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Predictors of Substance Use Disorder and Mental Health Treatment Use Among Rural Adults using Stimulants over Three Years

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Abstract

Background: Persons using substances, living in rural communities, tend to underutilize mental health (MH) and substance use disorder (SUD) treatment compared to their urban peers. However, no studies have examined longitudinal predictors of MH and SUD treatment use among rural persons using stimulants.

Methods: Data were collected through interviews conducted between 2002 and 2008 from a natural history study of 710 adults using stimulants and living in rural counties of Arkansas, Kentucky, and Ohio. Each study site recruited participants using Respondent-Driven Sampling (RDS). Participants were adults, not in drug treatment, and reporting past 30-day use of methamphetamine, crack cocaine or powder cocaine. Study participants completed face-to-face baseline assessments and follow-up interviews using computer-assisted personal interviews. Follow-up interviews were conducted at 6-month intervals for three years.

Results: Our results show that being male, nonwhite, and having a prior lifetime history of SUD or MH treatment use were associated with lower odds of using MH and SUD treatment over time; having medical insurance, and living in a state with potentially greater availability of MH and

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SUD treatment was associated with higher odds of using MH and SUD treatment over the three-year period. Further, reporting greater legal problems and alcohol severity were associated with greater odds of using MH and SUD care, while greater employment problems was associated with higher odds of SUD but not MH treatment use.

Conclusions: Findings from this study could be used to inform clinical and public health strategies for improving linkage to MH and SUD care in this population. Our findings also highlight the importance of having medical insurance as a potential facilitator to utilizing SUD care in this population, and support the need for health care policies that increase rural adults who use stimulants ability to pay for such services.

Large national surveys show that adults who use substances seek out substance use disorder (SUD) and mental health (MH) treatment services as care options.^{1,2} Unfortunately, rural adults who use drugs and alcohol tend to underutilize both of these service types compared to their urban counterparts.^{2,3} In a study of rural adults using substances, 24% reported using SUD services while 17% reported using MH services in the past three years.² Further, almost all rural participants in this study not using these services at baseline continued to not use these services over the following three years.² Qualitative studies show that barriers including the feeling that one “should not need help”; cost and availability of services; not knowing where to go to access services; distance to a care provider; mistrust of mental health providers; not thinking treatment will help; not wanting to talk with a stranger about private matters; and stigma can interfere with rural adults seeking mental health and substance use disorder treatment.^{4,5} Longitudinal studies of rural adult substance users’ use of SUD and MH care are needed to understand factors that affect their use of such care over the long-term. This line of research may also help lead to the development of clinical (e.g., use of linkage interventions) and public health strategies (e.g., policies to increase access and/or ability to pay for services) for improving rural adults using substances ability to seek needed care.

Few longitudinal studies have examined factors associated with MH and SUD service use among adults using drugs and alcohol. A recent study found that greater perceived need for SUD treatment, having a prior history of SUD treatment use, reporting higher severity of legal problems, and polysubstance use was associated with a greater likelihood of entering SUD treatment, among adult users of drugs and alcohol, at least once over a 2-year period.⁶ Cross-sectional surveys of individuals with a SUD show that gender, age, geographical proximity to SUD treatment resources, and health status may be associated with rural and non-rural persons, with a drug use disorder, decision to seek MH and SUD services.¹ However, to our knowledge, no studies have examined whether these factors contribute to MH and SUD treatment use among rural adults using stimulants over a multi-year period, which may be important in informing clinical strategies and policy to improve linkage to needed care in this population.

To address this gap in the literature, the present study sought to examine factors that predict three-year use of MH and SUD treatment services in a sample of adults using stimulants and living in rural counties in Arkansas, Kentucky, and Ohio. Data were collected from 710 adults reporting prior 30-day cocaine (powder or crack) and/or methamphetamine use. The

present study builds on three prior reports^{2,3,6} by examining predictors of SUD and MH treatment use independently (SUD treatment only, MH treatment only) and combined (MH and SUD treatment) and reporting on all three years of study data.

