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Individual and Network Correlates of Antisocial Personality Disorder Among Rural Nonmedical Prescription Opioid Users

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Abstract

Purpose—Examination of the association of antisocial personality disorder (ASPD) with substance use and HIV risk behaviors within the social networks of rural people who use drugs.

Methods—Interviewer-administered questionnaires were used to assess substance use, HIV risk behavior, and social network characteristics of drug users (n = 503) living in rural Appalachia. The MINI International Psychiatric Interview was used to determine whether participants met DSM-IV criteria for ASPD and Axis-I psychological comorbidities (eg, major depressive disorder (MDD), post-traumatic stress disorder, generalized anxiety disorder). Participants were also tested for herpes simplex 2, hepatitis C, and HIV. Multivariate generalized linear mixed modeling was used to determine the association between ASPD and risk behaviors, substance use, and social network characteristics.

Results—Approximately one-third (31%) of participants met DSM-IV criteria for ASPD. After adjustment for demographic variables and Axis-I disorders, distrust and conflict within an individual's social networks, as well as past 30-day use of heroin and crack, male gender, younger age, lesser education, heterosexual orientation, and comorbid MDD were associated with meeting diagnostic criteria for ASPD.

Conclusions—Participants meeting criteria for ASPD were more likely to report recent heroin and crack use, which are far less common drugs of abuse in this population predominantly consisting of prescription opioid users. Greater discord within relationships was also identified among those with ASPD symptomatology. Given the elevated risk for blood-borne infection (eg, HIV) and other negative social and health consequences conferred by this high-risk subgroup, exploration of tailored network-based interventions with mental health assessment is recommended.

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Keywords

antisocial personality disorder; drug abuse; nonmedical prescription drug use; rural; social network analysis

Antisocial personality disorder (ASPD) is characterized by a “pervasive pattern of disregard for and violation of the rights of others occurring since age 15 years” in persons at least 18 years of age, evidenced by at least 3 of 7 of the following characteristics: “failure to conform to social norms, deceitfulness, impulsivity, irritability and aggressiveness, reckless disregard for the safety of self and others, consistent irresponsibility, and lack of remorse following illicit behaviors.”¹ Recent studies have indicated the prevalence of ASPD ranges from 1%-3% in the general population, with estimates of 3.0%-6.8% among males and 0.8%-1.0% in females²⁻⁴; however, a substantially higher prevalence has been identified in clinical settings (3%-30%),^{1,5} in prison populations (35%-47%),⁶⁻⁸ and among those with substance dependence (18%-40%).⁹

National survey data have indicated that, among those meeting DSM-III criteria for ASPD, 84% also meet criteria for a substance use disorder (SUD).¹⁰ In fact, findings from the National Comorbidity Survey showed that among those with a *lifetime history* of ASPD, nearly two-thirds (61.4%) had a co-occurring history of at least one addictive disorder (alcohol abuse and/or dependence, drug abuse and/or dependence).¹¹ Studies suggest that individuals meeting diagnostic criteria for ASPD were more likely to engage in daily illicit drug use¹² and more likely to report high-risk drug behaviors, such as greater instances of needle use and syringe/equipment sharing.^{13,14} Moreover, characteristics typical of ASPD (eg, failure to socially conform, impulsiveness, lack of remorse following illicit behaviors, and reckless disregard for personal safety¹) may be associated with the increased risk for and persistence of alcohol and/or substance abuse.^{15,16}

ASPD has also been associated with behaviors that could increase risk for HIV and other blood-borne pathogens. The estimated population prevalence of ASPD in young people who inject drugs (PWID) is 17%-23%¹⁷; however, one study of adult PWID found that 44% met the diagnostic criteria for ASPD.¹³ Compared to those without ASPD, participants meeting diagnostic criteria for ASPD had a higher median number of drug injections, needle-sharing occasions, and multiple needle-sharing partners.^{13,14,18,19} Further, individuals with ASPD have exhibited lower rates of syringe cleaning²⁰ and earlier onset of injection drug use¹⁹ than those without ASPD. Among individuals with ASPD, an increased tendency to engage in risky sexual behavior—including greater number of sexual partners, higher frequency of anal sex and inconsistent condom use—has also been shown.^{5,20-22}

