Criminogenic Needs, Substance Use, and Offending among Rural Stimulant Users

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Abstract

There is a need to understand the determinants of both substance use and criminal activity in rural areas in order to design appropriate treatment interventions for these linked problems. The present study drew on a predominant model used to assess and treat offenders -- the Risk-Need-Responsivity (RNR) model -- to examine risk factors for substance use and criminal activity in a rural drug using sample. This study extends the RNR model's focus on offenders to assessing rural-dwelling individuals using stimulants (N=462). We examined substance use and criminal justice outcomes at 6-month (91%) and 3-year (79%) follow-ups, and used Generalized Estimating Equations to examine the extent to which RNR criminogenic need factors at baseline predicted outcomes at follow-ups. Substance use and criminal justice outcomes improved at six months, and even more at three years, post-baseline. As expected, higher risk was associated with poorer outcomes. Antisocial personality patterns and procriminal attitudes at baseline predicted poorer legal and drug outcomes measured at subsequent follow-ups. In contrast, less connection to antisocial others and fewer work difficulties predicted lower alcohol problem severity, but more frequent alcohol use. Engagement in social-recreational activities was associated with fewer subsequent arrests and less severe alcohol and drug problems. The RNR model's criminogenic

need factors predicted drug use and crime-related outcomes among rural residents. Services adapted to rural settings that target these factors, such as telehealth and other technology-based resources, may hasten improvement on both types of outcomes among drug users.

Keywords

Rural; drug use; alcohol use; criminal justice; risk factors

Methamphetamine and other stimulant use has spread in the US from urban to rural areas (Bowen, Moring, Williams, Hopper, & Daniel, 2012). Indeed, methamphetamine use has reached elevated levels in a number of highly-rural states, such that it is often described as a "rural problem" (Lambert, Gale, & Hartley, 2008; p. 221). Historically, stimulant use has played a role in rural areas because of its assistance in working long hours on farms or in packaging plants; in addition, methamphetamine labs can be hidden, and ingredients for methamphetamine were easy to obtain (Travis & Vereen, 2000). Characteristics of rural areas, such as smaller populations and limited informal networks, make rural areas vulnerable to problems caused or facilitated by drug use, such as crime (Herz & Murray, 2003). Increases found in both drug use and crime rates in rural communities are consistent with a positive association between the two (Herz & Murray, 2003; Keyes, Cerdá, Brady, Havens, & Galea, 2014).

Specifically, 25%–38% of rural arrestees, depending on the region, tested positive for at least one drug at the time of arrest (Herz & Murray, 2003). Research also has shown that people who use drugs are more likely to engage in crime than those who do not, such that the odds of offending are about three to four times greater for drug users than for non-drug users (Bennett, Holloway, & Farrington, 2008; Sutherland et al., 2015). For example, methamphetamine use was associated with property offending, and cocaine use with robbery, violent crime, and homicide (Gizzi & Gerkin, 2009; Hayes-Smith & Whaley, 2009; Sutherland et al., 2015). Accordingly, there is a need to understand the determinants of both substance use and criminal activity in rural areas in order to design appropriate treatment interventions for these linked problems. The present study drew on a model frequently used to assess and treat offenders -- the Risk-Need-Responsivity (RNR) model (Andrews & Bonta, 2010) -- to examine risk factors for substance use and criminal activity in a rural drug using sample.

RNR Model

The RNR model has three core principles. The *Risk principle* entails matching the level of service to the offender's level of risk for reoffending. The *Need principle* involves assessing criminogenic needs and targeting them in treatment. The *Responsivity principle* states that the offender's ability to learn from an intervention is maximized by tailoring the intervention to the learning style, motivation, abilities, and strengths of the individual. Cognitive behavioral strategies to address criminogenic needs are well supported in the literature for successfully treating various forensic populations, including violent, sexual, and juvenile offenders (Heglic, Maile & Mercado, 2010). Alternatives, such as humanistic approaches emphasizing the positive development of the offender, behavior modification, and

psychoeducation to educate offenders about crime and victim statistics, have little evidence to suggest that they are successful at reducing recidivism (Pearson, Lipton, Cleland, & Yee, 2002).