We used the Andersen Behavioral Model of Health Services Use to guide the selection of variables included in the statistical models predicting MH and SUD treatment use. The Anderson Model suggests that utilization of health care is largely determined by *predisposing* (e.g., demographic characteristics, lifetime MH or SUD treatment use), *enabling* (e.g., social support, availability of services, medical insurance status), and *current illness status* (e.g., severity of mental health and substance use) factors.^{6–8} We chose to use the Anderson Model as it has been used in prior cross-sectional research examining factors associated with use of MH and SUD treatment in urban and rural populations.¹ Further, because of its widespread use in the health care utilization literature, use of the Anderson Model helps facilitate comparisons with prior research in this area to improve our understanding of MH and SUD services use and potentially inform efforts to increase linkage and utilization of needed care among populations using drugs and alcohol.^{1,6,9}

Methods

Sample and Eligibility

Data were collected through interviews conducted between 2002 and 2008 from a natural history study of 710 adults using stimulants and living in rural counties of Arkansas, Kentucky, and Ohio.¹⁰ We used the 2000 Census to identify counties defined as non-metropolitan. Counties with populations less than 20,000 individuals were considered rural and included in the study. Participants were recruited from two counties in Arkansas, four counties in Ohio, and nine counties in Kentucky. Participants were eligible if they were: (1) not in drug treatment or mutual-help groups (e.g., narcotics anonymous) within the past 30 days; (2) 18 years of age or older; (3) had used methamphetamine, crack cocaine or powder cocaine by any route of administration in the past 30 days; and (4) had a verifiable address within one of the study counties.

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. Each study site recruited participants using Respondent-Driven Sampling (RDS), a type of snowball sampling.^{11,12} To identify potential "seeds," study staff met with drug treatment providers in the local area (to identify places in the community frequented by persons using drugs), distributed research study business cards to individuals who might know persons using drugs, and visited places such as bars frequented by adults using drugs. Study seeds were asked to complete a baseline interview and hand out information about the study to up to three people they knew who used drugs.¹³ Each seed received \$10 for up to three referred individuals who contacted the study coordinator and were eligible for, and enrolled in, the study. Participants were paid \$50 for each completed study session.

Study Procedure

Participants completed informed consent prior to the baseline interview. Study participants completed face-to-face baseline assessments and follow-up interviews using computer-assisted personal interviews. Follow-up interviews were conducted at 6-month intervals for three years. Each follow-up interview consisted of the same questions as asked in the baseline interview. Study staff collected demographic characteristics and updated participants' contact information at each follow-up interview to improve the likelihood of locating participants for subsequent follow-up interviews. Table 1 presents the follow-up rates at each interview. Retention rates were 85%, 82%, 81%, 79%, 79%, and 73% for the 6, 12, 18, 24, 30, and 36-month interviews, respectively; 73% of the initial sample completed all interviews.

Measures

Dependent variables.—Dependent variables were any use (yes or no) of MH and SUD treatment over the three-year follow-up. To assess SUD treatment use, at each follow-up participants were asked, “In the past 6-months, on how many separate occasions have you been a patient in a drug abuse treatment program (not counting self-help programs like AA or NA)?” To assess MH treatment use, at each follow-up participants were asked, “In the past 6-months, did you receive treatment from a professional like a psychologist, social worker, psychiatrist, or a therapist for an emotional or psychological problem such as feeling down in the dumps or sad, difficulty sleeping, feeling anxious, being worried much of the time, or feeling easily annoyed or irritated?” Responses to both items were separately converted to binary variables (0 or >1 visit).

Independent variables.—We first included *predisposing factors* such as gender, ethnicity, age, education, marital status, medical insurance, and State of residence. We also included any lifetime use (yes or no) of MH and SUD treatment measured at baseline. State of residence was also included in the model as an *enabling factor* or indicator of access to MH and SUD services.

