Published in final edited form as:
Subst Abus. 2010 January ; 31(1): 1–7. doi:10.1080/08897070903442459.

Predictors of Substance Abuse Treatment Entry Among Rural Illicit Stimulant Users in Ohio, Arkansas, and Kentucky

Robert G. Carlson, Ph.D.[1], **Rocky Sexton, Ph.D.**[1], **Jichuan Wang, Ph.D.**[1], **Russel Falck, M.A**[1], **Carl G. Leukefeld, DSW**[2], and **Brenda M. Booth, Ph.D.**[3]

[1]Center for Interventions, Treatment, and Addiction Research, Wright State University, Boonshoft School of Medicine, 3640 Colonel Glenn Hwy., Dayton, OH 45435

[2]University of Kentucky, Center on Drug & Alcohol Research, 643 Maxwelton Court, Lexington, KY 40506

[3]Division of Health Services Research, Department of Psychiatry, University of Arkansas for Medical Sciences, 5800 W. 10th St., Suite 605, Little Rock, Arkansas 72204 and Central Arkansas Veterans Healthcare System, Little Rock, AR 72205

Abstract

Illicit drug use in the rural United States is increasingly common, yet little is known about drug users' treatment-seeking behaviors. This study identifies predictors of substance abuse treatment entry over 24 months among 710 illicit stimulant users in rural areas of Ohio, Arkansas, and Kentucky. Active users of powdered cocaine, crack cocaine, and/or methamphetamine (MA) were recruited using respondent-driven sampling. Participants completed structured interviews at baseline and follow-up questionnaires every 6 months for 24 months. Data were analyzed using the Cox proportional hazards model. The paper is informed by the Anderson-Newman Model. Overall, 18.7% of the sample entered treatment. Ohio or Kentucky residence, perceived need for substance abuse treatment, higher ASI legal problem composite scores, prior substance abuse treatment, and tranquilizer use were positively associated with treatment entry. Non-daily crack cocaine users and marijuana users were less likely to enter treatment. The findings can help inform rural substance abuse treatment program development and outreach.

Keywords

Substance abuse; drug abuse treatment; rural; cocaine; crack; methamphetamine

INTRODUCTION

Drug abuse in rural areas of the United States has recently been reported as being on par with urban trends, or even surpassing them, in some areas. As such, identifying the predictors of substance abuse treatment entry in rural areas is increasingly important (1). Many studies of predictors of substance abuse treatment entry are generally cross-sectional and are usually based on urban populations, although some investigations have used aggregated urban and rural data. Longitudinal studies of treatment entry predictors are fewer (2–5). We report on the predictors of substance abuse treatment entry during the first 2 years of a natural history study of 710 illicit stimulant users in rural areas of Ohio, Arkansas, and Kentucky. The analysis is

Corresponding author: Robert G. Carlson, Professor and Director, Center for Interventions, Treatment, and Addictions Research, Boonshoft School of Medicine, Wright State University, 3640 Colonel Glenn Hwy. Dayton, Ohio, 45435. Office: 937-775-2066; Fax: 937-775-2214. robert.carlson@wright.edu.

informed by the Anderson-Newman model of health services use. The findings suggest contrasts between treatment entry in rural and urban areas, and describe both general trends and variation in treatment entry patterns across rural regions. The findings can help inform the improvement of availability of treatment resources and outreach to substance abusers in need of treatment in rural areas.

METHODS

Sampling

Study participants were recruited between 2002 and 2004 from 3 rural counties in western Ohio (n=248), 3 rural counties in eastern Arkansas (n=237), and 3 rural counties in western Kentucky (n=225). The populations of the counties ranged from 12,000 to 53,000. Non-whites (overwhelmingly African Americans) constituted 1.9–4.0% of the population in the Ohio counties, 0–2% in Kentucky, and 49–57% in Arkansas. Poverty levels (defined as annual household income under $10,000) were highest in Arkansas (22–24%) followed by Kentucky (14–18%), and Ohio (4–5%).

Respondent-driven sampling was used to recruit study participants (6–7). Study eligibility included: 1) being age 18 or older; 2) self-reported use of crack cocaine, powdered cocaine, and/or MA/amphetamine within the previous 30 days; 3) not being in formal drug abuse treatment within the past 30 days; 4) having a verified address within one of the targeted counties; and 5) providing informed consent to participate in the study.