This study focused on the need principle in that it presents the major risk factors that should be assessed and targeted in interventions to reduce recidivism (Bonta & Andrews, 2007). As shown in Table 1, the major risk factors, in addition to unhealthy drug and alcohol use, are having antisocial thought patterns such as high impulsivity and irritability, procriminal attitudes, social support from law-breaking peers and lack of social support from law-abiding peers, poor family relationships, poor work functioning, and lack of prosocial recreational activities. These factors resemble some of the individual, family, social, and community indices, such as employment difficulties, high interdependence, and lack of recreational activities tied to excessive boredom that were noted by Dew, Elifson, and Dozier (2007) as influencing drug use vulnerability in rural settings.

The need principle's risk factors have been examined primarily in studies in which the outcome of interest was recidivism, and, generally, associations of more risk or need with poorer outcome have been supported (Polaschek, 2012; Ward, Melser, & Yates, 2007). Fewer studies have examined whether the same risk factors predict poorer substance use outcomes. A meta-analysis of studies of drug abuse treatment programs in which an intervention was compared to no or usual treatment found that targeting the need principle – that is, providing a greater number of services that addressed risk factors – was associated with better crime outcomes, but less so with drug use outcomes (Prendergast, Pearson, Podus, Hamilton, & Greenwall, 2013). In a randomized trial with 251 individuals on probation for drug (49%), property (21%), personal (15%), or other (15%) offenses, decreases in family criminal networks predicted subsequent fewer crime days, and increased time spent in leisure and recreational activities predicted greater declines in illicit substance use (Wooditch, Tang, & Taxman, 2014).

Present Study

The present study extends the prior literature in several ways. First, this study examined associations of multiple risk factors with a number of indicators of substance use and criminal behaviors in a rural population. In contrast, previous studies have tended to examine only bivariate associations between risk factors and either recidivism or substance use outcomes (Wooditch et al., 2014). Second, this study utilized data from a natural history observational study of a rural community sample of stimulant users, rather than a randomized clinical trial of treatment or referral interventions. Although observational studies have shortcomings, they also have advantages, such as greater external validity; for example, individuals seek and receive health care when they choose to, rather than at predetermined intervals. In addition, observational studies are useful when it is not possible to randomly assign individuals to conditions; that is, it would not be ethical or practical to randomly assign individuals to the risk factors of poor family functioning or poor functioning at work.

This was a three-year study of individuals who were living in rural counties and using drugs, but not receiving drug treatment, at baseline. Its aims were to examine criminal justice and substance use outcomes at six-month and three-year follow-ups, and determine the extent to which baseline criminogenic need factors predicted these outcomes at the follow-ups. For the criminal justice and substance use outcomes, we examined both overall severity of these problems and their specific behavioral indicators. Our aim was to highlight risk factors that should be targeted for intervention studies in rural substance using populations having high rates of illegal behaviors. Data in the present study were collected using an observational design that did not evaluate an intervention targeting these needs. However, prior research suggests that meaningful changes in criminogenic needs, when these needs are intervened upon, are likely to occur (e.g, Heglic et al., 2010). Therefore, knowledge gained from this study of associations of these needs with short and longer-term outcomes indicating poor functioning should help to identify targets for intervention.

Method

Sample

Study participants were 462 stimulant users living in rural counties of Arkansas and Kentucky (Booth, Leukfeld, Falck, Wang, & Carlson, 2006). Eligibility criteria were: (1) use of stimulants (methamphetamine, cocaine) within the past 30 days, (2) no formal or informal (e.g., mutual-help group) drug treatment within the past 30 days, (3) ≥18 years old, and (4) had a verifiable address within one of the study counties. At baseline, participants had a mean age of 34.0 (SD=10.6); most were male (58.4%, n=270), unmarried (87.0%, n=402), and White (57.6%, n=266) or Black (39.6%, n=183), and most had a high school or more education (58.5%, n=270).

