use and concurrent social network variables were examined across the five social network variables used in previous analyses.

Social network size. Social network sizes were significantly correlated for T1 and T2 ($r = .748, p < .001$), and T2 and T3 ($r = .704, p < .001$). Social network sizes for T1 and T2 were not related to PDA in the same time period, but T3 social network size was negatively related to T3 PDA ($r = -.382, p = .02$), such that a smaller social network was related to higher PDA. PDH was not related to social network size at any time period.

Percent heavy drinkers. The percentages of social network members that were heavy drinkers (percent heavy drinkers) were significantly related from T1 to T2 ($r = .662, p < .001$), and T2 to T3 ($r = .810, p < .001$). Percent heavy drinkers was not related

to T1 PDA, but T2 and T3 percent heavy drinkers both were related negatively to PDA in the same time period ($r = -.489, p < .01$; $r = -.450, p < .01$, respectively), such that having a smaller percentage of social network members that were heavy drinkers was related to greater abstinence. T1 percent heavy drinkers showed a trend relation with concurrent PDH ($r = .311, p = .054$), and no other time periods approached significance.

Percent heavy drug users. The percentages of social network members that were heavy drug users (percent heavy drug users) were significantly related from T1 to T2 ($r = .564, p < .001$), and T2 to T3 ($r = .780, p < .001$). Percent heavy drug users across all time periods were negatively related to PDA in the same time period ($r = -.364, p < .05$; $r = -.742, p < .001$; $r = -.581, p < .001$, respectively), such that having a smaller percentage of social network members that were heavy drug users was related to greater abstinence. PDH was not related to percent heavy drug users at any time period.

Percent users of any kind (percent users). The percentages of social network members that were users of any kind (alcohol or drug, percent users) were significantly related from T1 to T2 ($r = .624, p < .001$), and T2 to T3 ($r = .519, p < .001$). Percent users at T1 and T3 exhibited a trend-like association with PDA at the same time period ($r = -.301, p = .070$; $r = -.315, p = .057$, respectively), but only T2 percent users was significantly related to T2 PDA ($r = -.495, p < .01$), such that having a smaller percentage of users was related to greater abstinence. PDH was not related to percent users at any time period.

Percent abstainers or individuals in recovery (percent abstainers). All of the significant results from the percent users model also were significant for the percent abstainers models, and correlation coefficients for the percent abstainers models were the

exact reciprocals of those from the percent users models. Results for the percent abstainers models that paralleled the results from the percent users models will not be reported.

Mediation models. Because PDA and all of the social network variables were significantly related across time, social network variables were tested as mediators of T1 to T2 PDA, and T2 to T3 PDA. First, the five social network variables (network size, percent heavy drinkers, percent heavy drug users, percent users, and percent abstainers) were tested as mediators of T1 to T2 PDA, and T2 to T3 PDA using the Baron and Kenny method (see Baron & Kenny, 1986; Hayes, 2009). Using this method, only percent heavy drug users was found to be a significant mediator between T1 and T2 PDA (see Figure 2), such that T1 PDA predicted T2 percent heavy drug users ($a = -.254, p < .05$) and T2 PDA ($c = .412, p < .01$), and T2 percent heavy drug users predicted T2 PDA ($b = -1.009, p < .0001$). When both T1 PDA T2percent heavy drug users were entered into the model as predictors of T2 PDA, T2 percent heavy drug users remained significant ($b' = -.951, p < .0001$), but T1 PDA did not remain significant ($c' = .170, p = \text{n.s.}$). No other social network variable was a significant mediator using the Baron and Kenny method at any of the time periods.

Because of the small sample size of the current study and the low power offered by the Baron and Kenny method, a Monte Carlo method of testing mediation also was used (Selig & Preacher, 2008), which produces confidence intervals that indicate whether or not the M variable acts as a mediator of X and Y . This Monte Carlo method provides greater power to detect mediation effects and has been shown to be comparable to bootstrapping, and provides confidence intervals as a hypothesis test to determine if the

M variable is a significant mediator between *X* and *Y* variables. Similar to the Baron and Kenny method, only percent heavy drug users was a significant mediator for T1 to T2 PDA ($LL = .0395$, $UL = .4776$). No other social network variables were significant mediators of T1 to T2 PDA, or T2 to T3 PDA.

Time-lagged models. Regression models were used to examine if the previous time period's social network variables predicted the subsequent time period's PDA. All models controlled for the previous time period's PDA.

Social network size. T1 PDA significantly predicted T2 PDA ($\beta = .404$, $p < .01$), and T2 PDA significantly predicted T3 PDA ($\beta = .658$, $p < .001$) after controlling for T1 and T2 social network size, respectively. T1 social network size did not significantly predict T2 PDA after controlling for T1 PDA. T2 social network size predicted present PDA after controlling for T2 PDA ($\beta = -.039$, $p < .05$).

Percent heavy drinkers. T1 PDA significantly predicted T2 PDA ($\beta = .594$, $p < .05$), and T2 significantly predicted T3 PDA ($\beta = .644$, $p < .001$) after controlling for T1 and T2 percent heavy drinkers in the social network, respectively. Neither T1 nor T2 percent heavy drinkers predicted T2 and T3 PDA, respectively, after controlling for T1 and T2 PDA.

Percent heavy drug users. T1 PDA significantly predicted T2 PDA ($\beta = .324$, $p < .05$), and T2 significantly predicted T3 PDA ($\beta = .707$, $p < .001$) after controlling for T1 and T2 percent heavy drug users in the social network, respectively. Neither T1 nor T2 percent heavy drug users predicted T2 and T3 PDA, respectively, after controlling for T1 and T2 PDA.

Percent users. T1 PDA significantly predicted T2 PDA ($\beta = .360, p < .05$), and T2 significantly predicted T3 PDA ($\beta = .702, p < .001$) after controlling for T1 and T2 percent users in the social network, respectively. Neither T1 nor T2 percent users predicted T2 and T3 PDA, respectively, after controlling for T1 and T2 PDA.

Dynamic predictor models. Regression models were used to examine if the differences between social network variables in consecutive time periods predicted the PDA in the subsequent time period. All models controlled for the PDA from the previous time period, and all differences were calculated using the variable from the earlier time period (T1 or T2, respectively) subtracted from the later time period (T2 or T3). For example, the difference between the social network sizes of T1 and T2 (as calculated by T2 network size minus T1 network size) was used to predict T2 PDA after controlling T1 PDA (see Figures 3 and 4).

Social network size. While controlling for T1 PDA ($\beta = .420, p < .01$), differences between T1 and T2 present network sizes did not significantly predict T2 PDA. Similarly, differences between T2 and T3 network sizes did not significantly predict T3 PDA while controlling for T2 PDA, but T2 PDA was significant ($\beta = .721, p < .001$). When predicting T2 network size, changes in PDA (T2 to T2) did not significantly predict network size while controlling for T1 network size, which was significant ($\beta_{T1} = .719, p < .001$); this also was true for changes in PDA predicting T3 network size after controlling for T2 network size, which was a significant predictor of T3 network size ($\beta_{T2} = .696, p < .001$).