At each interview, the following data measuring *enabling and current illness status factors* were collected. Participant MH status was assessed using the Brief Symptoms Inventory (BSI)¹⁴ Global Severity Index (GSI). The BSI is a self-report assessment of psychological distress. The GSI is a global index of distress with higher scores on this index indicating higher psychological distress. The employment, family, legal, alcohol, and drug composite scores of the Addiction Severity Index (ASI)¹⁵ were also included to assess severity of substance use and related problems. The ASI is a structured, clinical research interview that assesses different problem domains related to substance use. In each domain, a composite score is produced from items that are standardized and summed to provide an evaluation of participant status over his or her lifetime and in the past 30 days. Scores range from 0 to 1, with higher scores indicating greater severity.

Two summary measures of perceived social support (SS) from persons using drugs and persons not using drugs were also included in the model. Two of the five statements used to assess SS were adapted from the Medical Outcomes Study Social Support Questionnaire -

“There are people I can have a good time with” and “There are people who show they love or care for me.”¹⁶ Three additional statements were added: “There is someone I can talk to about important decisions in my life,” “There are people who recognize my abilities,” and “There are people I can count on in emergencies.” Response options ranged from 1 (strongly disagree) to 4 (strongly agree). Both types of SS were assessed with separate instructions requesting a response according to people in the participants’ life who use drugs and do not use drugs. A summary measure for each type of SS was created using the means of all five questions for a specific support type, with higher scores on each SS composite indicating more of that specific type of support. The Cronbach’s coefficient for the SS composite scores from persons not using drugs ($\alpha = .84$) and persons using drugs ($\alpha = .81$), measured at baseline, indicate reasonable internal consistency.

Data Analysis

Descriptive statistics were calculated and presented for all the variables included in the analysis. Generalized estimating equations (GEE) was used to examine the association between independent and dependent variables (odds of any MH treatment, SUD treatment, or use of MH and SUD treatment) in multivariable models using PROC GENMOD in SAS/STAT version 9.4. Use of treatment services was defined as any MH and/or SUD treatment use over the 3-year follow-up period. Distributions of binomial and negative binomial were specified for any treatment use with logit and log link respectively. GEE is an extension of generalized linear models that use quasi-likelihood estimation and is frequently used in longitudinal analysis involving data collected by repeated measures. A strength of GEE is that it allows for inclusion of all possible data in the analysis by not excluding participants with missing data. In the current analysis, we fit a lagged model where the likelihood of treatment use at the current assessment period was regressed on lagged values of independent variables. For example, we assessed the effect of baseline explanatory variables on the likelihood of treatment use at 6-months. This one-unit lag was carried forward for each subsequent follow-up period.

Results

Descriptive statistics

Table 1 presents descriptive statistics for the demographic characteristics, MH status, substance use severity and related problems, degree of perceived SS from persons using drugs and persons not using drugs, lifetime SUD and/or MH treatment use measured at baseline, and use of SUD and/or MH treatment measured at each of the six follow-up interviews.

Study participants were mostly male, younger, and reporting at least a high school education. Participants were 68% white, 29% black, 1% Hispanic/Latino, 1% Native American, and 2% other. At baseline, most participants did not have a partner, had an income level of below \$10K, and did not have medical insurance. About a third of participants were recruited from each state respectively, with 33% from Arkansas, 35% from Ohio, and 32% from Kentucky. At baseline, 17% of participants reported lifetime use of MH services, while 24% reported lifetime use of SUD services. One-fifth of participants reported

having ever used both MH and SA treatment at the baseline interview, with 38% reporting never having used either treatment in their lifetime.

At each follow-up interview, use of MH treatment ranged from 7% to 9%, use of SUD treatment ranged from 3% to 7%, and use of both services ranged from 2–3%. The majority of participants reported using neither MH nor SUD treatment over the course of the three-year follow-up. When examined by State, a greater proportion of participants in Ohio (46% and 57%) relative to Arkansas (32% and 41%) and Kentucky (37% and 37%) reported at least one MH and SUD treatment visit at baseline, respectively (data not shown in tables). This trend by state generally continued at each follow-up interview.