While the co-occurrence of ASPD and substance use has been well established, significant gaps in understanding remain. For example, the vast majority of research conducted on personality disorders, substance use, substance abuse treatment, and other high-risk behaviors has been conducted within urban populations. However, ASPD is not solely an urban phenomenon. A study examining comorbid substance use and mental disorders among rural Americans using national survey data found that ASPD prevalence among rural populations was not significantly different than that in urban populations,²³ yet compared to

those residing in urban areas, rural residents who met criteria for ASPD were significantly more likely to meet criteria for alcohol abuse or dependence after adjusting for sociodemographic variables such as age, race, gender, and income.²³ These findings highlight the need for more research on the intersection of substance use and ASPD in rural populations. In addition, more advanced research is needed to examine the social context of risk behavior among people with ASPD. Social network analysis is becoming an increasingly popular method in public health research and, while it has been used to examine personality *traits* within social networks,²⁴⁻²⁸ there is limited research on social networks and personality disorders.²⁹⁻³³ Because personality disorders are by definition “pervasive across a broad range of personal and social situations”¹ and are characterized largely by their harmful effects on interpersonal relationships,³⁴⁻³⁶ more research on these disorders within a social network context could prove useful in providing a deeper understanding of the impact of interpersonal interactions, ASPD, and related risk behavior. Thus, the purpose of this study was to examine the individual and network-level characteristics of those meeting DSM-IV criteria for ASPD in a population of rural drug users and to determine the prevalence of ASPD in this population.

Methods

The study sample (n = 503) comprised active drug users participating in an ongoing study of social networks and HIV risk. Study eligibility required participants to be residents of a rural Appalachian county in Kentucky; the large majority of participants lived in a rural (assigned a 2013 Rural-Urban Continuum Code of 7)³⁷, Appalachian Regional Commission (ARC)-designated distressed county³⁸ at the time of enrollment. Participants were recruited using respondent-driven sampling (described in detail elsewhere³⁹), which is an appropriate sampling method for hidden populations such as drug users,^{40,41} especially in rural areas.⁴² Briefly, network seeds were identified through community informants. Once a seed completed the baseline interview, they were given 3 coupons to recruit network members. The participants recruited by the seeds brought their coupons to the study site (a nondescript downtown store-front location), completed the baseline assessment, and then were also given 3 recruitment coupons. This process continued until the desired sample size was met. Eligible participants were at least 18 years of age, not currently in substance abuse treatment, and had to have used at least one of the following drugs “to get high” in the prior 30-day period: prescription opioids, heroin, crack/cocaine, and/or methamphetamine. The University Institutional Review Board approved the protocol and a Federal Certificate of Confidentiality was obtained. Participants were compensated \$50 for their time.

Trained interviewers administered face-to-face questionnaires in private settings. Data were entered directly into a laptop equipped with computer-assisted personal interviewing (CAPI) software. Data were collected on demographic characteristics (eg, age, gender, sexual orientation, months of formal and technical education, monthly income, ever incarcerated) and self-reported lifetime, previous 6-month, and/or past 30-day drug use/behaviors via the Addiction Severity Index (ASI).⁴³ For the present study, the ASI was modified to more fully describe drug use within the study population (eg, the ASI “Other opiates/analgesics” category was divided into 3 categories: “OxyContin[®],” “Other oxycodone,” and “hydrocodone,” while still allowing for addition of other opiates in an “other” category).⁴⁴

HIV risk behaviors were assessed using the Risk Behavior Assessment (RBA),⁴⁵ which includes lifetime and recent (prior 6 months and 30 days) measures of injection drug use (eg, any injection, recency and frequency of injection, syringe/equipment sharing) and sexual encounters (eg, recency and frequency, unprotected sex, sex under the influence of drugs/alcohol). All participants were tested for HSV-2 (Biokit, Lexington, Massachusetts), hepatitis C virus (HCV) (Home Access® Hepatitis C Check, Home Access Health, Hoffman Estates, Illinois), and HIV (OraSure Technologies, Bethlehem, Pennsylvania) by trained staff. Pre- and post-test counseling was provided to all persons tested, according to guidelines established by the Centers for Disease Control and Prevention.⁴⁶