Percent heavy drinkers. Changes in percentage of network members who were heavy drinkers from T1 to T2 approached significance as a predictor of T2 PDA ($\beta = -$

.709, $p = .088$) after controlling for T1 PDA ($\beta = .429, p < .01$). Changes in T2 to present T3 heavy drinkers did not significantly predict T3 PDA after controlling for T2 PDA ($\beta = .729, p < .001$).

In models predicting T2 and T3 percent heavy drinkers, T1 and T2 percent heavy drinkers, respectively, were controlled for and were significant ($\beta = .699, p < .001$; $\beta = .836, p < .001$, respectively). Changes in T1 to T2 PDA significantly predicted T2 percent heavy drinkers ($\beta = -.100, p < .05$) after controlling for T1 percent heavy drinkers. Changes in T2 to present PDA did not significantly predict T3 percent heavy drinkers in the social network.

Percent heavy drug users. In models predicting T2 and T3 PDA, T1 and T2 PDA, respectively, were included and were significant ($\beta = .435, p < .01$; $\beta = .784, p < .001$, respectively). Changes in T1 to T2 percent heavy drug users significantly predicted T2 PDA ($\beta = .515, p < .01$) after controlling for T1 PDA. Similar to percent heavy drinkers, the difference between T2 and T3 percent heavy drug users was not a predictor of T3 PDA.

Comparable to the percent heavy drinkers models, when predicting T2 and T3 percent heavy drug users, the percent heavy drug users from the previous time period was significant in each model ($\beta = .506, p < .001$; $\beta = .771, p < .001$, respectively). Changes in T1 to T2 PDA significantly predicted T2 heavy drug users ($\beta = -.254, p < .01$) after controlling for T1 heavy drug users; changes in T2 to T3 PDA were not significantly related to T3 percent heavy drug users in the social network.

Percent users. T1 ($\beta = .424, p < .01$) and T2 ($\beta = .742, p < .001$) PDA were significant as controls in the models predicting T2 and T3 PDA, respectively. Changes in

T1 to T2 percentage of networks who were users of any kind significantly predicted T2 PDA ($\beta = -.562, p < .01$) after controlling for T1 PDA; the same was not true for changes T2 to T3 percent users.

Differences from T1 to T2 PDA significantly predicted T2 percent users ($\beta = -.269, p < .05$), even after controlling for T1 percent users ($\beta = .801, p < .001$). T2 to T3 changes in PDA did not predict T3 percent users, although T2 percent users was a significant control ($\beta = .478, p < .01$).

Correlates of PDA and PDH

Motivation. First, ratings of motivation from the Readiness Ruler were averaged, and then correlations were examined to assess how these mean ratings of motivation related to PDA and PDH at pre-incarceration, post-incarceration, and present. The mean ratings of motivation were not related to PDA or PDH at any time period.

Next, ratings of T1 and T3 motivation by each specific type of drug were correlated with the percent days of use for each corresponding substance for T1, T2, and T3. Participants who endorsed not using a substance were excluded from the analyses for that specific type of substance. Only percent days of alcohol use only from T1 approached significance as being associated with current motivation to cut down or stop using alcohol ($r = .367, p = .055$). The other ratings of motivation for all other types of substances (marijuana, cocaine, opiates, amphetamines) for T1 or T3 were unrelated to percent days of use for the corresponding type of substance at all other time periods.

On the assessment of present motivation, some participants anecdotally reported choosing “I don’t use this drug” if they currently were abstinent from that type of substance, which would have excluded them from the analyses described above. For this

reason, participants who endorsed any level of motivation for a substance pre-incarceration but reported not using a drug currently, had their scores of motivation recoded from “0” (“I don’t use this drug”) to “10” (“Trying to change”). The change in scores would help to include participants who used a substance pre-incarceration, but endorsed a “0” on their levels of present motivation because they currently were abstinent from that type of drug. Levels of motivation to cut down or stop using stimulants (excluding cocaine) from T3 were significantly related to percent days of amphetamine use at T1 ($r = -.348, p < .05$), T2 ($r = -.337, p < .05$), and T3 ($r = -.352, p < .05$), such that more amphetamine use at all time periods was associated with lower current motivation to cut down or stop using stimulants (excluding cocaine). Percent days of drinking during T1 exhibited a trend-like association with T3 levels of motivation to cut down or stop using alcohol ($r = .306, p = .079$), such that more drinking during T1 was associated with greater motivation to cut down or stop using alcohol during the T3 time period.

Previous substance use treatment involvement. The ASI assessed lifetime number of alcohol treatment episodes, drug treatment episodes, alcohol detoxification only treatment episodes, and drug detoxification only treatment episodes. Only the number of lifetime alcohol treatment episodes was significantly related to T1 PDA ($r = .332, p < .05$), such that more lifetime alcohol treatment episodes were related to greater abstinence. No other previous treatment episode variable was related to PDA or PDH at any time period. However, the number of lifetime alcohol detoxifications showed a trend-like association with T1 PDA ($r = .309, p = .063$).

Current substance use treatment involvement. Current treatment involvement was assessed by the Form-90 and quantified current treatment involvement by the

number of days of attendance at alcohol and/or drug treatment in each time period (12-step meeting attendance also was assessed using the Form-90). There was a significant association between T2 alcohol treatment attendance and T3 PDH ($r = .355, p < .05$). T2 alcohol treatment approach significance as it related to T1 PDH ($r = .313, p = .052$), but all other correlations between current treatment involvement and PDA and PDH at any time periods were not significant. Of note, 25 (62.5%) participants engaged in substance use treatment at any of the time periods, with the highest treatment engagement occurring during the T3 time period. During T1, 27 participants (67.5%) did not attend any alcohol or drug treatment sessions or any 12-step meetings, 9 (22.5%) attended at least one day of treatment or 12-step meeting, and 4 (10%) attended at least one day of treatment and at least one day of 12-step meetings. During T2, 19 (47.5%) participants attended no treatment or 12-step meetings, 13 (32.5%) went to treatment or 12-step meetings at least one day, and 8 (20%) went to both treatment and 12-step meetings at least one day each. For T3, 13 (32.5%) participants did not attend any treatment or 12-step meetings, 16 (40%) attended either treatment or 12-step meetings at least once, and 11 (27.5%) attended at least one day of both treatment and 12-step meetings.

Twelve-step involvement. Twelve-step involvement was assessed by the TSPQ-21 and was examined as attendance of twelve-step meetings (including AA and other twelve-steps group) in the last ninety days, in the last year, and lifetime attendance. Attendance was significantly related across time between past ninety-day and past year attendance ($r = .667, p < .0001$), past year and lifetime attendance ($r = .684, p < .0001$), and past ninety-day and lifetime attendance ($r = .340, p < .05$). Only lifetime attendance of twelve-step meetings was significantly related to T1 PDA ($r = .350, p < .05$), such that

greater lifetime attendance was related to more abstinence prior to incarceration. Past ninety-day attendance of twelve-step meetings approached significance as being related to T2 PDA ($r = .274, p = .096$) and the T3 time period ($r = .271, p = .106$). All other correlations of twelve-step attendance and PDA and PDH were not significant.