Multivariate analysis

Results from the GEE model (Table 2) show that being from Ohio (Odds Ratio [OR] = 2.84, 95% Confidence Interval [CI] = 2.84, 5.16; compared to Arkansas) and having a higher ASI legal severity score (OR = 10.96, CI = 4.57, 26.26) were associated with greater odds of reporting a MH treatment visit, respectively. In contrast, participants reporting at least one lifetime visit to a SUD treatment program (OR = 0.14, CI = 0.08, 0.25) had significantly lower odds of reporting a MH visit.

Regarding predictors of a SUD treatment visit, results showed that older participants (OR = 1.02, CI = 1.00, 1.04), those with medical insurance (OR = 1.85, CI = 1.29, 2.65), higher scores on the BSI-GSI (OR = 1.03, CI = 1.01, 1.05), and higher scores on the ASI employment severity composite (OR = 3.02, CI = 1.15, 6.26) had greater odds of a SUD visit during the follow-up period than those without these characteristics. In contrast, participants who were nonwhite (OR = 0.57, CI = 0.34, 0.96), reporting higher ASI alcohol severity scores (OR = 0.25, CI = 0.07, 0.96), and having prior lifetime use of MH treatment (OR = 0.08, CI = 0.05, 0.12) had lower odds of SUD treatment use over the course of the three-year period.

Regarding predictors of MH and SUD treatment visits, participants who reported being from Ohio (OR = 3.82, CI = 1.34, 10.89, compared to Arkansas), having higher BSI-GSI scores (OR = 1.04, CI = 1.01, 1.08), and higher ASI legal (OR = 13.61, CI = 2.89, 64.07) and alcohol severity (OR = 14.67, CI = 3.33, 64.07) scores had greater odds of reporting a MH and SUD treatment visit over the three-year period. Male participants (OR = 0.38, CI = 0.18, 0.77) and those with prior lifetime use of MH (OR = 0.19, CI = 0.09, 0.39) or SUD (OR = 0.08, CI = 0.04, 0.15) treatment had lower odds of using MH and SUD treatment over the follow-up period.

Discussion

Our results indicate that being male was associated with lower odds of reporting a MH and SUD treatment visit over time, while being nonwhite was associated with lower odds of a SUD visit over the three-year follow-up. The finding that men had lower odds of using MH and SUD treatment over time contrasts from prior findings of rural and urban adults using drugs showing men to have higher perceived need for treatment than women.¹⁷ However, perceived need may not always translate to actual use of treatment services. Qualitative

research with primarily white, male (61%) rural adults using drugs, shows that a person's distance to care, work schedule, finances, perceived stigma, and concerns about consequences (e.g., losing custody of a child) are barriers to MH and SUD treatment use.¹⁸ Efforts are needed to better understand how to improve MH and SUD treatment access among rural, male adults using drugs, including the feasibility and acceptability of linkage interventions¹⁹ that can help overcome perceived barriers to care seeking.

Our findings showing that nonwhites had lower odds of using SUD care are consistent with those from a recent study of US adults showing that among those with SUDs, whites were more likely to utilize SUD treatment services than blacks.²⁰ Among US adults with a perceived or actual need for MH and SUD care, blacks were more likely to report no access and lower utilization of these care options than whites,²¹ which could help explain our findings. Rural black adults using drugs report less perceived need, availability, access, and acceptability of MH and SUD treatment services than their urban peers,¹⁷ which is especially relevant to the present study given our sample was almost 30% black. Our findings extend those from prior research⁶ by showing that gender and ethnicity are both crucial factors predicting long-term use of MH and SUD treatment in rural adults using stimulants.