Lifetime ASPD was assessed using the Mini-International Neuropsychiatric Interview (MINI) 5.0,⁴⁷ which has previously been used to screen for ASPD in substance using populations.⁴⁸⁻⁵³ The MINI was administered as part of the baseline study questionnaire by trained interviewers.⁵⁴ Individuals responded “Yes,” “No,” or “Refuse to Answer” to 6 questions regarding behavioral symptoms of ASPD pathology in childhood (ie, before age 15). At least 2 positive responses indicated childhood ASPD criteria were met. Individuals were then asked 6 questions related to emotional and behavioral symptoms of adult ASPD, again responding “Yes,” “No,” or “Refuse to Answer.” Participants with at least 3 positive responses in the adult ASPD section met criteria for adult ASPD. Participants had to meet the criteria for both childhood and adult psychopathology to be assigned to the ASPD group. The questionnaire also measured the following Axis I disorders: post-traumatic stress disorder (PTSD), major depressive disorder (MDD), and generalized anxiety disorder (GAD). Participants meeting criteria for any of the Axis I or Axis II disorders were provided with information on accessing community mental health services.

Information on drug, sex, and social support networks were elicited using a name-generating questionnaire (described in detail elsewhere⁵⁵). Participants were asked the first name and last initial, approximate age, and gender of anyone they had sex with, used drugs with, and/or relied on for social support during the past 6 months. For each network member named, participants indicated their trust in him/her (10-point Likert scale, with increasing values representing more trust), whether or not they were “on good terms” (binary), their frequency of communication (6-point Likert scale, with increasing values representing more frequent communication), the duration of their relationship (months), and geographic distance between their residences (9-point Likert scale with increasing values representing further distances). Due to skewness, frequency of communication was dichotomized (1=at least daily communication, and 0=communication less than daily) for analysis. Geographic distance was also dichotomized so that 1=lives “nearby” (eg, “same area of town” or closer) and 0=does not live “nearby” (eg, “another area of town” or further). In- and out-degree centrality⁵⁶ were computed on the social support, “good terms with,” and trust variables. In-degree centrality represents, for example, how many study participants reported receiving social support from the index participant, whereas out-degree centrality represents how many people the index participant reported as providing him/her with social support. For continuous variables (eg, trust and duration), in- and out-degree centrality represent the *sums* of values (ie, the sum of trust ratings for all alters named). Because these values would be inflated by number of partners, the values were divided by the total number of partners to produce averages. For example, a participant who named 3 partners and rated their trust in

the 3 partners as 10, 8, and 6 would have an "average trust score" of 8. Descriptions of all network variables are provided in Table 2. Each network measure was computed for the overall network (inclusive of all drug, sex, and social support ties) and for the social support network.

Data Analysis

To adjust for differential probability of recruitment via respondent-driven sampling,^{40,41} all multivariate and bivariate analyses were weighted using the individualized weights produced in RDSAT 7.1.⁵⁷ The individualized weights were generated based on individual network size (ie, each person's total number of network connections) and partition analysis on the dependent variable (ie, ASPD) using enhanced data smoothing and 25000 bootstrap iterations. In essence, these weights allow researchers to account for the potential over-sampling of participants with larger network sizes (ie, those with more social connections could have an increased probability of being recruited via chain referral). RDSAT was also used to generate an estimate of the prevalence of ASPD in the population sampled.

Since participants were nested within networks, binomial generalized linear mixed models with a random effect were used to examine the bivariate relationship between behavioral, demographic, and network-level characteristics and the presence of ASPD criteria. Given the exploratory nature of this cross-sectional study and the paucity of research on ASPD in rural areas, a non-subjective, a priori approach to model selection was not possible; instead, variables that had a significant ($P < .05$) or marginally significant ($P < .10$) association with the outcome in bivariate analysis were entered into a multivariate binomial generalized linear mixed model with a random effect. The final multivariate model was derived using manual backward elimination and modified purposeful selection⁵⁸ at a significance level of .05. SAS version 9.3 was used for all analyses (SAS Institute Inc., Cary, North Carolina).