Twelve-step attendance also was assessed by the Form-90 for each time period (T1, T2, and T3). The majority of the sample did not attend any twelve-step meetings at various times (82.5% not attending any twelve-step meetings during T1, 62.5% during T2, and 60% during the T3 time period). T1 twelve-step attendance was significantly correlated with concurrent PDA ($r = .341, p < .05$). T2 and T3 twelve-step attendance exhibited trend-like associations with concurrent PDA ($r = .282, p = .086$; $r = .284, p = .088$, respectively). Twelve-step attendance was not related to PDH at any time period.

Criminal history. The legal history section of the ASI assessed for participants' criminal histories, and included the number of lifetime adult arrests, convictions, driving while intoxicated (DWI) charges, major driving violations, and the total number of months incarcerated (see Table 4). Of these variables, only the number of major driving violations was positively related to T1 PDA ($r = .402, p < .05$), such that the higher the lifetime number of major driving violations the higher the T1 PDA. There was a trend-like relation between the number of DWIs and T1 PDA ($r = .295, p = .076$), such that the higher the number of lifetime DWI charges the higher the T1 PDA. No other criminal history variable was related to PDA or PDH at any time period.

Substance use severity. Substance use severity was quantified as the percentage of days of any substance use (alcohol and drugs) in the 30 days prior to incarceration assessed by the Form-90. T1 percent days of use was significantly related to T2 PDA ($r =$

-.441, $p < .01$), T3 PDA ($r = -.468, p < .01$), and T1 PDH ($r = .379, p = .023$). T1 percent days of use was not related to T2 or T3 PDH.

Demographic information. The CASAA Demographic interview form was used to collect participants' demographic information. Ethnicity, employment, education, and income were examined as correlates of PDA and PDH across all time periods. Significant results or results that approached significance are reported below; all other analyses were neither significant nor approached significance.

Ethnicity. African Americans approached significance as differing from the White Non-Hispanic group in terms of T3 PDH ($\beta = .134, p = .056$), such that African Americans might have had a higher PDH at the T3 time period than the White Non-Hispanic group. No other groups differed from the White Non-Hispanic group in terms of PDA or PDH at any time period.

Employment. Employment status was unrelated to PDA or PDH at any time period. Family income exhibited a trend-like association with PDA prior to incarceration ($r = -.308, p = .082$), such that higher income was related to lower PDA. Family income was not related to PDA or PDH at any other time period.

Education. Only the number of years of education completed exhibited a trend-like association with T2 PDA ($r = -.320, p = .050$), such that more years of education were related to lower PDA during the 30 days after being released from jail. The number of years of education was unrelated to PDA and PDH at all other time periods. To compare participants with a high school diploma or higher to participants without a degree, the highest degree completed was dummy coded and grouped high school diploma with a Graduate Equivalent Degree (GED). Here, having a high school

diploma/GED or a master's degree approached significance as varying from participants without a degree in terms of T1 PDA ($\beta = .242, p = .085$; $\beta = .658, p = .096$, respectively), such that a higher degree completed was related to having higher PDA prior to incarceration. Of note, only one individual reported having a master's degree, and having some college, an associate's degree, or a bachelor's degree was unrelated to PDA.

Age. Age was examined as a post-hoc correlate of PDA or PDH at any time period. Age was related to neither PDA nor PDH at T1, T2, or T3.

Discussion

The purpose of this study was to examine the demographic characteristics and social networks of adult males on probation for an alcohol or drug related charge who had been recently released from jail, to determine if and how social networks of this group changed before and after incarceration, and to see if and how social networks were related to substance use before and after incarceration for this population. The results highlighted the severity of this population, including the over-representation of minorities, the high rates of unemployment, the low educational level, the median annual income below the nation's poverty level, and the high average number of arrests and months of lifetime incarceration. All social network variables changed significantly between at least one pair of time periods (T1 to T2, T2 to T3, or T1 to T3), and many of the changes in T1 to T2 social network variables predicted PDA after release from jail (e.g., percentage of networks that were heavy drinkers, heavy drug users, users). Additionally, all social network variables were significantly related to at least one concurrent time period PDA. Of note, percentage of network members that were heavy drug users was significantly and negatively related to concurrent PDA across all time

periods, and mediated the relationship of PDA from pre- (T1) to post-incarceration (T2). Surprisingly, the majority of the individual differences tested (e.g., motivation, substance use treatment, demographic information) was not related to PDA or PDH at any time period.

Compared to other large clinical samples of individuals with SUDs (Project MATCH and Project COMBINE), the current study sample was comparable in age, had a larger proportion of minorities in the sample, had less education (however, comparable to other probationers/parolees; SAMHSA, 2011), had a larger percentage of participants who were unemployed, and had a smaller proportion who were married (Longabaugh et al., 2010; Zywiak et al., 2002). There were significant differences in the recruitment strategies of Project MATCH and Project COMBINE and the current study. Of note, Project MATCH and Project COMBINE excluded individuals with non-alcohol substance use disorders (other than nicotine or cannabis), likely included some individuals who were involved with the CJS, and only recruited individuals who currently were in substance use treatment. The differences in recruitment approaches may account for differences in study sample characteristics.

The first aim of this study was to examine the demographic information and social networks of adult male probationers with SUDs recently released from jail for an alcohol or drug related offense. There were no preliminary hypotheses for this aim, but descriptive information about the sample's social networks showed that there was high variability in many of the variables, which may be attributable to the small sample size or possible subgroups that may better categorize individuals in this population; additional research in this area is needed. The average size of social networks ranged from six to

seven individuals, which is comparable to network sizes from Project COMBINE (Longabaugh et al., 2010), but considerably smaller than individuals without stigma or whom are considered with “positive regard” (Carter & Feld, 2004) and individuals with co-occurring mental illnesses and SUDs (Skeem, Loudon, Manchak, Vidal, & Haddad, 2009). Smaller network sizes are consistent with evidence that stigmatized individuals (e.g., offenders) have smaller social networks (Carter & Feld, 2004).

The second aim was to determine if social networks changed from before to after incarceration. The results indicated that every social network variables changed from pre-incarceration (T1) to post-incarceration (T2), which is similar to social networks changing as a result of engaging in substance use treatment (Longabaugh et al., 2010), and most variables remained the same once the person was released from jail (excluding social network size). It was hypothesized that twelve-step attendance, substance use diagnosis (i.e., alcohol only versus drug only, abuse only versus dependence), and marital status would influence social network variables, but these influences were not found. Although the effect sizes for the changes in social networks were small, except for the medium effect found for percent heavy drinkers, these changes may be clinically relevant. The changes in social networks may be clinically relevant because they suggest that shifting only a few network members (either in terms of network members decreasing their use or decreasing the percentage of networks who use substances) may be related to less substance use after release from jail. Further, the changes seen in social networks suggest that social networks, and therefore social support, may not be a static factor, as proposed in Witkiewitz and Marlatt’s (2004) model of relapse.