Structured, computer-assisted, interviews were conducted by trained project staff in field site offices after eligibility was verified, and participants signed consent forms approved by the participating universities' Institutional Review Boards. The studies were granted Certificates of Confidentiality issued by the Department of Health and Human Services.

The baseline interview and follow-up interviews, conducted at 6 month intervals over 24 months, explored sociodemographic characteristics, drug use history, physical and mental health status, drug abuse treatment history, perceived need for health services, barriers to care, and use of health services. Participants were compensated $50 for the 2-2.5-hour baseline interview and $35 for subsequent interviews.

The Anderson-Newman Model

Data analysis was informed by the Anderson-Newman model of health services use. This model identifies factors "predisposing" individuals to seek treatment, such as sociodemographic characteristics, previous treatment history, and frequency of substance use. It also emphasizes "enabling/mediating factors" such as income or perceived need for care, as well as "current illness level factors" that potentially influence help-seeking behavior (8).

Measures

The primary outcome measure was the first formal substance abuse treatment entry after baseline. Participants were asked at each follow-up interview, "Since your last interview here, on how many separate occasions have you been a patient or client in a drug abuse treatment program (not counting self-help programs like AA or NA)?," with responses treated dichotomously.

Predisposing factors

Six sociodemographic variables were included in the analysis as covariates. State of residence at baseline remained a constant variable. Gender was recorded as male or female. Ethnicity was dichotomized as Black/other or white. Age was grouped as less than 25, 25 to 35, and

older than 35 years. Education was grouped as <high school, high school, and >high school. Employment was measured by days worked in the previous 30 days.

Use of marijuana, crack, cocaine (HCl), heroin, non-prescribed pharmaceutical opioids, MA, "other" stimulants, and tranquilizers was measured by days of use in the previous 30 days and then categorized as: "no use;" "non-daily use" (1–19 days); and "daily use" (20 days or more). Use of any drug on 20 or more days was used to differentiate daily from non-daily use. For analyses, drugs for which fewer than 10% of the total participants reported "daily use" were collapsed into "use" versus "no use." Alcohol use was measured by reported days of "drunkenness" in the previous 30, with categorical measures of: "no days;" "some days" (1 – 9 days); and "frequent" (10 or more days).

History of drug abuse treatment prior to the study was measured by asking participants at baseline, "In your lifetime, on how many separate occasions, if ever, have you been a patient or client in a drug abuse treatment program (not counting self-help programs like AA or NA)?," and treated dichotomously.

Current Illness-Level factors

Health status was assessed using the SF-8 Health Survey (SF-8) (9).

Enabling/Mediating Factors

The Addiction Severity Index (ASI) was used to assess Family/Social and Legal problem composite scores. Scores could range from 0 to 1, with higher scores indicating greater problem severity (10).

To assess perceived need for treatment, participants responded to the statement, "I now need to get into a drug abuse treatment program." Responses included: "strongly disagree," "disagree," "neutral," "agree," or "strongly agree," with "agree," and "strongly agree" considered as perceiving a need.

Statistical Analysis

Survival analysis and the Cox Proportional Hazards Model were used for analyzing the likelihood of first post-baseline treatment entry. Survival analysis was first used to explore the likelihood of drug treatment entry by geographic locations and time period, then the proportional hazards Cox model assessed the effects of geographic location, predisposing factors, current illness-level factors, and enabling/mediating factors on the hazard of drug treatment entry (11–12). The model was run using SAS PROC PHREG procedure (13). As the data contain very few tied event times (i.e. two or more events occurring at the same time), the default Breslow's approximation in PROC PHREG was used for construction of the partial likelihood (12).

RESULTS

Study Sample

The mean ASI composite score for family/social problems was highest for the Ohio sample (0.23), followed by Kentucky (0.18) and Arkansas (0.14). Ohio also had a higher mean composite ASI score for legal problems (0.19) than in Arkansas (0.16) and Kentucky (0.15).

