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Predictors of Depressive Symptomatology Among Rural Stimulant Users†

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Abstract

This study examined sociodemographic and drug-related predictors of depressive symptoms among a rural, multistate sample of not-in-treatment stimulant drug users ($n = 710$). Participants were recruited using respondent-driven sampling in Ohio, Arkansas, and Kentucky. The Patient Health Questionnaire (PHQ-9) was used to measure symptoms of depression. Moderate to severe depressive symptomatology was reported by 43.0% of the sample. Cumulative logistic regression analysis showed that daily and nondaily crack use as well as the daily use of cocaine HCl increased the odds of depressive symptoms. Methamphetamine use had no significant association with depression. The daily use of marijuana, the illicit use of tranquilizers, light/moderate cigarette smoking, and injection drug use also increased the risk of depressive symptoms. Living in Kentucky or Ohio (compared to Arkansas), having unstable living arrangements, and being White, female, and older were related to higher odds of depressive symptoms. These results suggest that a host of drug and nondrug factors need to be considered when addressing depressive symptoms in stimulant users.

Keywords

depression; cocaine HCl; crack cocaine; methamphetamine; PHQ-9; rural; substance abuse

Major U.S. population-based community surveys of psychiatric disorders have documented a strong association between depression and problematic substance use (Compton et al. 2007; Kessler et al. 2003; Grant 1995; Warner et al. 1995; Regier et al. 1990). According to the National Longitudinal Alcohol Epidemiologic Survey (NLAES), the odds of having a past year drug use disorder were seven times higher among those persons with major depression compared to those without major depression (Grant 1995).

Research suggests complex and varying relationships between depression and drug use disorders: some users may be self-medicating depression through their use of substances; depression may develop as a result of drug use; or both conditions, depression and drug use disorders, may occur as a result of common factors (DelBello & Strakowski 2003; Compton et al. 2000; Abraham & Fava 1999; Khantzian 1985). Acutely, stimulant drugs, such as cocaine and amphetamines, produce effects that can be viewed as “antidepressant,” including feelings of euphoria, increased energy, alertness, and concentration. However, they may also generate a withdrawal syndrome that is characterized by dysphoric mood, anhedonia, and irritability (Rounsaville 2004; Barr, Markou, & Phillips 2002; Gawin & Ellinwood 1988; Gawin & Kleber 1986). Overall, research has shown that substance use and depressive disorders are linked by some shared neurochemical alterations in the function of serotonin, dopamine, and peptide systems (Kosten, Markou, & Koob 1998; Markou, Kosten & Koob 1998).

Comorbidity rates of depressive and other psychiatric disorders vary by the type of abused drug. According to the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), rates of lifetime depression were 42% among those with lifetime amphetamine use disorder, and about 36% among individuals with lifetime cocaine use disorder (Conway et al. 2006). Prior research conducted with cocaine users recruited in rural and urban treatment programs found that at treatment entry, almost 44% of participants had current major depressive disorder (Brown et al. 1998). High levels of psychiatric symptoms, particularly depression and attempted suicide, were found among methamphetamine users recruited for the Methamphetamine Treatment Project; during the 30 days prior to entering treatment, 34% of women and 24% of men reported some depressive symptoms (Zweben et al. 2004). Further, at the three-year follow-up, about 15% of the total sample and almost 26% of those who reported methamphetamine use in the month prior to the follow-up interview met criteria for current major depressive disorder (Glasner-Edwards et al. 2010). Other studies conducted among treatment-seeking drug users have found higher rates of medical and psychiatric problems among methamphetamine users than cocaine users (Copeland & Sorensen 2001; Rawson et al. 2000). Alternatively, a study based on a multisite sample of 2,176 patients admitted to drug abuse treatment programs across the country suggested that the higher rates of depressive symptomatology observed among methamphetamine users may be related to higher rates of polydrug practices in this population (Riehm, Iguchi & Anglin 2002). Furthermore, most prior studies on comorbid depression have not considered potential psychopharmacological differences between crack and powder cocaine, although it has been shown that, compared to intranasal use of cocaine HCl, crack smoking may be linked to greater abuse liability and more severe consequences (Hatsukami & Fischman 1996).