Procedure

Study procedures were approved by the Institutional Review Boards at the investigators' universities. A Certificate of Confidentiality was obtained from the National Institute on Drug Abuse. Participants were recruited using Respondent-Driven Sampling, a type of snowball sampling (Heckathorn, 1997; Wang, Carlson, Falck, Siegal, & Rahman, 2005). Study staff identified potential "seeds" by meeting with drug treatment providers in the local area, distributing research study business cards to individuals who might know drug users, and visiting places such as bars frequented by drug users (Draus, Siegal, Carlson, Falck, & Wang, 2005). Study seeds were asked to complete a baseline interview and then to hand out referral coupons describing the study to up to three people they knew who used drugs. Each seed received $10 for up to each of three referred individuals who contacted the study coordinator and were eligible for, and enrolled in, the study.

Participants completed informed consent prior to the baseline interview. Trained research assistants conducted the face-to-face baseline and follow-up interviews using computer-assisted personal interview software on a laptop computer. Follow-up interviews were conducted at six-month intervals for a total of 36 months. They consisted of generally the same questions asked in the baseline interview. Demographic information was collected and updated at each follow-up interview to optimize the ability to locate participants for the

subsequent follow-up. Follow-up rates were 91% and 79%, for the six-month and three-year follow-ups, respectively.

Measures: RNR Risk Factors at Baseline

Antisocial personality pattern—Antisocial personality pattern was represented by two indices (Table 1). Restless, Irritable, and Aggressive was the sum of six items from the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983). Each item asked, "How much discomfort has the problem caused you in the past week, including today" (0=not at all, 1=a little bit, 2=moderately, 3=quite a bit, 4=extremely). Items summed were: feeling easily annoyed or irritated; temper outbursts that you could not control; having urges to beat, injure or harm someone; having urges to break or smash things; getting into frequent arguments; and feeling so restless you couldn't sit still (M=4.7, SD=4.7, range=0–24, Cronbach's alpha=.80). Childhood Antisocial Behavior was the number of "yes" responses to six items pertaining to when the respondent was <15 years old: frequently got into trouble for misbehaving in school; skipped school; told a lot of lies; swiped things from stores, other children, parents, or others; robbed or mugged anyone, purse snatched, or threatened harm if someone didn't give you money or jewelry; expelled or suspended from school (M=2.5, SD=1.8, range=0–6, alpha=.72). Items were based on Diagnostic and Statistical Manual (DSM-IV-TR; American Psychiatric Association, 2000) criteria and the Diagnostic Interview Schedule (Robins, Helzer, Cottler, & Golding, 1989) for conduct disorder.

Procriminal attitudes—Procriminal attitudes (Williams & McShane, 2008) was the sum of four items (1=strongly disagree, 2=disagree, 3=moderately disagree, 4=moderately agree, 5=agree, 6=strongly agree): Sometimes you just don't have any choice but to break the law; No matter how small the crime, breaking the law is a serious matter (reversed); It is morally wrong to break the law (reversed); and, If breaking the law doesn't really hurt anyone and you can make a quick buck doing it, then it's really not that wrong (M=10.4, SD=4.1, range=4–24, alpha=.66).

Social supports for crime—Less social support for crime was represented by more Support from Prosocial Others. Items, taken from the Duke-UNC Functional Support Questionnaire (Broadhead, Gehlbach, deGruy, & Kaplan, 1989), referred specifically to the respondent's non-drug-using social support system. Five questions were coded as 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree: These are people (a) I can have a good time with, (b) I can talk to about important decisions in my life, (c) who recognize my abilities, (d) who show they love or care for me, and (e) who I can count on in an emergency (M=15.9, SD=2.9, range=5–20, alpha=.84). More social support for crime was represented by more Support from Anti-Social Others (Broadhead et al., 1989). Items related specifically to people in the participant's life who were drug users and heavy users of alcohol. Using the same coding, the same five questions were answered (M=13.7, SD=3.4, range=5–20, alpha=.82).