The third aim of the presented study was to examine the association between social network variables and substance use in a variety of ways, including correlations between concurrent social network variables and PDA, time-lagged models, mediator models, as well as using changes in the social network variables and PDA as dynamic predictors of each other. Although every social network variable tested was related to concurrent PDA in at least one time period, most were related to concurrent PDA at post-incarceration (T2) or present (T3), which may indicate that social networks and network members' substance use may be more strongly associated after individuals are released from jail. Additionally, the percentage of network members that were heavy drug users was negatively related to concurrent PDA across all time periods, which is analogous to the results from Project COMBINE about heavy drinking network members (Longabaugh et al., 2010). The consistent association between percentage of network members who were heavy drug users and PDA may mean that having more friends or family who use substances heavily may make it especially difficult for individuals to stay sober themselves, but this direct effect between using members' influences and individuals' own use was not assessed specifically for the current study and future research is needed.

In the time-lagged models, only post-incarceration (T2) network size significantly predicted present (T3) PDA after controlling for post-incarceration (T2) PDA. Other than a small association between post-incarceration (T2) network size and present (T3) PDA, it appeared that social network variables were not sufficient in predicting the subsequent time period PDA. One reason that social network variables did not predict future substance may be that certain social networks have a greater influence on concurrent substance use. For example, having friends or family members who pressure or

encourage individuals to use alcohol or drugs may have a large impact on whether or not those individuals use that day, but pressure or encouragement to use today may not matter as much next week. Future research is needed to assess directly the influences of network members on individuals' substance use.

Only the percentage of network members that were heavy drug users was a significant mediator of PDA between pre- (T1) and post- incarceration (T2), which means that beyond the influence of individuals' PDA during the previous time period, the proportion of network members who used drugs heavily impacted how individuals used in the subsequent time period. There may be two reasons why this was the only significant mediator of PDA. First, having network members who are only light or moderate drug users may not impact individuals' substance use as much as network members who use more often or in greater quantity. Second, most social networks had more heavy drug users than heavy drinkers, which suggests that additional research on heavy drug using network members may be informative or helpful. However, this is the first study to look at the percentage of social network members that were heavy drug users as a mediator of PDA, and replication is needed.

When examining social network variables as dynamic predictors of substance use, there were significant associations between changes in social network variables pre- (T1) to post-incarceration (T2) predicting post-incarceration (T2) PDA (excluding network size), and their reciprocals. How individuals' social networks change, particularly concerning social network members' substance use patterns, appeared to have a significant influence on how often individuals used alcohol or drugs in the month after they were released from jail. Present (T3) PDA was not predicted by any changes in post-

incarceration (T2) to present (T3) social network variables, which may be because most social network variables did not change during this time.

The findings support the inclusion social factors in relapse models (e.g., Witkietwize & Marlatt, 2004). Further, there were a number of results that provided evidence for conceptualizing social networks (and perhaps social support) as dynamic or phasic responses in relapse models (Hunter-Reel et al., 2009), rather than as static factors, as proposed by the relapse model by Witkiewitz and Marlatt (2004). First, social networks were found to change across a relatively short period of time. Next, because social network variables changed and were related to concurrent substance use across time, this suggests that social networks and substance use may interact and sometimes systematically change together. Further, the percent heavy drug users in the network mediated substance use from pre- (T1) to post-incarceration (T2), which provides evidence that social networks can influence individuals' substance use. Perhaps the greatest support for social networks as a dynamic predictor of substance use was the fact that changes in social networks predicted substance use after release from jail even after controlling for substance use prior to incarceration. The time immediately following release from jail appeared to be a particularly important time regarding the influence of social networks on substance use, and stresses the importance of preparing males with SUDs for reentering their environments when prior to them leaving jail.

The fourth aim examined correlates of PDA and PDH across all time periods. Contrary to our hypotheses and previous research (e.g., Witkiewitz & Marlatt, 2004), neither overall ratings of motivation nor motivation to cut down or quit specific substances were related to general substance use or use of corresponding specific

substances (excluding motivation to cut down or quit amphetamines and amphetamine use); these results are inconsistent with other studies (e.g., Schnoll et al., 2005). One reason for these inconsistencies may be measurement error; assessment of motivation pre-incarceration (T1) was done retrospectively, which may have biased how participants recalled their levels of motivation at that time. Additionally, participants may have interpreted responses on the Readiness Ruler differently. For example, participants marked “I don’t use this type of drug” even if they actively were working on not using that substance. Further, the majority of participants used alcohol and multiple types of drugs prior to incarceration, which may have interfered with their ability to differentiate their motivation to cut down or stop using specific types of substances.

A significant portion of the sample did not engage in substance use treatment or attend twelve-step meetings at any time during the assessment period, with only about half of the sample being in formal treatment a month after release. A lack of resources for individuals being released, including access to substance use treatment, has been noted and identified by policy makers as an area for intervention (Travis, Solomon, & Waul, 2001). Lifetime number of alcohol treatment episodes and lifetime twelve-step attendance were positively related to abstinence prior to incarceration, and post-incarceration alcohol treatment attendance was negatively related to PDH at the present time period. These results regarding treatment and twelve-step engagement suggest that engaging in formal or informal substance use treatment may be helpful and needed to reduce substance use both after release from jail and in the future, which is consistent with other research on substance use treatment and offenders (e.g., drug courts, Hiller et al., 2010; Pelissier, Jones, & Cadigan, 2007). Low involvement in treatment may have

contributed to low power to detect the effects of twelve-step and substance use treatment attendance on substance use.

Psychopathy has been found to be common in the CJS population (Clements, 1996), however, mean levels of psychopathy of this sample were lower than reported in other research with offenders that used the same measure (e.g., Poythress et al., 2010). Lower levels of psychopathy may have been part of why psychopathy was unrelated to participants' network sizes for the present study. Further, this study excluded individuals who had been recently released from prison, which may have targeted a less severe population in terms of the seriousness of their offenses and in terms of their psychopathic tendencies.

Although support was found for the hypothesis that pre-incarceration (T1) substance severity would be related to future substance use, a number of other factors including criminal history (excluding major driving violations) and demographic information were unrelated to substance use at any time period, which was contrary to preliminary hypotheses. One reason for the null results of criminal history and demographic information may be the overall low functioning of the group, as seen by low rates of higher education, most individuals being single and unemployed, low median income, multiple lifetime substance use disorders, high rates of arrests and time incarcerated, and a large proportion of individuals (82.5%) relapsing after being released from jail. This evidence of overall low functioning across the group may have provided little variance with which to detect results. These outcomes should be replicated with a larger sample in order to determine how criminal history and demographic information relate to substance use.