Prior studies have also shown that individuals with comorbid major depression have a greater propensity to seek treatment for substance abuse compared to users with no depression (Grant 1997). However, psychiatric comorbidities, including depression, have been linked to poorer substance abuse treatment outcomes and a greater likelihood of relapse (Hasin et al. 2002; Compton et al. 2003; Compton et al. 2000). Prior studies have shown that depressive symptoms predicted poor treatment adherence among both methamphetamine (Glasner-Edwards et al. 2010) and cocaine users (Brown et al. 1998). Further, comorbid

depression and other psychiatric symptoms among drug users have also been linked to increased likelihood of engaging in high-risk sexual and injection-related practices (Conner, Piquart & Duberstein 2008; Havard et al. 2006; Roberts et al. 2003; Stein et al. 2003; Mandell et al. 1999; Woody et al. 1997; Latkin & Mandell 1993).

Treatment difficulties and other health risks associated with illicit drug use and comorbid depression may be even greater in rural areas, due to a limited access to health and social services and the potentially greater social stigma attached to drug use and/or mental health service utilization (Borders & Booth 2007; Pringle, Emptage, & Hubbard 2006; Fortney et al. 2004; Fortney & Booth 2001; Rost, Smith & Taylor 1993). In fact, results of the National Comorbidity Survey suggest that rural and urban populations had similar rates of drug use disorders, but rural residents were significantly more likely to meet the criteria for drug use disorders if they met the criteria for a mental disorder. For example, rural residents with past-month major depressive disorder had six times greater odds of meeting past-month drug abuse or dependence criteria, but they were significantly less likely to seek mental health or substance abuse treatment than their urban counterparts (Simmons & Havens 2007).

To extend knowledge about depression among drug users in rural areas of the United States, we report the results of a study that was conducted among 710 cocaine HCl, crack cocaine, and methamphetamine users recruited from rural communities in Ohio, Arkansas, and Kentucky (Falck et al. 2007; Garrity et al. 2007; Booth et al. 2006). This cross-sectional study aimed to: (1) assess the prevalence of depressive symptoms in a community sample of illicit stimulant users; (2) determine the association between depressive symptomatology and use of methamphetamine, crack, and powdered cocaine; (3) examine the relationships between depressive symptoms and other drug use behaviors; and (4) explore the potential differences in depressive symptoms as they relate to the place of residence (Arkansas, Kentucky, and Ohio), gender, age, race, employment status, education, and other selected sociodemographic characteristics. The findings from the study can help elucidate the relationship between illicit stimulant use and depressive symptoms in a population that has been relatively understudied. In turn, this knowledge may help enhance health policy makers' and clinicians' ability to deliver more effective prevention and treatment services in the rural areas of the U.S.

METHODS

Data were collected from 710 active stimulant drug users residing in rural counties in Ohio (n = 248), Arkansas (n = 237), and Kentucky (n = 225). Subjects were recruited over a two-year period, beginning in October 2003, to participate in a longitudinal, natural history study of illicit stimulant drug use and health service utilization. This study is based on data collected at baseline interviews.

Research Sites

Within each state, eligible participants were recruited from three counties that were classified as nonmetropolitan according to the U.S. Census Bureau, close to each other, and within manageable driving distance from the relevant home universities. Based on the 2000 US Census, Ohio counties ranged in population size from 46,000 to 53,000 people, Kentucky counties from 12,000 to 40,000, and Arkansas counties from 12,000 to 27,000. No county had a town with more than 20,000 people.

In terms of racial/ethnic composition, Whites comprised close to 100% of the population in Ohio and Kentucky counties; Arkansas counties (located in the Mississippi delta region) had a high proportion of African Americans (49% to 57%). The counties also varied socioeconomically: the Arkansas and Kentucky counties had higher rates of families living

below the poverty level than counties in Ohio (11% to 14% in Kentucky, 23% to 29% in Arkansas, and 5% to 7% in Ohio). Employment rates were the lowest in Arkansas counties (43% to 51%), followed by Kentucky (45% to 62%), and Ohio (83% to 84%) (US Census Bureau 2000).