Results

Table 1 shows the sociodemographic characteristics, psychological comorbidities, risk behaviors, and HCV, HIV, and HSV-2 serostatuses and the bivariate associations with ASPD. The demographic characteristics of the sample have been described in detail elsewhere.⁵⁹ Briefly, the majority of participants were white (94%), male (57%), and heterosexual (91%) with a median age of 31 years (interquartile range [IQR]: 26-38) and a median 12 years of education (IQR: 10-13). Approximately 80% of the sample had a lifetime history of incarceration.

The weighted prevalence of persons meeting criteria for ASPD in this cohort was 31.4%. The odds of meeting DSM-IV criteria for ASPD were higher for those meeting criteria for MDD (odds ratio [OR]: 1.80, 95% confidence interval [CI]: 1.13-2.85, $P = .013$), GAD (OR: 1.74, 95% CI: 1.11-2.75, $P = .017$), and PTSD (OR: 2.27, 95% CI: 1.26-4.07, $P = .006$). Participants that used alcohol (OR: 1.59; 95% CI: 1.03-2.45, $P = .036$), heroin (OR: 5.21; 95% CI: 2.05-13.26, $P = .001$), hydrocodone (OR: 1.68; 95% CI: 1.09-2.59, $P = .020$), crack or powder cocaine (OR: 1.81; 95% CI: 1.13-2.89, $P = .013$), and marijuana (OR: 1.56; 95% CI: 1.00-2.43, $P = .050$) within the last 30 days also had greater odds of meeting criteria for ASPD. Furthermore, participants that had injected drugs (OR: 1.74; 95% CI: 1.14-2.65, $P = .$

011), shared syringes (OR: 1.71; 95% CI: 1.00-2.92, $P = .051$), and/or had more sex partners (OR: 1.44; 95% CI: 1.11-1.86, $P = .001$) within the last 30 days had greater odds of meeting diagnostic criteria for ASPD. Of note, there was no association between ASPD and being antibody positive for HCV, HSV-2, or HIV.

Table 2 describes bivariate comparison of social network characteristics by ASPD status. For every additional network member that the participant reported as being “not on good terms with,” there was a 33% increase in the odds of meeting criteria for ASPD (OR: 1.33, 95% CI: 1.07-1.65, $P = .011$). Increasing average trust in network members was associated with significantly reduced odds of ASPD (OR: 0.81, 95% CI: 0.72-0.92, $P = .001$). Furthermore, a greater number of individuals a subject reported having daily communication with (OR: 1.13, 95% CI: 1.00-1.27, $P = .044$) and living close to (OR: 1.14, 95% CI: 1.03-1.25, $P = .011$) was associated with significantly higher odds of meeting ASPD diagnostic criteria. Post-hoc analyses examining characteristics of participants’ *social support* networks revealed that participants reporting a higher average trust in their social support network members had reduced odds of meeting ASPD criteria (OR: 0.87; 95% CI: 0.79-0.95, $P = .007$).

Adjusted odds ratios from the multivariate generalized linear mixed model are displayed in Table 3. After adjusting for the other covariates in the model, male gender (adjusted odds ratio [aOR]: 2.28, 95% CI: 1.37-3.81, $P < .01$), younger age (aOR: 0.96, 95% CI: 0.93-0.99, $P = .01$), and fewer years of education (formal or technical) (aOR: 0.85, 95% CI: 0.74-0.96, $P < .01$) were significantly associated with ASPD. Individuals who identified as heterosexual had lesser odds of meeting criteria for ASPD (aOR: 0.32, 95% CI: 0.14-0.73, $P = .01$). Subjects meeting diagnostic criteria for MDD were more than twice as likely to also meet ASPD criteria compared to those individuals that did not meet diagnostic criteria for MDD (aOR: 2.06, 95% CI: 1.22-3.47, $P = .01$). Recent heroin use (past 30 days) was associated with a 244% increase in the odds of exhibiting symptoms consistent with ASPD compared to no recent heroin use (aOR: 3.44, 95% CI: 1.15-10.31, $P = .03$), and recent crack use was associated with a 135% increase in the odds of an individual meeting ASPD criteria (aOR: 2.35, 95% CI: 1.15-4.83, $P = .02$). Reporting a higher average trust in network members was associated with reduced odds of ASPD symptoms (aOR: 0.85, 95% CI: 0.77-0.94, $P = .01$). For every additional network member the participant reported they were “not on good terms with,” there was a 28% increase in the odds of meeting ASPD criteria (aOR: 1.28, 95% CI: 1.01-1.62, $P = .04$).