According to the SF-8 health status assessment, slightly more Kentucky residents (35.6%) had physical problems less than or equal to the 25th percentile, compared to participants in Arkansas (30.8%) or Ohio (30.7%). The SF-8 evaluation indicated noticeably higher percentages of

participants in Ohio (64.1%) and Kentucky (60.4%) with mental health problems, compared to participants in Arkansas (45.6%).

More Ohio participants (56.9%) had previous treatment experience compared to Arkansas (41.4%) and Kentucky (37.3%). In contrast, perceived need for treatment was greater among participants in Arkansas (38.4%), than in Ohio (21.0%) and Kentucky (20.0%).

With regard to illicit stimulants, MA use was most prevalent in Kentucky (61.3%), followed by Arkansas (39.7%) and Ohio (29.8%). Daily and non-daily powdered cocaine use was more common in Ohio (72.6%) compared to Arkansas (40.5%) and Kentucky (30.7%). Daily/non-daily crack-cocaine use was higher in Ohio (68.5%) and Arkansas (65.4%) than in Kentucky (41.7%).

Treatment Entry Over 24 Months

Over 24 months, 18.7% (133) of the entire sample entered substance abuse treatment at least once after baseline (see Table 1). The greatest numbers of drug abuse treatment entry events occurred among Ohio participants with 69 (27.8%) entering treatment at least once, followed by 42 (18.7%) participants in Kentucky, and 22 (9.3%) in Arkansas. There was a general declining trend in the survival function in all 3 states during the 24-month observation period. In other words, over time, the number of people entering substance abuse treatment gradually increased in all 3 states. However, the likelihood of entering substance abuse treatment (Wilcoxon $\chi^2 = 28.65$ d.f.=2 $p < 0.0001$) was much lower in Arkansas, compared to participants in Ohio and Kentucky.

Cox Model Results

The results of the Cox Model are shown in Table 2. When controlling for other factors, significant location differences remained in regard to the hazard of substance abuse treatment entry. Ohio and Kentucky residents were more likely to have entered treatment. The hazard ratio (HR) of Ohio over Arkansas was as large as 4.14. In regard to the effects of predisposing factors, current illness-level factors, and enabling/mediating factors, perceived need for treatment (HR: 2.1), high ASI legal problem scores (HR: 1.0), and previous substance abuse treatment history (HR: 1.7) had significant effects on the hazard of treatment entry. In terms of drug use, tranquilizer use had a positive effect (HR: 1.7), while non-daily crack use (HR: . 69) and non-daily (HR: .55) and daily marijuana use (HR: .56) had a negative effect, on the hazard of treatment entry.

DISCUSSION

This study has several limitations. For example, it is impossible to recruit a random representative sample from an unknown universe of illicit drug users, but it has been argued that respondent-driven sampling can improve the representativeness of such samples (6–7). Second, our findings are based on self-reports, but there is substantial support for the validity of self-reported data from illicit substance abusers (14). Despite these limitations, to our knowledge this is the largest natural history study of the predictors of treatment entry among rural, illicit stimulant users conducted to date.

Overall, 18.7% (133) of the sample entered treatment over 24 months. As one example of a rural/urban contrast in treatment entry, a longitudinal study of urban crack-cocaine users in Dayton, Ohio, reported 30.5% (131) of participants entered treatment over 24 months (5).

Among the *predisposing* variables considered, residents in Ohio and Kentucky were significantly more likely to enter substance abuse treatment over 24 months (27.8% and 18.7%, respectively), compared to those in Arkansas (9.3%). This finding is somewhat parallel with

regard to treatment history at baseline, with 56.9% of the Ohio participants having a history of substance abuse treatment, compared to 41.4% in Arkansas, and 37.3% in Kentucky.

Variation in treatment entry across states may be related to several factors which impact treatment access. Ohio counties ranked somewhat higher than Kentucky's and much higher than Arkansas's (15–17) in terms of having lower poverty levels, larger county seat populations, closer proximity to urban centers, highest number of treatment centers located within 100 miles, highest number of local inpatient treatment programs, and highest per capita expenditures for drug abuse treatment. These findings are reflected in a recent study that ranked Ohio 18th, Kentucky 21st, and Arkansas 44th in terms of drug abuse treatment utilization relative to local treatment needs (18).