Eligibility and Recruitment

To be eligible for the study, participants had to: (1) be at least 18 years of age; (2) self-report having used crack cocaine, cocaine HCl, and/or methamphetamine at least once in the 30 days prior to the baseline interview; (3) be a resident of one of the targeted rural counties; and (4) not have been in a formal substance abuse treatment program in the previous 30 days.

Participants were recruited using respondent-driven sampling (RDS) (Wang et al. 2007; [Wange et al. 2005]; Heckathorn 1997). Ethnographic methods were used to identify initial “seeds,” who were asked to refer other participants. Seeds were compensated \$10 each for up to three referrals who presented at field site office for an eligibility determination. More details on the sampling methodology and participant recruitment can be found elsewhere (Wang et al. 2007; Booth et al. 2006; Draus et al. 2005).

Data Collection

Participants were engaged in an IRB-approved informed consent process at entry into the study. Project staff conducted office-based, face-to-face, structured interviews. Project staff were trained to conduct interviews in a nonjudgmental manner. The baseline interview lasted two to 2.5 hours, and participants were compensated \$50 for the time they spent responding to the questions. The baseline structured questionnaire consisted of author-generated and standardized items that covered a range of areas, including sociodemographics, past and current drug use practices, family/social and legal problems, and health status. The frequency of methamphetamine, crack cocaine, cocaine HCl, heroin, marijuana, pharmaceutical, and other drug use was obtained by asking: “On how many days in the past 30 days did you use [the drug]?” Alcohol use was measured by asking, “How many days in the past 30 days did you drink to the point of drunkenness?” Information about cigarette smoking was obtained by asking the following question: “On average, in the past 30 days, how many cigarettes did you smoke per day?” Many questionnaire items used in this study, including the drug use questions, were used in an earlier study of crack cocaine users and were found to have good to excellent reliability (Siegal et al. 1998).

Symptoms of depression during the previous two weeks were measured using the PHQ-9, the nine-item depression module from the Patient Health Questionnaire (PHQ). Considered a reliable and valid measure of depressive symptomatology (Martin et al. 2006; Kroenke, Spitzer & Williams 2001), the PHQ-9 yields a depression severity score ranging from 0 to 27. Five levels of severity can be identified: 0-4 (“none”), 5-9 (“mild”), 10-14 (“moderate”), 15-19 (“moderately severe”), and 20-27 (“severe”). A score of less than 10 is rarely seen in an individual with major depression, whereas a score of 15 or higher typically indicates major depression (Kroenke, Spitzer & Williams 2001). For this study, the first two levels were combined, as were the last two, thereby yielding three levels of symptom severity: “none or mild,” “moderate,” and “moderately severe/severe.”

Data Analysis

A cumulative logistic regression model (proportional odds model) was used for the analysis (Agresti 1996; Liao 1994). The dependent variable in the model was an ordinal measure of severity of depressive symptomatology with the three aforementioned levels. The model takes into account two cumulative logits: (1) the log odds of moderate-severe/severe

depression to moderate and none/mild depression, and (2) the log odds of moderate-severe/severe and moderate depression to none/mild depression. Sociodemographic variables and measures of drug use were included in the model. For more parsimonious analyses, pharmacologically similar drugs such as heroin and pharmaceutical opioids were grouped together. Since reported days of drug use had a skewed distribution, drug use measures were transformed into categorical variables. For methamphetamine, crack cocaine, cocaine HCl, and marijuana use, reported days of use were divided into three categories: 0 days (no use), 1-19 days (nondaily use), and use on 20 or more days (daily use). Thus, two dummy variables were created as regressors representing the categorical measures of using each of the drugs. Use of a 20-day cut point to differentiate daily from nondaily users is consistent with the methodological approach employed by the national epidemiological surveys (SAMHSA 2009; Johnston, O'Malley & Bachman 2003). Further, use of a greater number of categories would substantially increase the number of regressors and make the model less parsimonious. Other drug use practices, including illicit use of amphetamines, heroin/pharmaceutical opioids, pharmaceutical tranquilizers, and injection of any drug in the past 30 days, were measured with two categories: "use" and "no use." Reported days of drunkenness were divided into three categories: "none" (0 days), "nondaily" (1-19 days), and "daily drunkenness" (20 or more days). The responses regarding tobacco use were categorized into: "no use," "light or moderate use" (1-19 cigarettes per day), and "heavy use" (20 or more cigarettes per day).