Lifetime use of MH and SUD treatment was associated with lower odds of using both treatment types over the three-year follow-up, while age was associated with slightly higher odds of SUD treatment use. These findings are consistent with prior research showing that older age is associated with greater perceived need for care among adults using substances,^{17, 20} and greater odds of utilizing SUD treatment among US adults.¹⁷ However, our finding that lifetime care use predicted less likelihood of MH and SUD treatment is inconsistent with findings from a prior report using 2-years of data from this study showing that prior treatment history is associated with increased likelihood of SUD treatment at 2-year follow-up.⁶ It is possible that this finding reflects a selection bias in our sample as we may have recruited individuals who were less responsive to prior treatment experiences as evident by their continued use of drugs. It may also be that prior treatment experiences (e.g., treatment perceived as not being helpful), stigma, and complicated processes for connecting to care reduce one's likelihood of seeking treatment again. Fear of losing friends, having negative prior experiences in treatment, being afraid of seeing people you might know, inability to complete processes necessary for linking to care (e.g., does not fit in one's schedule, difficulty getting to treatment) are reported barriers to seeking SUD care among urban adults using substances.²² The present study supports these findings by showing that prior experiences may lower the odds of seeking care among rural adults using stimulants over the long-term. Further research is needed to determine how specific barriers to care noted in prior work²² might interfere with the long-term use of care in rural populations using substances.

Participants' State of residence and their medical insurance status predicted the use of MH and SUD treatment, respectively. Participants living in Ohio compared to Arkansas had greater odds of reporting a MH treatment visit over the three-year period. One factor that might have contributed to this finding is that participants in Ohio may have had greater access to MH and SUD treatment services than participants in Arkansas.²³ Indeed, in 2006

(during the time of data collection for this study) the National Alliance on Mental Illness (NAMI) presented a State by State “report card” grading the overall mental health system in each US State.²⁴ Each State was graded on specific criteria concerning mental health and substance use treatment infrastructure, information access, services available, and recovery support. In their report, NAMI gave Ohio a B grade, while Arkansas received a D-. The report described Arkansas as “...a case of good people trying to do good – with almost nothing (page 42)” indicating a lack of resources available to provide sufficient mental health care to the State population. In contrast, Ohio was described as being “...home to some of the strongest leaders in improving the nation’s mental healthcare system (page 138)...” Data show that this difference in mental health resources by State continues as a 2015 report by Mental Health America ranks Ohio 26th and Arkansas 48th in terms of access to MH services for adults.²³ Further, the Pew Charitable Trust and Catherine T. MacArthur Foundation reported that, in 2013, substance abuse agencies in Arkansas spent \$3 million while Ohio spent \$73 million on SUD treatment.²⁵ Accordingly, in our study, rural persons using stimulants living in rural Ohio were four times more likely to report a MH and SUD treatment visit during follow-up than those living in rural Arkansas. However, other factors, such as having medical insurance, may influence access to mental health services. In our study, 26% of participants in Ohio and 23% of participants in Arkansas reported having medical insurance (data not in tables). Other factors including differential dropout rates of MH treatment by State; actual distance to treatment programs; higher SUD diagnosis among participants in Ohio; and differential referral rates (e.g., by a primary care provider) by State could also help explain these findings and should be examined in future research.

Participants with medical insurance also had a greater likelihood of a SUD treatment visit during the three-year follow-up. Having medical insurance is a strong correlate of access to medical care,^{26, 27} and plays an important role in explaining racial/ethnic disparities in access to health care.^{26, 28} Indeed, when compared to whites, a lower percentage of nonwhites report having employment-based coverage and a higher percentage of these individuals report relying on public insurance (e.g., Medicaid) when compared to whites.²⁸ Our findings highlight the importance of geographical access and having the “ability to pay” for services in predicting the use of MH and SUD treatment over time. One implication of this finding is the continued need for health care policies that help cover care expenses for persons, living in rural communities and using drugs, in need of SUD treatment.