The majority of the nation's rural poor are concentrated in the South. This population has been identified having fewer locally available health services compared to other regions, and facing the greatest number of barriers to accessing health services (19). As residents of the most rural and "southern" of the three states, Arkansas participants perhaps faced the greatest constellation of barriers to treatment services relative to availability/accessibility.

No other sociodemographic characteristics were associated with entering substance abuse treatment. This finding is consistent with Hser and colleague's (4) longitudinal study of polydrug users in California, although age has been associated with substance abuse treatment entry in another longitudinal study (5).

In terms of substance use practices, tranquilizer use was independently associated with treatment entry, while non-daily crack use and daily/non-daily marijuana use were negatively associated with entering treatment. The relationship between tranquilizer use and treatment entry may be related to excessive self-medication as tranquilizers are often used by stimulant users to mediate the negative effects of extended binge periods of use (1).

Daily/non-daily marijuana use may be negatively associated with treatment entry for a variety of reasons. Marijuana is often viewed as "harmless" and socially acceptable, compared to "hard drugs" (20). Marijuana is also used to aid in "calming down" and going to sleep after binge use of stimulants. But unlike tranquilizers, marijuana also helps stimulant users, especially MA users, regain their appetites (1). So, marijuana use by some stimulant users may make it less likely for them to fully experience or recognize stimulant-related physical problems (e.g. drastic weight loss) or mental health problems (e.g. post-binge depression) that might motivate treatment seeking. Finally, participants who use crack cocaine less than daily were less likely to enter treatment. This may reflect belief that their level of use is not problematic enough to require substance abuse treatment services.

Another *predisposing* variable predicting treatment entry was previous substance abuse treatment history, which is consistent with longitudinal findings among various populations (2–4,21). This suggests that substance abusers with previous knowledge of the substance abuse treatment system may be more cognizant of the need for treatment, have less fear or uncertainty about what it entails, and be more willing and adept at seeking it out (22).

Neither the SF-8 physical or mental health status measures used to assess *current illness-level factors* were related to substance abuse treatment entry. It is not clear why this is the case. For example, in a study on perceived need for substance abuse treatment among the same sample, it was reported that participants having SF-8 physical and mental health status scores above the lowest quartile were less likely to perceive a need for treatment (23). Because perceived need for treatment is related to treatment entry, one might suspect a similar finding with regard to the SF-8 health status and treatment entry; however, this was not the case.

Among the *enabling/mediating factors* included in the model, ASI legal status was a significant predictor of treatment entry. This finding is consistent with previous studies (4–5). Legal problems associated with obtaining and using illicit drugs perhaps motivates perceived need and subsequent linkage with services.

ASI family/social problems were not significantly associated with substance abuse treatment entry. Findings elsewhere regarding this variable have been mixed. For example, Hser and her colleague's (4) found that lower levels of ASI family or social problems were associated with substance abuse treatment entry, while participants having higher levels of problems in these areas were less likely to enter treatment. Our finding of a lack of association is consistent with our previous study among urban crack-cocaine users (5), and suggests that rural stimulant users who do, or do not, enter treatment experience family/social problems at similar levels.

Regardless of predisposing and illness-level variables included in the model, participants who perceived a need for treatment were more likely to enter treatment than participants who did not. This finding is consistent with longitudinal studies among urban crack users (5) and injection drug users (21). Perceiving a need for treatment may be motivated by a number of factors, such as deteriorating health, increased frequency of use, costs, and/or legal problems. In another report on this sample, higher ASI composite scores for family/social problems or legal problems, and prior drug treatment experience were associated with perceived need for treatment (23). Our findings also point to a substantial gap between perceived need and linkage with services in rural areas in general, but especially in Arkansas. Further research is needed to understand why some rural stimulant users who perceive a need for treatment access services while others do not.

Our study, like others (5) indicates that previous treatment history is one of the most consistent predictors of substance abuse treatment reentry. As such, it is extremely important to link substance abusers with treatment services for the first time. Increasing entry into available services in rural areas may be enhanced through outreach efforts. Finally, the overall low level of treatment entry (18.7%), indicates a general need for increased treatment services in rural areas, a finding reported elsewhere (2,24). Increases in funding for local treatment services may help reduce disparities across states.