RESULTS

Table 1 presents participants' sociodemographic characteristics. Men constituted about 61% of the sample. Participants from Ohio and Kentucky were predominately White, whereas participants from Arkansas were predominately African American (65.4%). About 41% of the total sample had less than a high school education; 15% were married or living as married. More than half of the total sample did not have their own residence, and most participants lived on an income of \$5,000 or less per year.

Thirty-day drug use is shown in Table 2. Crack use was reported by about 60% of the participants, cocaine HCl use by almost 50%, and methamphetamine by about 44%. Use of other drugs was common among participants. Almost 40% of the sample reported the daily use of marijuana, and about 57% smoked 20 or more cigarettes per day. Non-medical use of pharmaceutical opioids was reported by about 46% of the sample, and nearly 13% reported injecting an illegal drug in the past 30 days.

Responses to the PHQ-9 indicated that about 43% of the respondents at the three sites had moderate to severe depressive symptomatology (i.e., PHQ-9 scores ≥ 10) in the two weeks prior to the interview, with higher rates reported in Ohio and Kentucky than in Arkansas (Table 3). Reliability measures for the PHQ-9 were 0.82 or greater for each of the three sites.

Table 4 shows the results of the cumulative logistic regression. The score test for the proportional odds assumption yielded a chi-square statistic of 26.7 (df = 26), which was not statistically significant ($p = 0.42$), suggesting that the cumulative logistic regression was appropriate to model the three-level ordinal outcome under study. The effects of the independent variables on the log odds of having higher levels of depressive symptoms, rather than lower levels of depressive symptomatology, were tested using a Wald chi-square statistic.

White ethnicity, older age, and unstable living arrangements (or not having his or her own place to live) were associated with increased odds of having higher levels of depressive

symptomatology, while male gender was linked to lower odds (Table 4). Participants in Arkansas were less likely to report depressive symptomatology than those in Kentucky and Ohio, controlling for other factors (Table 4).

Crack use, both daily and nondaily, was a significant predictor of more severe depressive symptomatology. Those who used crack on a nondaily basis were twice as likely to report higher levels of depressive symptomatology compared to nonusers, while the odds of depressive symptoms were 2.6 greater among daily users (see Table 4). Those who used cocaine HCl on a daily basis also had significantly higher odds of having higher levels of depressive symptomatology compared to nonusers. No association was found between nondaily cocaine HCl use and depressive symptoms. Daily and nondaily methamphetamine use had no association with depressive symptomatology, controlling for other drug use practices, gender, ethnicity, and other variables as seen in Table 4.

Considering other drug use practices, the daily use of marijuana, the nonmedical use of tranquilizers, and injection use of any illicit drugs in the past 30 days were associated with higher odds of having more severe depressive symptoms. Compared to nonuse, light or moderate cigarette smoking was associated with higher levels of depressive symptomatology, while heavy smoking had no significant effects.

DISCUSSION

This study is among the first to explore the sociodemographic and drug-related predictors of depressive symptoms among a large, not-in-treatment sample of rural stimulant users. The prevalence of moderate to severe depressive symptomatology, as measured by PHQ-9, was about 43% for the sample as a whole. In comparison, an earlier study conducted among an urban sample of 430 not-in-treatment crack cocaine users found that about 56% had symptoms of moderate to severe depression as measured by the Beck Depression Inventory (Falck et al. 2002). However, comparing prevalence rates to prior studies (e.g., Falck et al. 2002; Brown et al. 1998; Rounsaville et al. 1991; Kleinman et al. 1990) is difficult because of significant differences in sociodemographic characteristics, treatment involvement, and drug use practices of the sampled populations, and because of different instruments used to assess depressive symptoms.

The results suggest that crack cocaine and cocaine HCl use had different associations with depressive symptomatology. While any use of crack cocaine (both daily and nondaily) was associated with higher odds of more severe depressive symptomatology, only daily use of cocaine HCl showed a significant association. Prior studies have shown that compared to intranasal use of powdered cocaine, crack use is linked to a greater propensity for abuse and dependence (Hatsukami & Fischman 1996). Furthermore, prior qualitative research reported greater social stigma attached to crack than to cocaine HCl use (OSAM 2005, 2004). Social stigma may increase interpersonal discrimination, which could have a negative impact on health, including increased levels of depressive symptoms (Young et al. 2005).