Discussion

This study explored the prevalence and correlates of ASPD in a cohort of active rural drug users. Approximately 31% of the study sample met the DSM-IV diagnostic criteria for ASPD, consistent with other studies examining drug-using populations.^{13,18,60,61} The study revealed that ASPD was associated with a number of individual- and network-level characteristics. Male gender, younger age, and fewer years of formal or technical education were associated with ASPD. Psychological comorbidity with symptoms suggestive of major depressive disorder was associated with twice the odds of meeting ASPD diagnostic criteria. Reporting more trust in and less conflict with members of one’s social networks was

associated with reduced odds of meeting ASPD criteria. These findings are consistent with previous research reporting that drug users with comorbid ASPD and other Axis I disorders often exhibit more drug use and family/social problem severity than do drug users with ASPD or an Axis I disorder alone.^{21,62,63} Among rural populations specifically, other work has provided evidence that rural residents have higher odds of meeting diagnostic criteria for comorbid substance abuse or dependence and mental disorders.²³ Barriers to treatment such as distance, lack of transportation,⁶⁴ treatment cost, and stigma⁶⁵ may all exacerbate the treatment issues of rural residents with comorbid ASPD and other mental disorders.

Participants who recently used crack or heroin were significantly more likely to meet DSM-IV criteria for ASPD. This finding is concerning given that previous research has found that injection heroin users with ASPD had increased rates of HIV infection.^{19,66} Similarly, research on cocaine users revealed that those with ASPD engaged more frequently in anal sex, were less likely to use condoms, and had a greater number of sexual partners, thereby placing them at a higher risk for HIV acquisition.²² These findings underscore the importance of integrating mental health screening for ASPD with interventions to encourage HIV risk reduction and drug treatment. This is critically important among drug users in Appalachia given the high risk for HIV posed by dense risk network structures,⁵⁵ frequent unprotected sex,⁶⁷ injection drug use,^{39,68} sharing of injection equipment,^{39,55} and geographic proximity to an ongoing HIV outbreak.^{69,70}

Evaluating the need for and encouraging drug treatment among those that screen positive for ASPD is critical, especially in light of challenges posed in low-resource rural settings. Rural residents with any mental disorder, including ASPD, have been found to be significantly less likely to seek treatment for drug and alcohol abuse than urban residents.²³ Previous research has also shown that ASPD and antisociality can have a negative impact on treatment outcomes among those seeking substance abuse treatment,⁷¹ and they are negatively associated with treatment retention and post-treatment psychosocial adjustment.^{63,72,73} However, there is evidence that these barriers can be overcome. For example, a study by Havens and associates⁷⁴ in Baltimore, Maryland, found that PWID with comorbid ASPD who spent more time with a case manager were more likely to enter drug treatment than those who spent less time in case management.⁷⁴ Therefore, identifying drug users with comorbid ASPD and tailoring treatment (eg, establishing case management) for those individuals may increase their likelihood to enter substance use treatment, especially if barriers associated with cost and access are also addressed.

While other studies have been able to identify correlates of ASPD among individuals who use drugs, the major strength of this study is that it is among the first to use network analysis to examine ASPD within a cohort of drug users. Results showed that individuals reporting less trust in and more conflict with their network members were at increased odds for ASPD symptomatology. Of note, bivariate findings indicated that individuals who lived close to and interacted daily with more of their network members were at increased odds for ASPD symptomatology. This finding was counterintuitive given previous research, which found that the absence of frequent contact with close friends was associated with increased risk of mood and anxiety disorders.⁷⁵ One explanation for the difference in findings between the present study and that of Chou and associates⁷⁵ is that social interaction may distinctly

affect Axis I symptomatology, characterized as acute or episodic, compared to that of Axis II disorders that are mainly chronic in nature.⁷⁶ In addition, post-hoc analysis of the network data revealed that the association between increased social interaction and ASPD was only present in sex and drug network relationships and not in relationships conferring social support. This finding underscores the utility of applying network analytic methods to understanding social interaction, as this nuance may not have been identified through a general, individual-level measure inquiring about social interaction.