Limitations

The current study has a number of limitations. First, the small sample size may have resulted in low power for a number of the analyses, which would make it difficult to detect effects. A number of hypotheses were not supported, which may be due to low power, particularly for results that approached the significant threshold of $p = .05$. Second, each hypothesis included multiple analyses; this fact coupled with a low sample size increases the chance of Type I error (Keselman, Miller, & Holand, 2011). All analyses reported stemmed from preliminary hypotheses (except where noted), and analyses were exploratory and should be replicated to corroborate the findings. Third, because recruitment was on a volunteer-basis, the study sample may be self-selected and may not have included certain types of individuals. For example, individuals who worked full-time may not have had the time to participate or felt incentivized by the study compensation level. An alternative group not represented in the study's sample could be individuals with current severe alcohol or drug use who either did not go to the probation department or were unable to contact the study because of their substance use. A fourth limitation was that changes in individuals' social networks were not tracked to determine if changes were attributable to certain members leaving the social network and others coming in, or if changes were because of behavioral modifications by network members. For example, it is unknown if the decrease in percentage the of network members that were heavy drug users was because individuals ended contact with some heavy drug using network members or if network members decreased their own drug use (and were no longer "heavy drug users"). Fifth, all assessments, excluding the tests of blood alcohol content and urine analyses, were based on self-report. Self-report assessments introduce

the issue of individuals' subjective interpretations of questions, which may have affected differences or increased the inconsistency of answering. Additionally, all assessments were completed retrospectively, which makes their results subject to the biases of individuals' not remembering events accurately or remembering certain events at all. Measuring social network and substance use data weekly or monthly may help to reduce the biases of individuals' memories in future studies.

The present study also has a number of strengths. First, participants in this study included underrepresented individuals: substance users involved in the CJS. Little research to date has examined the association between social networks and substance use specifically for individuals involved in the CJS, despite their large representation in general substance use treatment seeking research samples. Additionally, this study targeted a group of individuals who face a number of difficulties, including unemployment, extensive legal involvement, and multiple SUDs, who could benefit from interventions when they leave jail that target their substance use and the social environments to which they return.

Future Directions

The current study provided evidence of the disparities and disadvantages faced by males with SUDs when leaving jail (e.g., environments that are high risk for relapse, unemployment, low treatment or twelve-step involvement), which is consistent with other research with offenders coping with reentry (Shivy et al., 2007). Brief motivational interventions have been found to be helpful for decreasing alcohol and drug use (Hettinga, Steele, & Miller, 2005), and may help bolster the motivation of males with SUDs being released from jail to change their social networks and decrease their

substance use. Most individuals who participated in substance use treatment did not engage until more than a month after release from jail, but the first 30 days following incarceration appeared to be the most critical in terms of social networks' influences on substance use. There is little research regarding the use of brief interventions on social networks and substance use, but one study found them to be efficacious in terms of increasing awareness of their peers' influences and decreasing the use of social network members (Nygaard, 2006), which may be translatable into a brief intervention for male probationers with SUDs. The time right after individuals are released from jail may be a critical time during which to administer a brief intervention, which may help to decrease substance use following release from jail, and therefore decrease criminal behavior and recidivism rates (Pettus-Davis, Owen Howard, Roberts-Lewis, Scheyett, 2011).

A second area for future research that may be informative is mechanisms of behavior change, specifically how individuals reduce their substance use after getting out of jail. Because substance use significantly decreased after being released from jail, examining how other factors may interact with social networks and in turn influence substance use may help inform future interventions. The current study began to examine the links between social networks and substance use for the CJS population, but replications of the current findings are needed. Future studies that assess social networks and substance use more proximally may be informative and help to provide more reliable results, which can help improve the quality of treatment that men with SUDs get both while incarcerated and when they are released.

Some analyses from the current study could be reexamined using different operational definitions. For example, rather than using PDA from the 30 days prior to

incarceration as a measure of substance use severity, it may be helpful to use the number of substance use dependence criteria endorsed. Further, comparing the number of dependence criteria for each type of substance to percent days of use of that type of substance may be informative. Second, support for drinking has been found to be a predictor of individuals' drinking behaviors (Longabaugh et al., 2010); future analyses could look at network members' support for substance use (drinking or drug use) as a predictor of drinking and/or drug use to test if the findings reported by Longabaugh et al. (2010) replicate with the current sample. Additionally, based on the HLM models, there was significant heterogeneity in changes in social network variables for the second aim (excluding network size), which suggests that participants differ in how their social networks change. Future analyses could identify potential sub-groups (level-2 predictors; e.g., primary drug of abuse) that could better explain how social networks change.

Conclusion

Although individuals involved with the CJS have been included in research examining the link between social environment and substance use, few studies have differentiated results in terms of individuals involved in the CJS and the general substance use treatment seeking population; this study tried to address this gap in the literature. Results showed that adult males' social networks do change after incarceration in jail, and that social networks influence individuals' substance use, which supports the conceptualization of social networks and social support as dynamic predictors of substance use. Further, changes in social networks from before to after incarceration predict substance use after release, but have little influence as time continues. Therefore, if adult males do not change their social networks after the first month of being released

Social Environment of Probationers

from jail, they are less likely to change their networks and are more likely to continue their pattern of use. The results suggest that the time immediately following release from jail may be a critical time during which to intervene, which may have a positive effect on the individuals' substance use, a reduction in their criminal activity, and a decreased probability of being arrested and going back to jail.

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Appendix A

Research Opportunity:

AMPS

Adult Male Probationers' Social environments

Are you an English-speaking male?

Currently on probation?

Recently incarcerated (3-6 months ago)?

A research team from the University of New Mexico is recruiting adult males who were in jail 3 to 6 months ago for one week or longer, and are currently on probation for an offense related to alcohol or drug use (probation violations, DUIs, possession, etc.).

You can make **\$25** for a single, **two-hour** interview.

All information and participation is kept **confidential**.

This study is in no way affiliated with the probation department and participating in this study will **not** influence your status on probation.

Interested? Questions? Call (505) 925-2333

AMPS Study –
@ (505) 925-2333

AMPS Study –
@ (505) 925-2333

AMPS Study –
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AMPS Study –
@ (505) 925-2333

AMPS Study –
@ (505) 925-2333

Appendix B

Research Opportunity:

AMPS – Adult Male Probationers’ Social Environments

A research team from the University of New Mexico is recruiting adult males who were in jail 3 to 6 months ago for seven days or longer, and are currently on probation for an offense related to alcohol or drug use.

You can make **\$25** for a single, **two-hour** interview.
All information and participation is kept **confidential**.
Participating in this study will **not** influence your status on probation.

Fluency in English is required.

Interested? Questions?

Call (505) 925-2333

Research Opportunity:

AMPS – Adult Male Probationers’ Social Environments

A research team from the University of New Mexico is recruiting adult males who were in jail 3 to 6 months ago and are currently on probation for an offense related to alcohol or drug use.

You can make **\$25** for a single, **two-hour** interview.
All information and participation is kept **confidential**.
Participating in this study will **not** influence your status on probation.

Fluency in English is required.

Interested? Questions?

Call (505) 925-2333

Appendix C
Screening Form

Name of Person Conducting Screen:

Date:

First Name of Caller:

Phone #:

For phone screens: **“Hi, my name is _____ from the University of New Mexico calling for _____.** *(Confirm the caller’s identity)* **Is now a good time to talk?** *(If no, schedule time to call back. If yes, proceed)* **I am calling from the AMPS Study, we received a voicemail from you that you might be interested in participating in our study?”** *(If yes, proceed).*

For phone and in-person screens: **“If it is all right with you, I can tell you a little bit about our study.** *(If yes, proceed)* **We are interested in better understanding the experiences individuals face after being released from jail for an alcohol or drug related offense. We are looking to collect this information from individuals through an interview that should take less than two hours. In exchange for your time, you will be paid \$25 in a Wal-Mart or grocery store gift card. All information is kept confidential within the research study, unless you express intent to harm yourself or others. This means that your participation in our study or any alcohol or drug use reported to us will be kept confidential from your probation officer. Interviews can either be held at the probation department on Monte Vista or at our center, which is a block south of Gipson on Yale. What questions do you have so far?** *(Answer any questions)* **Great. Now, to see if you would be a good fit for the study I will need to ask you some brief questions. Some questions ask about sensitive information regarding alcohol or drug use. All information is kept confidential from anyone outside of the study staff, including probation, unless you express intent to harm yourself or others. If at any time you wish to discontinue, you may do so.”**

“Do I have your permission to continue?” YES NO → Exclusion

(If YES, proceed to the inclusion and exclusion criteria. If NO, offer referrals.)