Our findings also suggest that methamphetamine use had no significant association with depressive symptoms, after controlling for other sociodemographic and drug use characteristics (Table 4). These results contrast with prior studies conducted among in-treatment and arrestee samples that have linked methamphetamine use to a high prevalence of depressive symptoms (Zweben et al. 2004; Rawson et al. 2002; Kalechstein et al. 2000). However, our results are consistent with those of Riehm and colleagues (2002) showing that an association between amphetamine/methamphetamine use and depressive symptoms disappeared when controlling for polydrug use and other factors. Of note, our prior findings have shown greater levels of illness among crack users, compared to methamphetamine

users (Garritty et al. 2007), and a link between nondaily use of methamphetamine and lower odds of perceived need for substance abuse treatment (Falck et al. 2007).

The lack of a statistically significant relationship between methamphetamine use and depressive symptoms among rural stimulant users may be surprising, especially in the context of prior reports of the effects of methamphetamine use on mental and physical health (Boulard 2005; Jefferson 2005; Albertson, Derlet & Van Hoozen 1999; Barnes, Boeger & Huffman 1998). One potential explanation for these findings may be related to different patterns and social contexts of drug use. Most of the prior research on methamphetamine use has been conducted among urban populations in western states. As Sexton and colleagues (2006) noted, in the rural communities of Kentucky and Arkansas, small-scale, independent methamphetamine production has contributed to the development of a flexible, localized drug economy with private distribution channels, close social relationships and often noncommercial, drug sharing behaviors. The rural methamphetamine economy differs in many ways from crack scenes, which have been frequently portrayed as highly competitive arenas where most social connections are based on greediness and hostility and even intimate relationships are reduced to commodities to be exchanged for crack (Daniulaityte, Carlson, & Siegal 2007; Bourgois & Dunlap 1993; Inciardi, Lockwood, & Pottieger 1993; Ratner 1993; Carlson & Siegal 1991). These differences between crack and methamphetamine use scenes may be one of the contributing factors to the observed distinct relationships between particular types of illicit stimulant use and depressive symptoms. However, some studies have pointed out that although rural and urban crack scenes are similar in many ways, rural crack use is frequently embedded in close social relationships that may moderate some of the most negative behaviors associated with crack use (Draus & Carlson 2007; Brown & Trujillo 2003).

The differences observed between methamphetamine and cocaine (crack, in particular) associations with depressive symptoms should be considered in the context of prior studies showing that some individuals use methamphetamine to enhance productivity, energy, and daily functioning in their roles as family caregivers and providers (Daniulaityte, Carlson & Kenne 2007; Sexton et al. 2006; Morgan & Beck 1997). One study found that methamphetamine users spent less money on drugs and were more successful at participating in "normal" activities of daily life than cocaine users (Simon et al. 2002). Overall, the relationships between illicit stimulant use and depressive symptoms observed in this study echo some of the user perceptions recorded in qualitative research in Ohio, which emphasized greater social and health-related consequences associated with crack than with methamphetamine or cocaine HCl use (Daniulaityte, Carlson & Kenne 2007).

Consistent with earlier research (Wasan et al. 2007; Conway et al. 2006; Quintero, Peterson, & Young 2006; Kurtz et al. 2005; Zweben et al. 2004; Domie et al. 2000; Grant & Pickering 1998; Latkin & Mandell 1993; Dinwiddie, Reich & Cloninger 1992), the risk of more severe depressive symptoms was greater for individuals who reported daily use of marijuana, illicit use of tranquilizers, and/or injection drug use. Light or moderate cigarette smoking was also linked to increased odds of depressive symptomatology, while heavy smoking had no significant association. Past research has shown that smokers have higher rates of depression than nonsmokers (Lasser et al. 2000; Glassman 1997). Further, in prior studies, psychiatric disorders were linked to higher level of cigarette consumption (Lasser et al. 2000) and increased risk of progression to nicotine dependence (Breslau, Novak & Kessler 2004; Breslau, Kilbey & Andreski 1993). The reasons behind the observed relationship between depression and light or moderate smoking, and a lack of such association with daily cigarette smoking are not clear and warrant further research.