Indicators of participants’ health status were associated with greater odds of using MH and SUD treatment over time. This is consistent with prior research showing more severe psychological distress, having a criminal history, and lack of employment to be associated with greater SUD treatment use among adults using substance in the US.²⁰ Our findings extend this line of research to show that health status indicators are strong predictors of MH and SUD treatment use, over time, in a rural population of adults using drugs. Most notably, participants reporting increased legal and alcohol severity were 14 and 15 times more likely to report using MH and SUD treatment over the three-year follow-up. The present study does not specify why those with increased legal problems were more likely to use MH and SUD care, although one might speculate that mandated use of these services on the part of the justice system might play a role. Because of data limitations, we were not able to

identify those who sought care voluntarily or out of coercion, which might help shed light on these findings.

It is also important to point out that although higher alcohol severity was associated with greater odds of using both MH and SUD treatment, participants with higher alcohol severity were *less* likely to use SUD care only during the three-year follow-up. It is possible that the small sample of rural adults using stimulants in the present study seeking both MH and SUD care were also experiencing greater severity of problems and/or had greater access to services, including geographical access and medical insurance, all of which are associated with greater care seeking.²⁹ However, for the majority of participants, greater alcohol severity appears to be associated with lower likelihood of seeking SUD care alone which is consistent with research showing that among those with an alcohol use disorder, men and those without medical insurance tend to be less likely to seek SUD treatment.³⁰ This is relevant to the present study as our sample was mostly male (62%) and the large majority (73%) of participants did not report medical insurance.

This study has several strengths and limitations worth noting. Strengths of this study include inclusion of three rural geographical regions of the US which may enhance the generalizability of our findings to rural communities, especially those in the Midwest and Midsouth regions, in the US. Multiple assessments over a three-year period allowed us to examine variables of interest in relation to long-term use of MH and SUD treatment. Limitations include requiring participants to have a verifiable address, which may reduce the generalizability of our findings to homeless or marginally housed individuals. Further, requiring participants to have an identifiable address may have resulted in recruiting higher functioning persons using drugs who might be less likely to use MH or SUD treatment options. The data presented in this study are also about 10 years old and may not reflect some of the current challenges, such as the current increase in polysubstance use due in part to opioid misuse, and policies, including the Affordable Care Act, affecting a person's ability to seek MH and SUD care. The sample size from each State is relatively small which may also reduce the generalizability of study findings to the larger target population. Also, the inclusion of a comparison group (e.g., urban adults using drugs) would have allowed us to determine the degree to which these findings are specific to rural (compared to urban) persons using stimulants or more general predictors of MH and SUD treatment use among adults using stimulants regardless of rural or urban status. Further, respondent driven sampling, as used in this study, may not yield a representative sample of adults using drugs further limiting the generalizability of study findings to the larger target population. Participants in this study were also mostly male and white which may further limit the generalizability of study findings, although it is notable that 39% of the sample was female and almost 30% black.

Conclusions

In general, we found that predisposing, enabling, and current illness status factors of the Andersen Behavioral Model of Health Services Use predicted the use of MH and/or SUD services over a three-year follow-up in a sample of rural adults using stimulants. To our knowledge, this is the first study to examine predictors of MH and SUD treatment use,

among rural persons using stimulants, over a three-year period. Findings from this study could be used to inform strategies for improving linkage to care in this population. Furthermore, and perhaps most importantly, our findings highlight the importance of having medical insurance as a potential facilitator to using SUD care in this population, and support the need for health care policies that improve rural adults who use drugs ability to pay for such services.

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Table 1:
Descriptive statistics obtained at baseline and follow-up interviews for rural stimulant users