Acknowledgments

This research was supported by National Institute on Drug Abuse grant R01 DA15363 to Brenda M. Booth and grant R01 DA14340 to Harvey A. Siegal, who died on December 22, 2004. Robert G. Carlson was appointed principal investigator of R01 DA14340. The contents of this study are solely the responsibility of the authors and do not necessarily represent the official views of the National Institute on Drug Abuse or the universities involved.

The authors thank Patricia Wright, Joni Furlong, Kathy Russell, Leslie Cena-Talley, Michelle Jones, Ever Jean Ford, Rance Lewis, Abe Lovelace, Brad Johnson, and Desi Sims for data collection in Arkansas and Kentucky. In Ohio, we thank Terrie Hottle, Heather Overbay, James "Smitty" Smith, Jr., and Mekia Winder for data collection, and Paul Draus for ethnographic research and recruitment of study participants. We thank Linna Li for data management and Janet Kuester for proofreading. A previous version of this paper was presented at the Addiction Health Services Conference, Little Rock, Arkansas; October 2006.

References

1. Sexton RL, Carlson RG, Leukefeld CG, Booth BM. Methamphetamine use and adverse consequences in the rural southern United States: An ethnographic overview. J Psychoactive Drugs, SARC Supplement 2006a;3:393–404.
2. Booth BM, Kirchner J, Fortney J, Ross R, Rost K. Rural at-risk drinkers: correlates and one-year use of alcoholism treatment services. J Stud Alcohol 2000;61:267–277. [PubMed: 10757138]
3. Weisner C, Matzger H. A prospective study of the factors influencing entry to alcohol and drug treatment. J Behav Health Ser Res 29:126–137.

4. Hser Y, Maglione M, Polinsky M, Anglin MD. Predicting drug treatment entry among treatment-seeking individuals. J Subst Abuse Treat 1998;15:213–220. [PubMed: 9633033]
5. Siegal HA, Falck RS, Wang J, Carlson RG. Predictors of drug abuse treatment entry among crack-cocaine smokers. Drug Alcohol Depend 2002;68:159–166. [PubMed: 12234645]
6. Heckathorn D. Respondent-driven sampling: A new approach to the study of hidden populations. Social Probl 1997;44:174–199.
7. Heckathorn D. Respondent-driven sampling II: Deriving valid population estimates from chain-referral sampling of hidden populations. Social Probl 2002;49:11–34.
8. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? J Health Soc Behav 1995;36:1–10. [PubMed: 7738325]
9. Ware, JE.; Kosinski, M.; Dewey, JE.; Gandek, B. How to score and interpret single-item health status measures: A manual for users of the SF-8 health survey. Lincoln: QualityMetric Incorporated; 2001.
10. McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, Pettinati H, Argeriou M. The fifth edition of the addiction severity index. J Subst Abuse Treat 1992;9:199–213. [PubMed: 1334156]
11. Allison, PD. Sage University Papers, Quantitative applications in the social sciences. Beverly Hills: Sage Publications; 1984. Event history analysis: Regression for longitudinal event data. No. 07-046
12. Allison, PD. Survival analysis using the SAS system: A practical guide. Cary, NC: SAS Institute; 1995.
13. SAS Institute, Inc.. SAS/STAT user's guide. Version 8. Vol. vol. 3. Cary: SAS Institute.; 1999.
14. Adair EBG, Craddock SG, Miller HG, Turner CF. Assessing consistency of responses to questions on cocaine use. Addiction 1995;90:1497–1502. [PubMed: 8528035]
15. Substance Abuse and Mental Health Services Administration Treatment Facility Locator. http://www.findtreatment.samhsa.gov
16. Derived from: Office of National Drug Control Policy. Inventory of State Substance Abuse Prevention and Treatment Activities and Expenditures. Washingon, D.C: Executive Office of the President; 2006. (Publication No. NCJ 216918)
17. Sexton RL, Carlson R, Leukefeld C, Booth B. Barriers to drug abuse treatment in the rural South: Preliminary findings from Arkansas and Kentucky. J Psychoactive Drugs 2008;40(2):1–29. [PubMed: 18472660]
18. McAuliffe W, Dunn R. Substance abuse treatment needs and access in the USA: Interstate variations. Addiction 2004;99:999–1014. 2004. [PubMed: 15265097]
19. Rowland D, Lyons B. Triple jeopardy: rural, poor, and uninsured. Health Serv Res 1989;23:975–1004. [PubMed: 2645253]
20. Quintero G, Peterson J, Young B. An exploratory study of socio-cultural factors contributing to prescription rug misuse among college students. J Drug Issues 2006;36:903–932.
21. Zule WA, Desmond DP. Factors predicting entry of injecting drug users into substance abuse treatment. Am J Drug Alcohol Abuse 2000;26:247–261. [PubMed: 10852359]
22. Appel PW, Ellison AA, Jansky HK, Oldak R. Barriers to enrollment in drug abuse treatment and suggestions for reducing them: opinions of drug injecting street outreach clients and other system stakeholders. Am J Drug Alcohol Abuse 2004;30(1):129–153. [PubMed: 15083558]
23. Falck RS, Wang J, Carlson RG, Krishnan LL, Leukefeld C, Booth BM. Perceived need for substance abuse treatment among illicit stimulant drug users in rural areas of Ohio, Arkansas, and Kentucky. Drug Alcohol Depend 2007;91:107–114. [PubMed: 17604917]
24. Pringle JL, Emptage NP, Hubbard RL. Unmet needs for comprehensive services in outpatient addiction treatment. J Subst Abuse Treat 2006;3:183–189. [PubMed: 16616161]