The limitations in this study should be noted. First, given the use of a screening instrument administered by trained lay interviewers to determine presence of symptoms indicative of ASPD, the prevalence of this and other psychiatric disorders may have been under- or overestimated compared to what may be found through thorough clinical evaluations. However, previous research has shown that those experiencing symptoms of psychiatric illness have similar characteristics as those with a clinical diagnosis of disorder.⁷⁷ Second, due to the cross-sectional design of the study, it cannot be determined if ASPD is driving substance use or if drug use triggers behaviors indicative of ASPD. However, this limitation is somewhat mitigated by requiring that those meeting criteria for ASPD meet both childhood and adult diagnostic criteria. Third, data were self-reported and therefore subject to information biases such as inaccurate recall and social desirability. Finally, although findings were largely consistent with those from previous research in other settings, the conclusions drawn from this study of rural drug users should be generalized with caution.

Despite limitations, this study presented several important findings regarding the relationship between ASPD, comorbid psychiatric symptoms, substance use, and social networks. First is the need for readily accessible drug treatment programs for rural drug users with comorbid ASPD, including interventions tailored to address risk factors for HIV, unique characteristics of ASPD, and psychological comorbidity with DSM-IV Axis I disorders. Additionally, even within this primarily prescription drug using population, heroin and crack use were found to be more likely among those meeting diagnostic criteria for ASPD. These behaviors may place these individuals at higher risk for HIV.^{22,66} Network-based, peer-driven interventions are becoming increasingly common approaches to reducing HIV risk in drug using populations⁷⁸⁻⁸⁰; however, our study provides important evidence that conflict and distrust within the personal networks of individuals meeting ASPD criteria may act as barriers. Future research should examine if network-based (ie, peer-driven) interventions intended to diffuse through social networks are reaching individuals with ASPD and if and how these interventions may be adapted to meet the needs of this high-risk population.

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Table 1

Demographic, Psychological, and Risk Behavior Characteristics of Rural Drug Users Meeting and Not Meeting DSM-IV ASPD Criteria (N = 503)

	Overall n (%)	ASPD (n = 158) % (95% CI) ^a	No ASPD (n = 345) % (95% CI) ^a	OR (95% CI)	P
<i>Demographic Characteristics</i>					
Male gender	286 (56.9)	63.3 (55.7 – 70.9)	53.9 (48.6 – 59.2)	1.68 (1.09 – 2.58)	.020*
Median age (IQR)	31 (26-38)	29.7 (23.4-36.2)	31.6 (26.3-38.6)	0.97 (0.95 – 1.00)	.022*
White race	474 (94.2)	93.7 (89.8 – 97.5)	94.5 (92.1 – 96.9)	1.16 (0.48 – 2.78)	.747
Heterosexual orientation	459 (91.3)	88.0 (82.8 – 93.1)	92.8 (90.0 – 95.5)	0.46 (0.23 – 0.93)	.030*
Median years of education (IQR) ^b	12 (10-13)	11.7 (8.5-12.3)	11.8 (10.8-13.0)	0.87 (0.79 – 0.95)	.003*
Median monthly income, in \$ (IQR)	677 (300-1200)	654.2 (278.4-1344.8)	673.4 (245.4-997.0)	1.00 (1.00 – 1.00)	.221
Ever incarcerated	402 (79.9)	89.9 (85.1-94.6)	75.4 (70.8-79.9)	2.56 (1.37 – 4.77)	.003*
<i>DSM-IV psychological comorbidity</i>					
Major Depressive Disorder	131 (26.0)	34.2 (26.7-41.7)	22.3 (17.9-26.7)	1.80 (1.13 – 2.85)	.013*
Generalized Anxiety Disorder	146 (29.0)	36.7 (29.1-44.3)	25.5 (20.9-30.1)	1.74 (1.11 – 2.75)	.017*
Post-Traumatic Stress Disorder	71 (14.1)	22.8 (16.2-29.4)	10.1 (6.9-13.3)	2.27 (1.26 – 4.07)	.006*
<i>Recent (past 30 day) substance use</i>					
Alcohol	276 (54.9)	64.6 (57.0-72.1)	50.4 (45.1-55.7)	1.59 (1.03 – 2.45)	.036*
Heroin	22 (4.4)	8.2 (3.9-12.6)	2.6 (0.9-4.3)	5.21 (2.05 – 13.26)	.001*
Illegal Methadone	306 (60.8)	60.1 (52.4-67.8)	61.2 (56.0-66.3)	0.88 (0.57 – 1.36)	.568
Legal Methadone	14 (2.8)	2.5 (0.1-5.0)	2.9 (1.1-4.7)	0.88 (0.26 – 3.00)	.839
Oxycontin	351 (69.8)	73.4 (66.5-80.4)	68.1 (63.2-75.1)	1.50 (0.93 – 2.41)	.094
Oxycodone	364 (72.4)	75.9 (69.2-82.7)	70.7 (65.9-75.6)	1.32 (0.81 – 2.13)	.263
Benzodiazepine	241 (47.9)	55.7 (47.9-63.5)	44.3 (39.1-49.6)	1.43 (0.94 – 2.19)	.099
Hydrocodone	283 (56.3)	65.2 (57.7-72.7)	52.2 (46.9-57.5)	1.68 (1.09 – 2.59)	.020*
Cocaine (powder or crack)	122 (24.3)	31.0 (23.7-38.3)	21.2 (16.8-25.5)	1.81 (1.13 – 2.89)	.013*
Powder Cocaine	113 (22.5)	27.8 (20.8-34.9)	20.0 (15.8-24.2)	1.66 (1.03 – 2.69)	.040*
Crack Cocaine	57 (11.3)	19.0 (12.8-25.2)	7.8 (5.0-10.7)	2.51 (1.35 – 4.65)	.004*
Methamphetamine	17 (3.4)	5.7 (2.0-9.3)	2.3 (0.7-3.9)	2.71 (0.94 – 7.80)	.065
Marijuana	308 (61.2)	69.0 (61.7-76.3)	57.7 (52.4-62.9)	1.56 (1.00 – 2.43)	.050*