Family/marital relationships—Better relationships were represented by lower scores on the Family-Social Composite on the Addiction Severity Index (ASI; McLellan et al., 1992) (M=.164, SD=.198, range=0-.930). The ASI is a structured, clinical research interview that

assesses problem areas. In each area, a composite score is produced from items that are standardized and summed to provide an internally consistent evaluation of patient status in the past 30 days. Scores range from 0 to 1, with higher scores indicating poorer outcomes. In addition to the ASI Family-Social Composite (example item: In the past 30 days, have you had significant periods in which you have experienced serious problems getting along with your partner or spouse?), better relationships were represented by higher scores on Connectedness (Broadhead et al., 1989), measured with six items: How connected are you with your mother, father, partner/spouse, brothers, sisters, and friends. Items were rated as 1=not at all, 2=slightly, 3=moderately, and 4=extremely (M=13.7, SD=4.6, range=2–24). Alpha was not computed because, conceptually, connection to one family member (e.g., spouse) may not be reliably associated with connection with another (e.g., sibling).

Work—Poorer work functioning (example item: How many days were you paid for working in the past 30?) was represented by higher scores on the ASI Employment Composite; (M=. 578, SD=.280, range=.050–1.00).

Prosocial recreational activities—Engagement in Prosocial Recreational Activities was represented by lower scores on the sum of yes responses to, "I gave up or cut way back on important activities in order to use alcohol or drugs (activities like sports): (a) lifetime, and (b) past 12 months; (M=1.1, SD=.9, range=0–2).

Outcomes at Six Months and Three Years

Criminal justice—Two criminal justice outcomes were measured at the six-month and three-year follow-ups (as well as at baseline; Table 2). Poorer functioning was represented by higher scores on the ASI Legal Composite (example item: How much money did you receive from illegal income in the past 30 days?), and having been arrested and charged (measured with regard to lifetime at baseline, and for the past six months at follow-ups).

Substance use—Greater substance use severity was represented by ASI Alcohol Use composite scores and ASI Drug Use composite scores (Table 2; for example, these composites ask for ratings of how troubled or bothered the individual has been by his or her alcohol, or drug, problems in the past 30 days). In addition, poorer outcomes were reflected in higher frequencies of alcohol and drug use during the past six months (0=never/none, 1=less than once a month, 2=about one to three times a month, 3=about 1 day a week/4 times a month, 4=about 2 days a week, 5=3 to 5 days a week, and 6=6 to 7 days a week/ every day); the mean for drug frequency is >6 because frequency was summed across drugs (mainly methamphetamine, cocaine, opiates, and marijuana).

Analysis Plan

First, we conducted analyses of variance to compare criminal justice and substance use outcomes over the baseline and six-month and three-year follow-up occasions. Then, because of the repeated structure of the data, we used generalized estimating equation (GEE) models to assess associations between RNR risk factors at baseline and criminal justice and substance use outcomes at the subsequent six-month and three-year follow-ups (Hardin & Hilbe, 2013). Most simply, GEE models measure differences in the response for a unit

change in the predictor, averaged over the whole sample. As a result of different distributions of the dependent variables, error distributions with different links (the link between the linear predictor and the mean of the distribution function) were specified. Specifically, having performed the necessary diagnostics, the following models (n=420 at six months, n=365 at three years) were fit: gamma distribution with log link (ASI composites), logistic regression (arrests), cumulative logit (alcohol use frequency), and negative binomial distribution with log link (drug use frequency) (Hardin & Hilbe, 2013).

Results

Baseline Status and Outcomes at Follow-ups

Table 2 shows that, at baseline, participants had severe legal (e.g., 86% had been arrested in their lifetime) and drug (e.g., high frequency of use) problems. In addition, both legal problems and substance use declined significantly from baseline, to the six-month follow-up, and to the three-year follow-up. As indicated by the superscripts in Table 2, this finding held for the outcomes of legal problem severity, arrests (with the caution that arrests at baseline referred to lifetime, and at follow-ups to the past six months), drug use severity, and drug use frequency. Alcohol use severity declined from baseline to the six-month follow-up, and then remained stable at the three-year follow-up. Alcohol use frequency declined from baseline to the three-year follow-up.