Subst Abus. Author manuscript; available in PMC 2011 January 1.

Table 1

Life Table Survival Estimates by Site

Time period (Months)	Site					
	OH (n=248)		KY (n=225)		AR (n=237)	
	No. of Events[1]	Conditional Prob.[2]	No. of Events[1]	Conditional Prob.[2]	No. of Events	Conditional Prob.[2]
0 – 6	25	0.101	13	0.058	4	0.017
7 – 12	15	0.067	8	0.038	5	0.022
13 – 18	18	0.087	9	0.044	7	0.031
19 –24	11	0.058	12	0.062	6	0.027
Total No. and % of Events	69 (27.8%)		42 (18.7%)		22 (9.3%)	
Test of equality over site: Wilcoxon $\chi^2 = 28.65$ d.f.=2 $p < 0.0001$						

Note:

[1] Number of cases in drug treatment by period.

[2] Conditional probability of being in drug treatment in each period.

Table 2

Cox Proportional Hazard Model Ratios Predicting Substance Abuse Treatment Entry

	Coefficient	Hazard Ratio
Residence		
Arkansas	-------	-------
Ohio	1.42281*	4.149
Kentucky	0.66019*	1.935
Age	−.01409	.986
Gender		
Female	--------	-------
Male	0.18333	1.201
Ethnicity		
Black/other	--------	-------
White	0.25231	1.287
Education		
High School or Less	0.10516	1.111
More than High School	0.03841	1.039
Days Employed in last 30	−0.01766	0.982
SF-8 Mental Health Status	−0.00928	0.991
SF-8 Physical Health Status	0.23139	1.260
ASI Family/Social	−0.01061	0.989
ASI Legal	0.02047*	1.021
Perceived Need	0.71796*	2.050
Previous Treatment	0.51306*	1.670
Marijuana		
Non-daily	−0.59604*	0.551
Daily	−0.57754*	0.561
Crack		
Non-daily	−0.37825*	0.685
Daily	−0.86925	0.419
Non-Prescribed Opioids		
Non-daily	−0.42123	0.656
Daily	−0.33844	0.713
Heroin[1]	0.21359	1.238

	Coefficient	Hazard Ratio
Cocaine Hydrochloride[1]	−0.39246	0.675
Tranquilizers[1]	0.53290*	1.704
Methamphetamine[1]	−0.37981	0.684
Other Stimulants[1]	0.04248	1.043
Alcohol Use		
“Drunk” 1–9 Days	0.14490	0.865
“Drunk” ≥ 10 Days	0.16401	0.849

[1] Use vs. no use in the previous 30 days. ---------- Reference Group

* Statistically Significant at 0.05 Level