Social Environment of Probationers

1. How do you identify your gender?

MALE FEMALE/OTHER → Exclusion

2. Are you fluent in reading and understanding verbal English?

YES NO → Exclusion

3. Are you currently on probation with the New Mexico Correctional Department?

YES NO → Exclusion

4. What are you on probation for? _____

4a. Is this alcohol or drug related? YES NO → (See #5a)

5. Have you been incarcerated in jail (not prison or treatment) in the last 90 to 180 days?

YES NO → Exclusion

5a. Was this alcohol or drug related? YES NO → Exclusion

5b. Date of incarceration: _____

5c. Date of release: _____

6. Did you use alcohol or drugs at least once 30 days prior to incarceration?

YES NO → Exclusion

(If ELIGIBLE, continue to NIDA Modified ASSIST)

(If Moderate to High Risk, continue to following questions)

Now we're going to shift from talking about alcohol and drugs to some other questions that I ask everyone. I'd like to ask you about unusual experiences that people sometimes have.

"In the last six months have you had any strange, unusual, or frightening experiences such as:"

7. "Hearing things that other people couldn't hear?" Yes ____ No ____
If yes: "Can you give me an example?"

8. "What about seeing things other people couldn't see?" Yes ____ No ____
If yes: "Can you give me an example?"

9. "What about having strange ideas like people were out to get you or that you were receiving special messages from the TV or radio?" Yes ____ No ____
If yes: "Can you give me an example?"

10. "What about feeling that you were losing your mind or having periods of feeling very confused?"
If yes: "Can you give me an example?" Yes ____ No ____

11. "Have you ever been hospitalized for psychiatric treatment?"
If yes: "Can you tell me more about that?" Yes ____ No ____

Eligible for study? YES NO

If eligible: "Thank you for taking the time to answer those questions. It appears as though you would be a good fit for the study, and we would really like you to participate. Do you have any additional questions for me right now? (*Answer any questions*) If it is okay with you then, we will schedule you for an appointment. (*Schedule appointment, reaffirm confidentiality and no influence on probation status, offer directions, and offer a reminder phone call the day before*) Great, we'll see you on (*day*) at (*time*) at (*location*)."

Appointment Date: _____ Time: _____

Location: Probation Department CASAA

Reminder Phone Call? YES NO

If ineligible: "Thank you for taking the time to answer those questions. It appears as though the study might not be a good fit for your right now. Thanks for your interest and have a great day."

Table 1

Descriptive Information

Demographic Variable	n (%)
Gender:	
Male	40 (100)
Female	0 (0)
Ethnicity:	
American Indian or Alaskan Native	1 (2.5)
Black or African-American	7 (17.5)
Hispanic, Mexican	3 (7.5)
Hispanic, New Mexican	18 (45.0)
Hispanic, Other Latin American	1 (2.5)
White, not of Hispanic origin	8 (20.0)
Chose not to answer	2 (5.0)
Age (years):	
Mean (Standard Deviation)	40.3 (12.2)
Current Marital Status:	
Single, never been married	14 (35.0)
Divorced	9 (22.5)
Cohabiting with partner	6 (15.0)
Legally married	5 (12.5)
Separated, but still married	3 (7.5)
Widowed	3 (7.5)
Current Employment Status:	
Unemployed	26 (65.0)
Work <40 hours a week	5 (12.5)
Work 40 or more hours a week	3 (7.5)
Retired	3 (7.5)
Homemakers	1 (2.5)
Chose not to answer	2 (5.0)
Total Family Income (\$):	
Mean (Standard Deviation)	41,955.20 (163,689.01)
Median	3,700.00

Social Environment of Probationers

Education:	
No Degree	16 (41%)
High School Diploma	10 (25.6%)
Graduate Equivalent Degree	6 (15.4%)
Trade School Certificate	3 (7.7%)
Associate Degree	2 (5.1%)
Masters Degree	1 (2.6%)
Chose not to answer	1 (2.6%)

Psychopathy <i>Mean (SD)</i>	
Primary Scale*	20.9 (5.6)
Secondary Scale****	14.1 (4.2)
Total Score*	35.1 (8.0)

Incarceration <i>Mean (SD)</i>	
Days Incarcerated	86.2 (94.4)
Days Since Release	123.6 (31.6)

Substance Use <i>Mean (SD)</i>	
T1 PDA (SD)**	39.2 (38.2)
T2 PDA (SD)***	73.5 (35.9)
T3 PDA (SD)*	75.1 (33.5)
T1 PDH (SD)****	21.7 (32.2)
T2 PDH (SD)****	7.6 (19.5)
T3 PDH (SD)	6.3 (14.0)

Motivation: T1 <i>Mean (SD)</i>	
Alcohol (<i>n</i> = 34)	5.5 (3.2)
Tobacco (<i>n</i> = 29)	5.4 (3.5)
Marijuana (<i>n</i> = 23)	4.0 (3.7)
Tranquilizers (<i>n</i> = 5)	7.2 (4.1)
Sedatives (<i>n</i> = 13)	5.7 (4.1)
Steroids (<i>n</i> = 0)	-
Stimulants (<i>n</i> = 13)	6.0 (3.4)
Cocaine (<i>n</i> = 25)	6.2 (3.7)
Hallucinogens (<i>n</i> = 7)	6.6 (3.7)
Opiates (<i>n</i> = 16)	6.9 (3.8)
Inhalants (<i>n</i> = 2)	10.0 (0.0)
Other Drugs (<i>n</i> = 5)	10.0 (0.0)

Social Environment of Probationers

Motivation: T3 <i>Mean (SD)</i>	
Alcohol (<i>n</i> = 28)	7.9 (2.8)
Tobacco (<i>n</i> = 27)	6.5 (3.2)
Marijuana (<i>n</i> = 18)	6.4 (3.9)
Tranquilizers (<i>n</i> = 3)	8.3 (2.9)
Sedatives (<i>n</i> = 9)	8.9 (2.2)
Steroids (<i>n</i> = 2)	5.5 (6.4)
Stimulants (<i>n</i> = 8)	9.4 (0.9)
Cocaine (<i>n</i> = 20)	9.6 (1.2)
Hallucinogens (<i>n</i> = 5)	7.2 (4.1)
Opiates (<i>n</i> = 14)	9.6 (1.3)
Inhalants (<i>n</i> = 0)	-
Other Drugs (<i>n</i> = 6)	10.0 (0.0)

Notes. **n* = 35; ***n* = 37; ****n* = 38; *****n* = 39. T1 = the 30 days prior to incarceration, T2 = the 30 days after incarceration, and T3 = 31 days after incarceration to the day before the assessment interview. *Mean* ratings of motivation from T1 and T3 excluded participants who endorsed “I don’t use this drug”, and were measured on a scale from 1 (“Not ready to change”) to 10 (“Trying to change”).