Associations of Need Factors with Outcomes

Table 3 presents the multivariable GEE regression analyses. As indicated by the beta coefficients and confidence intervals, participants scoring higher on Antisocial Personality Pattern (i.e., Restless, Irritable, and Aggressive; Childhood Antisocial Behavior) at baseline had significantly more severe legal and drug problems, and more frequent drug use, at follow-ups. Participants with more procriminal attitudes at baseline also had more severe legal problems and more frequent drug use at follow-ups.

In contrast to the results finding similar antisocial and procriminal attitude predictors of legal and drug use problems, analyses showed that more baseline social support from antisocial others was associated with subsequent alcohol and drug use problems. Specifically, more support from antisocial others was associated with more alcohol and drug use severity, and with a higher frequency of drug use. However, more support from antisocial others was associated with a lower frequency of alcohol use. Similarly, more connectedness to family and friends, as well as poorer work functioning, were associated with more severe alcohol use severity, but with lower alcohol use frequency.

More engagement in prosocial recreational activities was associated with a lower likelihood of being arrested, less severe alcohol and drug use, and a lower frequency of drug use. However, engagement was associated with a higher frequency of alcohol use.

Discussion

This study found that, among rural-dwelling individuals using drugs but not in drug treatment at baseline, criminal justice system involvement was common; at baseline, almost

90% of participants had a history of being arrested and charged. In addition, alcohol and drug use severity, indicated by ASI composite scores, were higher than those for samples of treated chronic pain and general medical patients, although they were lower than those for addiction treatment samples (Saffier, Columbo, Brown, Mundt, & Fleming, 2007). In the present study, criminal justice and drug use-related outcomes improved at six months post-baseline, and tended to improve even more at the three-year follow-up. These results are consistent with findings that crime and illegal drug use decline over the life course, and that a correlate of quitting drugs is legal concerns (Heyman, 2013; Sampson & Laub, 2003). For example, for cocaine dependence, the half-life was four years, and most dependent cocaine users remitted before age 30, although about 5% remained heavy cocaine users well into their forties (Heyman, 2013). Although our findings suggest that, on average, outcomes tend to improve over time among substance using individuals living in rural areas of the US, they also suggest that outcomes remain poor for a meaningful subset of this population (e.g., at the three-year follow-up, 14% had a recent arrest, and the mean frequency of drug use was daily).

We also found that the criminogenic needs specified by the RNR model were associated with criminal justice and drug use outcomes in the directions that would be expected. That is, indicators of higher risk for recidivism were associated with poorer outcomes. These findings support the RNR model's need principle stating that criminogenic risk factors should be assessed and targeted in treatments, or at least intervention studies, to reduce recidivism, especially for the subset of individuals continuing to function poorly over time (Andrews & Bonta, 2010). They extend the model's reach to suggest that targeting these factors may also be important for reducing drug use in rural areas, especially the use of stimulants.

In particular, GEE analyses found that baseline antisocial personality patterns, including current irritability and aggression, and childhood antisocial behavior, predicted greater severity of legal problems at follow-up. The empirical finding that childhood problem behavior is predictive of adult problem behavior is well-established in criminology (Joon, Doherty, & Ensminger, 2006). Developmentally, childhood disruptive behaviors may indicate an underlying behavioral disposition that continues to manifest itself as disruptive behavior throughout childhood and as delinquent and criminal behavior into adolescence and adulthood. These disruptive behaviors also may initiate negative interactions with peers and authority figures in school and at home, facilitating their continuation.