	Overall n (%)	ASPD (n = 158) % (95% CI) ^a	No ASPD (n = 345) % (95% CI) ^b	OR (95% CI)	P
<i>Injection drug use (past 30 days)</i>					
Currently injecting	242 (48.1)	53.2 (45.3-61.0)	45.8 (40.5-51.1)	1.74 (1.14 – 2.65)	.011*
Syringe sharing ^c	84 (16.7)	20.9 (14.5-27.3)	14.8 (11.0-18.5)	1.71 (1.00 – 2.92)	.051
<i>Sexual behavior (past 30 days)</i>					
Median number of unprotected sex acts (IQR)	10 (2-27)	10.7 (2.0-29.1)	9.5 (1.2-24.7)	1.01 (1.00 – 1.02)	.213
Median number of sexual partners (IQR)	1 (0-1)	0.4 (0.0-0.9)	0.1 (0.0-0.6)	1.44 (1.11 – 1.86)	.001*
<i>Blood-borne infection</i>					
HCV	222 (44.1)	41.1 (33.4-48.9)	45.5 (40.2-50.8)	1.01 (0.66 – 1.55)	.970
HSV2	59 (11.7)	10.1 (5.4-14.9)	12.5 (9.0-16.0)	0.65 (0.32 – 1.32)	.237
HIV	0 (0)	0 (0)	0 (0)	--	--

ASPD: meeting DSM-IV criteria for antisocial personality disorder; No ASPD: not meeting DSM-IV criteria for anti-social personality disorder; OR: bivariate odds ratio; CI: 95% Wald confidence interval; IQR: interquartile range.

^aCorresponds to the estimated population proportion.

^bIncludes formal and technical education.

^cReceptive or distributive.

*Significant at $\alpha = .05$.