Table 2

Descriptive Information for Social Network Variables

Social Network Variable	T1	T2	T3
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Total number of members	6.8 (3.0)	6.0 (2.8)	6.8 (2.9)
Average general support per member	3.9 (1.2)	4.6 (1.0)	4.7 (1.0)
Percentage heavy drinkers (%)	15.6 (21.9)	7.4 (17.6)	6.5 (14.9)
Percentage heavy drug users (%)	24.8 (29.4)	15.5 (26.9)	13.5 (25.7)
Percentage users of any kind (%)	55.9 (25.3)	44.5 (33.0)	47.2 (30.9)
Average frequency of drinking	2.6 (1.6)	1.9 (1.7)	1.9 (1.6)
Average frequency of drug use	2.7 (2.1)	1.8 (2.1)	1.7 (2.1)
Number who accept use	2.3 (2.1)	1.4 (2.2)	1.1 (2.1)
Percentage who accept use (%)	37.0 (30.0)	21.8 (30.0)	16.8 (26.2)
Number who do not accept use	2.4 (2.2)	3.1 (2.7)	3.7 (3.2)
Percentage who do not accept use (%)	36.1 (28.5)	52.6 (34.3)	54.0 (35.2)
Number of spouses who accept use	7.0*	3.0**	2.0***
Percentage spouses who accept use (%)	33.3*	15.8**	11.1***
Number supportive of treatment	4.1 (3.2)	4.0 (3.2)	4.7 (3.5)
Percentage supportive of treatment (%)	61.2 (33.9)	66.4 (37.1)	69.0 (34.8)

Notes. * $n = 21$; ** $n = 19$; *** $n = 18$. T1 = the 30 days prior to incarceration, T2 = the 30 days after incarceration, and T3 = 31 days after incarceration to the day before the assessment interview. Average frequencies of drinking and drug use were measured on a scale from 0 (“not during that time period”) to 7 (“daily”), where 2 was “less often than monthly” and 3 was “about once a month”.

Table 3

Changes in Social Network Variables (β and t values) and Effect Sizes (Cohen's d) of Changes

Social Network Variable	T1 to T2	T2 to T3	T1 to T3
Total number of members			
β values	.000		
t values	2.449*	-2.302*	.000
Effect sizes (Cohen's d)	.389*	.367*	.000
Percentage heavy drinkers (%)			
β values	-.046**		
t values	2.952*	.567	3.112**
Effect sizes (Cohen's d)	.478*	.093	.521**
Percentage heavy drug users (%)			
β values	-.056*		
t values	2.212*	.725	2.646*
Effect sizes (Cohen's d)	-.351*	.115	-.421*
Percentage users of any kind (%)			
β values	-.054		
t values	2.763**	-.556	2.299*
Effect sizes (Cohen's d)	-.453**	-.088	-.373**

Notes. * $p < .05$; ** $p < .01$. All β values are coefficients from hierarchical leveling models looking across T1, T2, and T3, and all but social network size showed significant heterogeneity in these β statistics. The β value for percentage users of any kind approached significance ($p = .051$).

Table 4

Criminal History

Demographic Variable	<i>Mean (SD)</i>	<i>Median</i>
Total number of arrests	15.4 (14.6)	11.0
Total number of convictions	11.0 (10.3)	8.0
Total number of DWIs	1.9 (3.0)	0.5
Total number of major driving violations	8.3 (16.1)	3.0
Total number of months incarcerated	44.6 (60.1)	21.0

Social Environment of Probationers

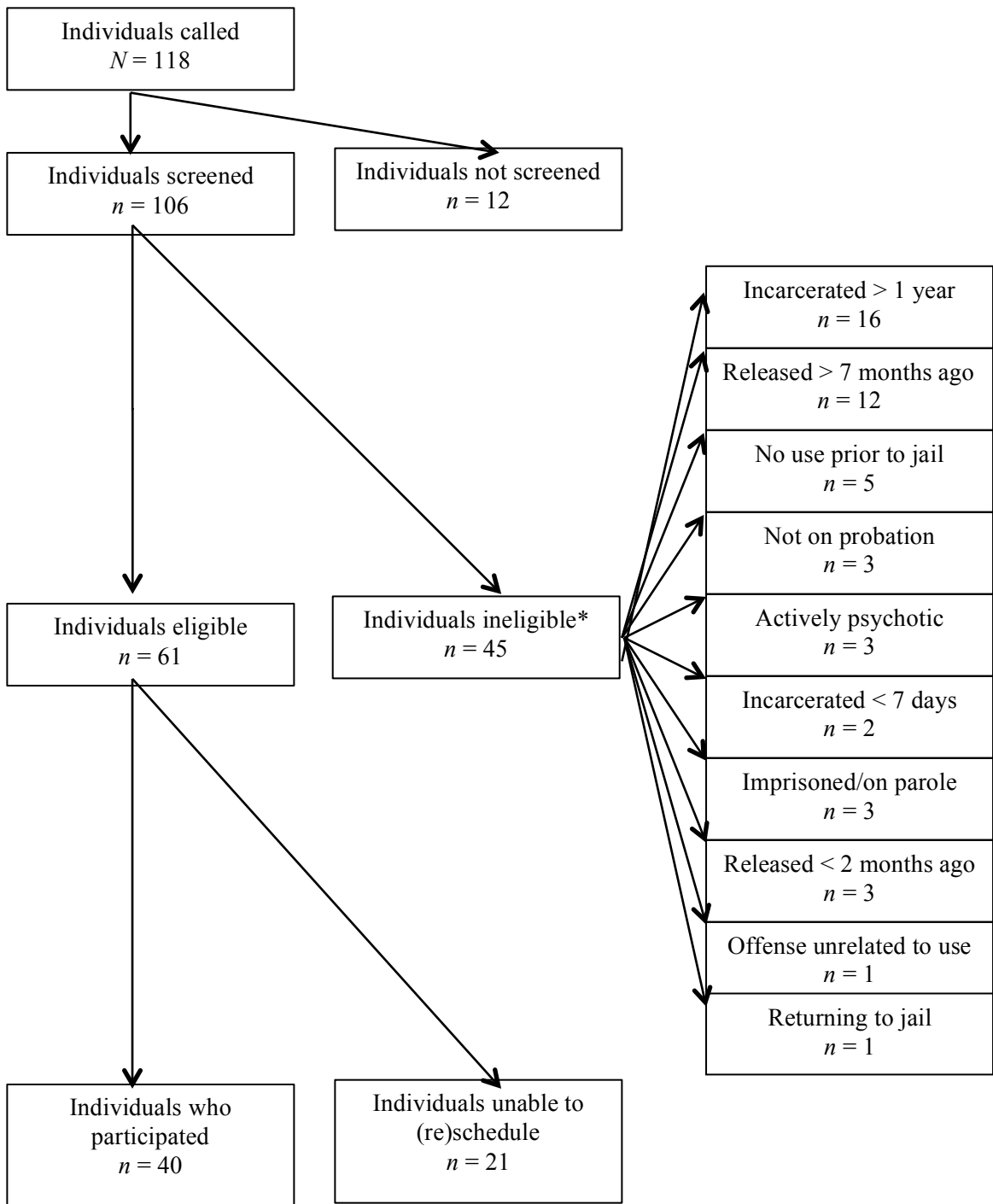


Figure 1. Flow chart of individuals who were included in and excluded from the study.