Variable	Baseline (N=710)	6-months (N=603)	12-months (N=581)	18-months (N=575)	24-months (N=561)	30-months (N=563)	36-months (N=519)
Male, N (%)	436 (61.41%)						
Race/Ethnicity, N (%)							
White	482 (67.89%)						
Black	208 (29.30%)						
Hispanic/Latino	5 (0.70%)						
Native American	4 (0.56%)						
Other	11 (1.55%)						
Age, mean $\pm$ sd	32.56 $\pm$ 10.35						
High School, N (%)	416 (58.59%)						
Married/partner, N (%)	112 (15.77%)	101 (16.78%)	112 (19.28%)	109 (18.96%)	112 (19.96%)	116 (20.60%)	120 (23.12%)
Income \$10K, N (%)	199 (28.11%)	143 (23.79%)	183 (31.61%)	166 (29.48%)	169 (30.62%)	179 (33.03%)	189 (37.03%)
Medical Insurance, N (%)	192 (27.35%)	177 (29.78%)	173 (29.78%)	195 (33.91%)	203 (36.25%)	215 (38.26%)	201 (38.88%)
State							
Arkansas, N (%)	237 (33.38%)						
Ohio N (%)	248 (34.93%)						
Kentucky N (%)	225 (31.69%)						
BSI-GSI (T-score)	43.58 $\pm$ 9.76	42.17 $\pm$ 10.27	40.90 $\pm$ 9.81	39.87 $\pm$ 9.29	39.18 $\pm$ 9.18	38.81 $\pm$ 8.99	38.78 $\pm$ 9.35
ASI							
Employment	0.58 $\pm$ 0.27	0.59 $\pm$ 0.29	0.55 $\pm$ 0.29	0.58 $\pm$ 0.29	0.56 $\pm$ 0.30	0.57 $\pm$ 0.31	0.56 $\pm$ 0.30
Family	0.19 $\pm$ 0.20	0.14 $\pm$ 0.19	0.13 $\pm$ 0.19	0.11 $\pm$ 0.17	0.10 $\pm$ 0.17	0.10 $\pm$ 0.17	0.11 $\pm$ 0.17
Legal	0.17 $\pm$ 0.21	0.12 $\pm$ 0.20	0.10 $\pm$ 0.19	0.09 $\pm$ 0.17	0.07 $\pm$ 0.15	0.09 $\pm$ 0.17	0.06 $\pm$ 0.14
Alcohol	0.20 $\pm$ 0.18	0.14 $\pm$ 0.17	0.13 $\pm$ 0.15	0.12 $\pm$ 0.15	0.12 $\pm$ 0.15	0.11 $\pm$ 0.14	0.12 $\pm$ 0.14
Drug	0.23 $\pm$ 0.15	0.15 $\pm$ 0.14	0.13 $\pm$ 0.12	0.12 $\pm$ 0.12	0.11 $\pm$ 0.12	0.10 $\pm$ 0.12	0.11 $\pm$ 0.12
Social Support							
Persons using drugs	2.91 $\pm$ 0.66	2.75 $\pm$ 0.69	2.69 $\pm$ 0.66	2.69 $\pm$ 0.70	2.67 $\pm$ 0.68	2.64 $\pm$ 0.65	2.66 $\pm$ 0.65
Persons not using drugs	3.26 $\pm$ 0.57	3.20 $\pm$ 0.56	3.17 $\pm$ 0.54	3.23 $\pm$ 0.47	3.18 $\pm$ 0.50	3.18 $\pm$ 0.48	3.19 $\pm$ 0.46
MH treatment, SUD treatment, both treatments, or neither treatment							

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Variable	Baseline (N=710)	6-months (N=603)	12-months (N=581)	18-months (N=575)	24-months (N=561)	30-months (N=563)	36-months (N=519)
Male, N (%)	436 (61.41%)						
MH treatment only	120 (16.95%)	51 (9.46%)	57 (9.81%)	57 (9.93%)	50 (8.93%)	51 (9.09%)	38 (7.32%)
SUD treatment only	169 (23.87%)	20 (3.32%)	30 (5.16%)	37 (6.45%)	35 (6.25%)	37 (6.60%)	32 (6.17%)
Both	154 (21.61%)	19 (3.15%)	13 (2.24%)	11 (1.92%)	20 (3.57%)	14 (2.50%)	12 (2.31%)
Neither	266 (37.57%)	513 (85.07%)	481 (82.79%)	469 (81.71%)	455 (81.25%)	459 (81.82%)	437 (84.20%)

sd = standard deviation; BSI-GSI = Brief Symptoms Inventory - Global Severity Index; ASI = Addiction Severity Index.