The same predictors of being restless, irritable, and aggressive, and childhood antisocial behavior, aspects of antisocial personality patterns, were associated with more severe drug problems, and a greater frequency of drug use, at follow-ups. These results are consistent with findings that antisocial personality disorder predicts crime among individuals with unhealthy drug use (Fridell, Hesse, Jaeger, & Kuhlhorn, 2008). Identifying antisocial characteristics among rural substance using individuals may help inform the selection of evidence-based interventions such as Cognitive Behavioral Therapy (CBT). CBT can effectively reduce substance use by improving the management of cognitive and emotional triggers to using drugs and alcohol (Magill & Ray, 2009).

Procriminal attitudes also were associated with both legal problem severity and drug use frequency. Attitudes that criminal behavior is justified often contribute to drug use and criminal behavior (Fletcher & Chandler, 2014). Criminological theory postulates that procriminal attitudes precede and cause criminal behavior; that is, a necessary condition to violate the law is to find reasons or excuses, or claim special circumstances, that justify illegal behavior (Lilly, Cullen, & Ball, 2007). Evidence supports the relationship of procriminal attitudes to reoffending, and that offender treatment programs tend to reduce procriminal attitudes, especially among offenders with mental health disorders; that is, attitudes can be changed by education, training, and therapy (Banse, Koppehele-Gossel, Kistemaker, Werner, & Schmidt, 2013). However, evidence supporting the link between decreases in procriminal attitudes that are attributed to treatment and reduced recidivism is relatively weak (Banse et al., 2013). From a psychological perspective, procriminal attitudes also may arise as a consequence, not simply as a cause, of criminal behavior and drug use. Thus, behaving in accordance with the law and health recommendations (not using drugs in unhealthy ways) may be important antecedents to self-efficacy and responsible attitudes toward fellow citizens (Gastil & Xenos, 2010). Reducing illegal drug use and resolving legal problems may shift attitudes to endorsement of fewer procriminal beliefs, supporting Myers' (2012) assertion that people not only "think themselves into a way of acting, but also act themselves into a way of thinking" (p. 479).

Whereas baseline predictors of legal concerns and drug use were quite similar in this sample, different baseline predictors were identified of alcohol-related outcomes. Less social support from antisocial others, less connectedness to family and friends, and lower severity of employment problems all were associated with less alcohol use severity, but with a greater frequency of alcohol use. These results suggest that, in this rural sample of individuals using drugs, frequent alcohol use may not be viewed as consonant with having an "alcohol problem" as assessed by the ASI composite, which includes perceived troublesomeness of, and need of treatment for, alcohol use; spending more money on alcohol; and drinking to intoxication more often.

In fact, frequent alcohol use is more normative among some rural than urban samples (Gale, Lenardson, Lambert, & Hartley, 2012), and alcohol is used more commonly than illicit drugs in rural areas (Meit et al., 2014). Rural areas accounted for the majority of fatalities involving alcohol-impaired drivers in 2013 (National Center for Statistics and Analysis, 2015), and the lack of alcohol treatment services in rural areas confers greater risk for continued driving under the influence of alcohol (Webster, Dickson, Duvall, & Clark, 2010). Our results suggest that to reduce more severe alcohol use, treatment providers should consider helping patients break ties with antisocial others, and focus on improving their worklife quality. An arrest history, had by the majority of this sample, may prevent people from obtaining desired employment, and in turn, unemployment is associated with recidivism (Laub & Sampson, 2001; Visher, Winterfield, & Coggeshall, 2005) as well as with problematic substance use (Henkel, 2011). Accordingly, job skills training is a key component of some approaches to treating substance use disorders, such as the Community Reinforcement Approach (Meyers, Roozen, & Smith, 2011).

We found that engagement in prosocial recreational activities at baseline predicted a lower likelihood of being arrested, less severe alcohol problems (but greater drinking frequency), less severe drug problems, and less frequent drug use at follow-ups. The potentially important role of these activities in deterring drug use is also contained in the Community Reinforcement Approach to treating substance use disorders (Meyers et al., 2011), which provides patients with opportunities to sample new social and recreational activities, such as hobbies, as alternatives to using drugs. Mutual-help groups also offer substance-free social-recreational activities, such as dances, sports teams, picnics, and camping trips, to promote recovery.