Note. *Some individuals were ineligible for multiple reasons.

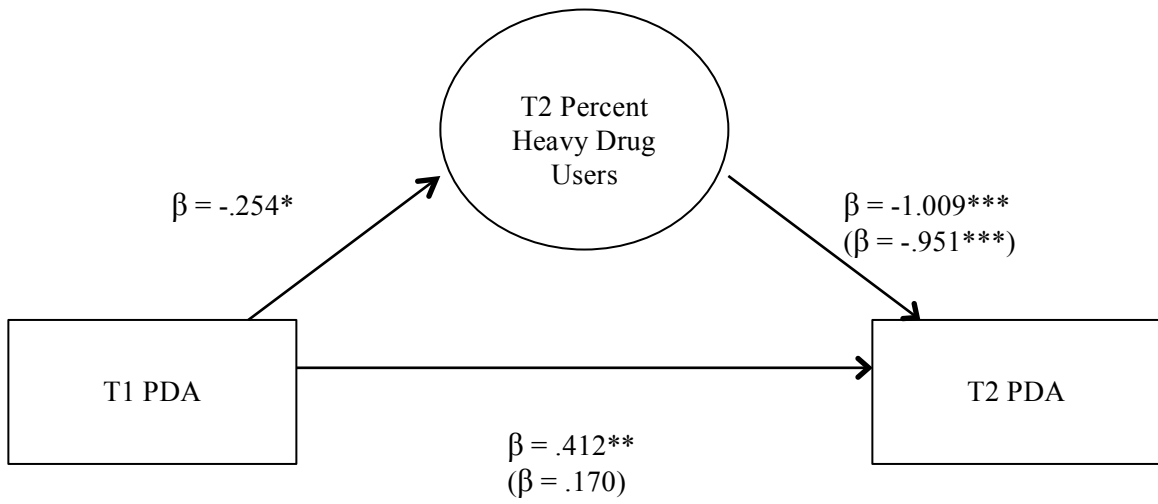


Figure 2. Mediation model of percentage of social networks that were heavy drug users from T1 to T2 (using the Baron and Kenny method).

Notes. * $p < .05$; ** $p < .01$; *** $p < .0001$.

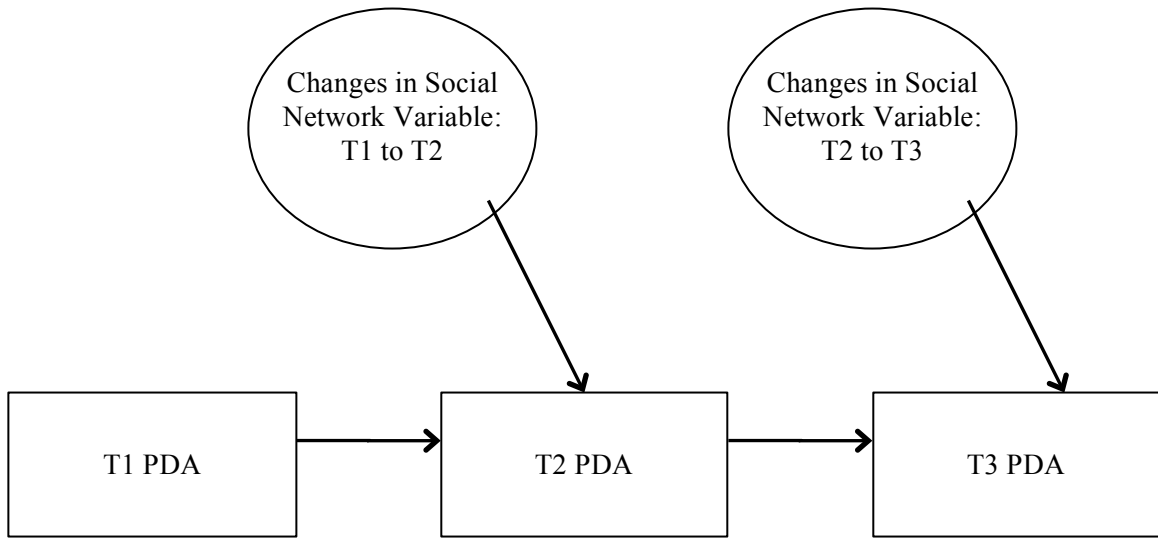


Figure 3. Changes in T1 to T2 and T2 to T3 social network variables as predictors T2 and T3 PDA, respectively (after controlling for T1 and T2 PDA, respectively).

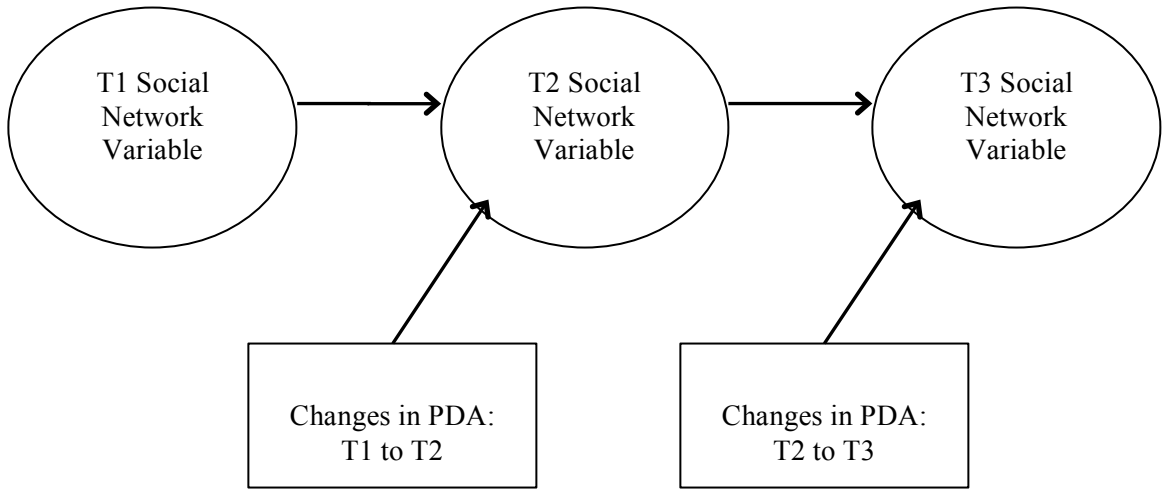


Figure 4. Changes in T1 to T2 and T2 to T3 PDA as predictors T2 and T3 social network variables, respectively (after controlling for T1 and T2 social network variables, respectively).