Persons using drugs = strength of perceived support from persons using drugs, Persons not using drugs = strength of perceived support from persons not using drugs

MH = mental health; SUD = substance use disorder

Table 2:

GEE models (lagged) of any (yes or no) lifetime use of mental health (MH) treatment, substance use disorder (SUD) treatment, and both treatment modalities in rural stimulant users

Variables	MH vs. none		SUD vs. none		MH and SUD vs. none	
	OR	95% CI	OR	95% CI	OR	95% CI
Male (ref. female)	1.41	0.90, 2.20	0.80	0.54, 1.17	0.38*	0.18, 0.77
Nonwhite (ref. White)	1.17	0.71, 1.91	0.57*	0.34, 0.96	0.48	0.19, 1.22
Age	0.99	0.97, 1.01	1.02*	1.00, 1.04	0.99	0.96, 1.02
High school (ref. < high school)	1.15	0.77, 1.72	1.03	0.70, 1.52	1.20	0.66, 2.16
Married/partner (ref. single)	1.57	0.96, 2.55	0.87	0.58, 1.31	0.97	0.41, 2.28
Income > \$10K (ref. < \$10K)	0.77	0.77, 1.23	1.17	0.76, 1.80	0.62	0.32, 1.24
Medical insurance (ref. no insurance)	0.67	0.67, 1.07	1.85*	1.29, 2.65	1.25	0.66, 2.37
State Ohio (ref. Arkansas) Kentucky (ref. Arkansas)	2.84* 1.30	2.84, 5.16 1.30, 2.42	0.84 1.17	0.46, 1.52 0.69, 1.96	3.82* 1.16	1.34, 10.89 0.36, 3.69
BSI-GSI (T-score)	0.99	0.97, 1.02	1.03*	1.01, 1.05	1.04*	1.01, 1.08
ASI	1.54	0.74, 3.22	3.02*	1.45, 6.26	1.49	0.42, 5.28
Employment	1.08	0.33, 3.53	2.27	0.94, 5.44	2.35	0.41, 13.60
Family	10.96*	4.57, 26.26	1.19	0.49, 2.91	13.61*	2.89, 64.07
Legal	0.37	0.09, 1.52	0.25*	0.07, 0.96	14.67*	3.33, 64.07
Alcohol	2.79	0.59, 13.21	1.03	0.22, 4.83	0.09	0.01, 1.02
Drug						
Perceived social support	0.97	0.75, 1.25	1.11	0.87, 1.43	0.74	0.48, 1.14
Persons using drugs	1.13	0.76, 1.67	1.08	0.80, 1.47	1.10	0.58, 2.11
Persons not using drugs						
Lifetime SUD Tx (baseline)	0.14*	0.08, 0.25	1.27	0.73, 2.19	0.08*	0.04, 0.15
Lifetime MH Tx (baseline)	0.75	0.41, 1.36	0.08*	0.05, 0.12	0.19*	0.09, 0.39
Time	0.13*	0.05, 0.34	0.39*	0.20, 0.76	0.11*	0.03, 0.35
6-month (ref. 36-month)	0.81	0.43, 1.52	1.23	0.74, 2.04	0.87	0.27, 2.80
12-month (ref. 36-month)	0.84	0.45, 1.56	1.17	0.70, 1.96	0.65	0.20, 2.16
18-month (ref. 36-month)	1.02	0.56, 1.86	1.15	0.70, 1.87	3.21*	1.13, 9.09
24-month (ref. 36-month)	1.01	0.60, 1.71	1.39	0.78, 2.47	1.44	0.48, 4.31
30-month (ref. 36-month)						

MH = mental health treatment, SUD = substance use disorder; BSI-GSI = Brief Symptoms Inventory - Global Severity Index; ASI = Addiction Severity Index.

Persons using drugs = strength of perceived support from persons using drugs, Persons not using drugs = strength of perceived support from persons not using drugs

OR = odds ratio, 95% CI = 95% confidence interval