Although reducing recreational activities because of drug use is to some extent volitional, this choice may be discouraged in rural areas because these settings have relatively few community or corporate recreational programs and exercise facilities, and resources to support them (Goodwin, 2010). Lack of recreation is related to the boredom often cited in rural communities as a reason for substance use. In a study of the rural US, boredom emerged as the most salient characteristic in youths' depictions of their communities (Willging, Quintero, & Lilliott, 2014). Drug use was portrayed as a means to resolve boredom, grapple with economic deprivation, and address the alienation accompanying the lack of recreational opportunities. Specifically, methamphetamine use helped alleviate boredom, but also enabled participants to engage in activities, such as working, with more vigor and focus. It allowed respondents to stay alert, or made more interesting the performance of low-wage jobs (Willging et al., 2014). Rural-dwelling respondents downplayed problematic dimensions of alcohol and drug use, clarifying that such behavior simply reflected an abundance of unstructured time (Brown, 2010).

Strengths and Limitations

Despite this study's strengths, including successfully following a large rural sample of initially untreated drug users over a relatively long time period, it also had limitations. First, we relied on participants' self-reports. In the case of arrest status, self-reports have been questioned as biased because of underreporting, overreporting, and problems of recall (Joon et al., 2006), although self-reports of criminal activity also have been found to have high agreement with criminal records from the police and FBI (Gottfredson, Kearley, & Bushway, 2008). Future studies of the RNR model should verify self-reports of criminal activity and substance use with objective measures and/or collateral reports. Second, despite our efforts to comprehensively measure the RNR model's risk factors, additional research should utilize more fine-tuned indices. For example, social connections in relation to criminal and drug use behaviors also could cover organizational memberships and involvement in organized religion (Ensminger, Juon, Lee, & Lo, 2009). Third, although we found associations of risk factors with outcomes, we cannot say that risk factors play a causal role in the aspects of functioning that were measured. Subsequent intervention studies are needed to examine the extent to which the risk factors are causally related to well-being in the population followed in this study.

Conclusions

This study found that risk factors contained in the RNR model were related to both criminal and substance use outcomes in this sample of rural stimulant users. Specifically, antisocial personality patterns and procriminal attitudes at baseline predicted poorer legal and drug outcomes measured six months and three years later. In contrast, less connection to antisocial others and fewer work difficulties predicted lower alcohol problem severity, but more frequent alcohol use. Engagement in social-recreational activities was associated with fewer subsequent arrests and less severe alcohol and drug problems. Each of these risk factors – childhood and adult antisocial patterns, procriminal attitudes, weak pro-social support, employment problems, and lack of social-recreational activities – can be reliably assessed and improved with help from formal treatment, and possibly from informal sources such as mutual-help groups and technology-based programs (Bickel, Christensen, & Marsch , 2011; Lipsey, Landenberger, & Wilson, 2007). Telemedicine modalities, such as telephone-based care, internet-based screening and treatment, videoconferencing, and smartphone mobile applications (apps), remove the barrier of distance and so offer great potential for enhancing treatment and recovery for people with unhealthy drug use living in rural settings (Molfenter, Boyle, Holloway, & Zwick, 2015). In addition, the media has reported instances in which rural communities used technology-based resources to increase residents' engagement in fun educational and creative artistic activities (Mader, 2014). Facilitating linkages to services that target the RNR risk factors may hasten improvements in unhealthy substance use and crime among rural drug users.

Acknowledgments

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Table 1

The seven major risk/need factors, their indicators in the RNR model, and variables used to measure them in this study.