The Arkansas sample had significantly lower levels of depressive symptoms than Ohio or Kentucky participants, even after controlling for other sociodemographic and drug use characteristics (Table 4). The explanation of these regional differences is unclear. On the one hand, US Census data show that Arkansas counties had higher levels of poverty and unemployment than counties in Ohio or Kentucky (US Census Bureau 2000), which previous research suggests would contribute to a comparatively higher prevalence of depression and other mental health problems (Muntaner et al. 2006; Xue et al. 2005; Muramatsu 2003). On the other hand, National Survey on Drug Use and Health data suggest that rates of serious psychological distress (based on annual averages, 2002-2004) were higher in Kentucky counties, but lower in Ohio, compared to rural counties in Arkansas (SAMHSA 2005). Future research should take into account social and cultural factors to better understand differential regional rates of depressive symptoms among rural stimulant users.

Our findings indicate higher odds of depressive symptomatology were linked to White ethnicity and female gender. These results are consistent with other research conducted among substance abusers (Conner, Pinquart & Holbrook 2008; Falck, Wang & Carlson 2008; Falck et al. 2006, 2002; Ziedonis et al. 1994) and in the general U.S. population (Breslau et al. 2006; Compton et al. 2006; Kessler et al. 2003; Andrade et al. 2003; Blazer et al. 1994). Previous research suggests that the lower risk for major depression among African Americans, compared to Whites, indicates the presence of protective sociocultural factors that originate in childhood (Breslau et al. 2006), and may persist despite harmful behaviors such as drug use. Greater vulnerability of women to depression has been observed in many different countries and cultures, and most likely is linked to biological, psychosocial and cultural factors (Bogner & Gallo 2004; Bebbington 1999; Weissman & Klerman 1992).

In contrast to prior epidemiological studies (Kessler et al. 2003; Falck et al. 2002; Riehm, Iguchi & Anglin 2002), our findings indicate that older individuals were more likely to report depressive symptomatology compared to younger counterparts. To better understand the relationship between age and depressive symptoms among drug users, future research should take into account duration of drug use, which might be an important confounding factor in this association.

In terms of socioeconomic indicators, only one variable—stability of the living situation—had a significant association with symptoms of depression. Those participants who did not have stable residence were more likely to report depressive symptoms than those who lived in their own house or apartment. Other factors, such as marital status, education, income and employment, that have been shown to relate to depression in the general population (Kessler et al. 2003), did not have significant associations with depressive symptoms among this sample.

These findings should be evaluated in the context of several limitations. First, the sample was not a random one, although using respondent-driven sampling is recognized as one of the best methods to recruit active illicit drug users (Wang et al. 2005; Heckathorn 1997). Second, the study relies on participants' self-reports of their nonmedical drug use. Although the quality of such data is not without problems, self-reports continue to be the primary source of data for estimating drug use prevalence, and there is evidence to suggest that such reports often have good validity and reliability (Darke 1998; Hser 1997; Adair et al. 1995). Third, this study's cross-sectional design and methods used to assess depressive symptoms precludes determining whether depressive symptomatology is primary or secondary to stimulant use. Additional research is needed to clarify this issue since prior studies have shown that the timing of depressive episodes relative to substance dependence may have differential effects on the remission and relapse of drug use behaviors (Hasin et al. 2002).

The high rates of depressive symptomatology found among this rural sample of not-in-treatment stimulant drug users are largely consistent with prior research conducted on comorbid depression and substance abuse (Conner, Pinquart & Holbrook 2008). Further, our results suggest that rather than trying to address stimulant abuse as a category in itself, prevention and treatment efforts should take into account unique client needs linked to differential effects of crack cocaine, cocaine HCl and methamphetamine use as well as polydrug use practices. Matching treatment settings, interventions, and services to each person's individual problems and needs has been recognized as one of the core principles of effective treatment (NIDA 2008). However, local rural communities may find it difficult to fund comprehensive services that are capable of accommodating the unique needs of individual clients. Our findings may help policy makers and treatment program managers identify high priority groups who display several risk factors for depressive symptomatology and create more targeted treatment efforts. For example, according to our findings, female crack users would be expected to experience significantly higher levels of depressive symptomatology than male methamphetamine users. Based on such information, treatment providers and policy makers could make adjustments to their service planning.