Table 2
 Network Characteristics of Rural Drug Users Meeting and Not Meeting DSM-IV Criteria for ASPD (N = 503)

	Overall Mdn (IQR)	ASPD (n = 158) Mdn (IQR) ^a	No ASPD (n = 345) Mdn (IQR)	OR (95% CI)	P
<i>Overall Network Sociocharacteristics^b</i>					
No. of people providing social support ^c	2 (1-3)	1.4 (0.7-2.2)	1.2 (0.6-2.1)	1.04 (0.90 – 1.21)	.578
No. of people individual provides social support for	1 (0-1)	0.0 (0.0-0.7)	0.1 (0.0-0.7)	0.94 (0.73 – 1.20)	.611
No. of people not on good terms with	1 (0-1)	0.0 (0.0-0.7)	0.0 (0.0-0.5)	1.33 (1.07 – 1.65)	.011*
No. of people who named them as not on good terms with	0 (0-0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.93 (0.63 – 1.37)	.708
No. of people have daily communication with	2 (2-4)	1.8 (1.0-2.9)	1.5 (0.6-2.5)	1.13 (1.00 – 1.27)	.044*
No. of people that live nearby ^d	3 (2-5)	2.2 (1.0-3.7)	1.5 (0.6-3.0)	1.14 (1.03 – 1.25)	.011*
Average trust rating of network ^e	7.2 (6.0-8.4)	6.9 (5.7-8.2)	7.5 (6.5-8.9)	0.81 (0.72 – 0.92)	.001*
Average trust rating of participant	6 (2.5-8.0)	5.9 (1.0-8.1)	5.9 (1.4-8.0)	1.00 (0.95 – 1.07)	.916
Average no. of years participant knew people in network	13.6 (8.9-20.0)	12.9 (8.4-16.5)	14.0 (7.6-21.1)	0.98 (0.95 – 1.00)	.085
<i>Social Support Sociocharacteristics</i>					
No. of people not on good terms with	0 (0-1)	0.0 (0.0-0.1)	0.0 (0.0-0.1)	1.14 (0.83 – 1.55)	.422
No. of people who named participant as not on good terms with	0 (0-0)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.89 (0.47 – 1.66)	.704
No. of people have daily communication with	1 (1-2)	1.0 (0.4-1.6)	0.8 (0.3-1.5)	1.12 (0.93 – 1.36)	.222
No. of people that live nearby	1 (1-2)	0.8 (0.2-1.6)	0.6 (0.1-1.3)	1.13 (0.94 – 1.35)	.186
Average trust rating of network	8.8 (7.5-10.0)	8.6 (6.8-9.7)	8.9 (7.5-9.9)	0.87 (0.79 – 0.96)	.007*
Average trust rating of participant	5 (0-9)	0.0 (0.0-8.8)	4.3 (0.0-8.9)	0.97 (0.93 – 1.02)	.278
Average no. of years participant knew those in network	17.3 (8.3-25.0)	14.7 (5.9-22.4)	17.7 (6.8-25.2)	0.98 (0.96 – 1.00)	.057

ASPD: meeting DSM-IV criteria for antisocial personality disorder; No ASPD: not meeting DSM-IV criteria for anti-social personality disorder; Mdn: median; IQR: interquartile range; OR: odds ratio; CI: 95% Wald confidence interval.

^aEstimator for the population median.

^bIncludes social support, sex, and drug networks.

^cSocial support is categorized by one who may provide advice, lend money, share living space with, and other supportive behaviors.

^dNearby is measured by living in the “same area of town” or closer. Those that don’t live nearby live in “another area of town” or further.

^eTrust is measured on a 10-point scale, with increasing values corresponding to more trust.

* Significant at $\alpha = .05$.

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Table 3

Sociodemographic and Network Predictors of Rural Drug Users Meeting and Not Meeting DSM-IV ASPD Criteria (N = 503)

	AOR (95% CI)	P
Male gender	2.28 (1.37-3.81)	< .01
Age	0.96 (0.93-0.99)	.01
Heterosexual orientation	0.32 (0.14-0.73)	.01
Years of education	0.85 (0.74-0.96)	< .01
MDD	2.06 (1.22-3.47)	.01
Heroin use past 30 days	3.44 (1.15-10.31)	.03
Crack use past 30 days	2.35 (1.15-4.83)	.02
No. of people not on good terms with ^a	1.28 (1.01-1.62)	.04
Average trust rating of network ^b	0.85 (0.77-0.94)	.01

AOR: adjusted odds ratio; CI: 95% Wald confidence interval; MDD: major depressive disorder.

^aBased on overall network.

^bTrust measured on a 10-point Likert scale with increasing numbers corresponding to more trust.