Risk/Need factor	Indicator	Variables
Antisocial personality pattern	Impulsive, adventurous pleasure seeking, restlessly aggressive and irritable	Restless, Irritable and Aggressive; Child Antisocial Behavior
Procriminal attitudes	Rationalizations for crime, negative attitudes towards the law	Procriminal Attitudes
Social supports for crime	Criminal friends, isolation from prosocial others	Support from Prosocial Others; Support from Anti-Social Others
Substance abuse	Abuse of alcohol and/or drugs (see Table 2)	
Family/marital relationships	Inappropriate parental monitoring and disciplining, poor family relationships	Family-Social Composite; Connectedness
Work or school	Poor performance, low levels of satisfaction	Employment Composite
Prosocial recreational activities	Involvement in prosocial recreational/leisure activities	Engagement in Prosocial Recreational Activities

Table 2

Baseline status and six-month and three-year follow-up outcomes.

Variable	Baseline (N=462)	Six months (N=420)	Three years (N=365)	F
ASI Legal M (SD)	.150[a] (.201)	.104[a] (.177)	.062[a] (.144)	28.12[**]
Arrested % (N)	86.0[a] (299)	24.0[a] (84)	14.0[a] (49)	421.65[**]
ASI Alcohol M (SD)	.148[a,b] (.163)	.121[a] (.147)	.108[b] (.138)	7.48[**]
Alcohol freq. M (SD)	3.1[a] (2.1)	2.9 (2.1)	2.7[a] (2.3)	5.03[*]
ASI Drugs M (SD)	.191[a] (.134)	.144[a] (.128)	.101[a] (.110)	67.93[**]
Drug freq. M (SD)	11.3[a] (6.6)	9.2[a] (5.2)	6.2[a] (4.8)	108.63[***]

[*]
$p < .05$

[**]
$p < .01$

[***]
$p < .001$

Means or percentages that share a superscript are significantly different (p<.05); for example, on ASI Alcohol, the mean at six months, and at three years, is significantly different from the mean at baseline, but the six-month mean is not significantly different from the three-year mean.

Table 3

Estimated associations between RNR factors at baseline with outcomes. Outcomes

RNR Factor	ASI Legal Composite		Arrested		ASI Alcohol Composite		Alcohol frequency		ASI Drug Composite		Drug frequency	
	β	95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI
Antisocial Personality Pattern												
Restless, Irritable, & Aggressive	.04**	.01 – .07	.01	–.03 – .05	.00	–.01 – 0.02	.01	–.02 – .04	.04***	.03 – .05	.03***	.02 – .04
Childhood Antisocial Behavior	.09*	.01 – .16	.05	–.03 – .14	.03	–.02 – 0.08	–.05	–.13 – .02	.05**	.02 – .08	.05***	.02 – .07
Procriminal Attitudes	.05**	.02 – .08	.02	.02 – .05	–.01	–.03 – .01	.01	–.02 – .05	.01	–.01 – .01	.02**	.01 – .02
Social Support												
Prosocial Others	.00	–.04 – .05	.01	–.05 – .06	–.04	–.08 – .00	.04	–.01 – .09	–.01	–.03 – .01	–.01	–.03 – .00
Antisocial Others	–.03	–.06 – .01	–.03	–.08 – .01	.06***	.03 – .08	–.09***	–.13 – –.04	.02*	.01 – .04	.03***	.02 – .04
Family/Social Relationships												
ASI Composite	.62	–.15 – 1.39	–1.27	–2.70 – .16	–.10	–.68 – .47	.46	–.41–1.33	.14	–.20 – .49	–.25	–.54 – .04
Connectedness	.00	–.02 – .02	.00	–.03 – .03	.02**	.01 – .04	–.04**	–.07 – –.01	–.01	–.02 – .00	–.01	–.02 – .00
Work ASI Composite	.17	–.28 – .62	.72	.10–1.34	.75***	.44–1.06	–1.20***	–1.69 – –.70	.10	–.13 – .32	–.17	–.38 – .03
Prosocial Recreational Activities	–0.13	–.44 – .19	–1.38***	–2.06 – –.70	–.33**	–.54 – –.13	.56***	.24 – .88	–.40***	–.54 – –.25	–.21***	–.32 – –.10

*
p<.05,

**
p<.01,

***
p<.001