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TABLE 1

Sociodemographic Characteristics

Variable	Ohio n	Ohio %	Kentucky n	Kentucky %	Arkansas n	Arkansas %	Total n
Age							
Mean (SD)	29.9 (9.23)		32.3 (10.45)		35.6 (10.58)		32.6 (10.35)
Gender							
Male	166	66.9	129	57.3	141	59.5	436
Female	82	33.1	96	42.7	96	40.5	274
Ethnicity							
Non-White	32	12.9	41	18.2	155	65.4	228
White	216	87.1	184	81.8	82	34.6	482
Education							
<HS	102	41.1	80	35.6	112	47.3	294
HS/GED	122	49.2	115	51.1	87	36.7	324
>HS	24	9.7	30	13.3	38	16.0	92
Marital Status							
Married or Living as							
Married	36	14.5	35	15.6	41	17.3	112
Single, Divorced, Separated, Widowed	212	85.5	190	84.4	196	82.7	598
Living Situation							
Own Place	116	46.8	123	54.7	81	34.1	320
Someone Else's Place	132	53.2	102	45.3	156	65.9	390
Employment (Full Time)							
Employed	87	35.1	95	42.2	47	19.8	229
Unemployed	161	64.9	130	57.8	190	80.2	481
Annual Income							
<\$5000	115	46.4	105	46.9	172	72.9	392
\$5000+	133	53.6	119	53.2	64	27.1	316

TABLE 2
Drug Use in the Past 30 Days

Drug	Ohio (n = 248)	Kentucky (n = 225)	Arkansas (n = 237)	Total (n = 710)
Crack Cocaine				
No Use	78 (31.5)	131 (58.2)	81 (34.2)	290 (40.8)
Nondaily Use	125 (50.4)	82 (36.5)	89 (37.6)	296 (41.7)
Daily Use	45 (18.1)	12 (5.3)	67 (28.3)	124 (17.5)
Cocaine Hcl				
No Use	68 (27.4)	156 (69.3)	141 (59.5)	365 (51.4)
Nondaily Use	151 (60.9)	67 (29.8)	72 (30.4)	290 (40.9)
Daily Use	29 (11.7)	2 (0.9)	24 (10.1)	55 (7.7)
Methamphetamine				
No Use	174 (70.2)	87 (38.7)	142 (59.9)	403 (56.7)
Nondaily Use	63 (25.4)	115 (51.1)	73 (30.8)	251 (35.4)
Daily Use	11 (4.4)	23 (10.2)	22 (9.3)	56 (7.9)
Tobacco Use				
No Use	28 (11.3)	36 (16.0)	36 (15.3)	100 (14.1)
1-19 Cigarettes/Day	56 (22.6)	68 (30.2)	82 (34.9)	206 (29.1)
20 + Cigarettes/Day	164 (66.1)	121 (53.8)	117 (49.8)	402 (56.8)
Drunkenness				
None	70 (28.3)	127 (56.5)	136 (57.4)	333 (46.9)
Nondaily	144 (58.3)	86 (38.2)	87 (36.7)	317 (44.7)
Daily	33 (13.4)	12 (5.3)	14 (5.9)	[59] (8.4)
Marijuana				
No Use	36 (14.5)	48 (21.3)	51 (21.5)	135 (19.0)
Nondaily Use	96 (38.7)	97 (43.1)	100 (42.2)	293 (41.3)
Daily Use	116 (46.8)	80 (35.6)	86 (36.3)	282 (39.7)
Amphetamine				
No Use	188 (75.8)	204 (90.7)	211 (89.0)	603 (84.9)
Use	60 (24.2)	21 (9.3)	26 (11.0)	107 (15.1)
Tranquilizers				
No Use	157 (63.3)	156 (69.3)	207 (87.3)	520 (73.3)
Use	91 (36.7)	69 (30.7)	30 (12.7)	190 (26.7)
Pharmaceutical Opioids				
No Use	83 (33.1)	131 (58.2)	172 (72.6)	386 (54.4)
Use	165 (66.9)	94 (41.8)	65 (27.4)	324 (45.6)
Heroin				
No Use	205 (82.7)	223 (99.1)	234 (98.7)	662 (93.2)
Use	43 (17.3)	2 (0.9)	3 (1.3)	48 (6.8)
Drug Injection				
No Use	209 (84.3)	200 (88.9)	212 (89.5)	621 (87.5)
Use	39 (15.7)	25 (11.1)	25 (10.5)	89 (12.5)

TABLE 3
PHQ-9 Depressive Symptom Severity Among Rural Stimulant Users

Depressive Symptom Severity	Ohio		Arkansas		Kentucky		Total	
	N	%	N	%	N	%	N	%
None-Mild (0-9)	122	49.2	159	67.1	124	55.1	405	57.0
Moderate (10-14)	58	23.4	53	22.4	55	24.4	166	23.4
Moderate-Severe to Severe (15+)	68	27.4	25	10.5	46	20.4	139	19.6

TABLE 4
Results of Cumulative Logistic Regression: Sociodemographic and Drug-Related Predictors of Depressive Symptoms

Variable	Odds Ratio	95% C.I.	P Value
Sociodemographic Characteristics			
Site (vs. Arkansas)			
Ohio	2.03	(1.24 - 3.32)	0.0047
Kentucky	2.34	(1.49 - 3.69)	<0.0002
Ethnicity			
White (vs. Non-White)	1.82	(1.12 - 2.97)	0.0165
Gender			
Male (vs. Female)	0.51	(0.37 - 0.71)	<0.0001
Age	1.03	(1.01 - 1.05)	0.0017
Education			
"High school +" (vs. "< High school")	0.91	(0.65 - 1.26)	0.5531
Marital Status			
Single (vs. Married)	0.86	(0.55 - 1.33)	0.4944
Employment, Full Time or Part Time			
Unemployed (vs. Employed)	0.84	(0.59 - 1.20)	0.3413
Income			
\$5000 or More (vs. Less than \$5000)	0.77	(0.54 - 1.09)	0.1420
Living Situation			
Someone Else's Place (vs. Own Place)	1.48	(1.05 - 2.08)	0.0259
Drug use in past 30 days			
Crack Cocaine (vs. No Use)			
Nondaily	2.17	(1.49 - 3.17)	<0.0001
Daily	2.60	(1.57 - 4.31)	0.0002
Cocaine HCl (vs. No Use)			
Nondaily	0.90	(0.63 - 1.30)	0.5850
Daily	2.62	(1.37 - 5.01)	0.0036
Methamphetamine (vs. No Use)			
Nondaily	0.93	(0.62 - 1.39)	0.7068
Daily	1.10	(0.57 - 2.11)	0.7754
Tobacco (vs. No Use)			
Less Than 20 Cigarettes per Day	1.83	(1.08 - 3.10)	0.0253
20 or More Cigarettes per Day	1.20	(0.73 - 1.98)	0.4761
Drunkenness (none)			
Nondaily	0.97	(0.69 - 1.37)	0.8690
Daily	1.43	(0.79 - 2.59)	0.2346
Marijuana (vs. No Use)			
Nondaily	0.85	(0.55 - 1.32)	0.4743
Daily	1.70	(1.05 - 2.73)	0.0299

Variable	Odds Ratio	95% C.I.	P Value
Amphetamine Use (vs. No Use)	0.89	(0.56 - 1.43)	0.6309
Tranquilizer Use (vs. No Use)	1.51	(1.03 - 2.22)	0.0357
Heroin/Opioid Use (vs. No Use)	1.45	(0.99 - 2.13)	0.0555
Drug Injection (vs. No Use)	1.73	(1.06 - 2.82)	0.0273

The “Score Test for the Proportional Odds Assumption” yielded a chi-square statistic of 26.75 (df = 26), which was not statistically significant ($p = 0.42$), suggesting that the cumulative logistic regression was appropriate to model the three-level ordinal outcome under study. The effects of the independent variables on the log odds of having more depression, rather than less depression, were tested using a Wald chi-square statistic.