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Injection risk behaviors among rural drug users: Implications for HIV prevention

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Abstract

Objective—The purpose of this study was to examine injection drug use (IDU) among a cohort of felony probationers from rural Appalachian Kentucky.

Methods—An interviewer administered questionnaire given to 800 rural felony probationers ascertained data regarding demographics, drug use, criminal behavior, psychological distress, and HIV risk behaviors.

Results—The sample was primarily white (95.1%), male (66.5%) and the median age was 32.3 years (interquartile range [IQR]: 25.2, 40.5). There were no cases of HIV in the sample. Of the 800 rural probationers, 179 (22.4%) reported lifetime IDU. Receptive and distributive syringe sharing (RSS and DSS) were reported by 34.5% and 97.1% of the IDUs, respectively. Independent correlates of risky injection behaviors included cocaine injection (AOR: 14.9, 95% CI: 8.0, 27.7) and prescription opioid injection (AOR: 14.7, 95% CI: 7.7, 28.1).

Discussion—Although HIV was not prevalent, data suggest that the rural felony probationers in this sample were engaging in risky injection practices that could facilitate transmission of HIV. This is especially problematic since those involved in the criminal justice system may be more likely to be exposed to HIV. Therefore, prevention aimed at reducing HIV risk behaviors among rural, criminally-involved individuals is warranted.

1. Introduction

Injection drug use was previously thought to be rare in rural Appalachian Kentucky (Leukefeld, Logan, Farabee, & Clayton, 2002); however these estimates were reported prior to the rapid increase in use of controlled-release opioids such as OxyContin in Appalachia. In a more recent study of rural nonmedical prescription opioid users, Havens, Walker and Leukefeld (2007a) reported the prevalence of IDU to be 44.3%; and the majority of these IDUs were injecting controlled-release oxycodone formulations rather than heroin and/or cocaine (Havens, Walker, & Leukefeld, 2007a). This rapid escalation in the number of IDUs puts this population at risk for HIV and other blood borne infections (BBIs), and identification of these BBIs in rural areas is important for several reasons. First, with lack of available testing for HIV and BBIs and the stigma associated with these diseases in rural areas (Reif, Golin, & Smith, 2005; Crosby, Yarber, DiClemente, Wingood, & Meyerson, 2002), extant surveillance may be underestimating the prevalence and incidence of these infections. Since HIV and HCV are also likely to be more prevalent in hidden populations such as drug users, and testing may be limited, this further increases the chance of

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underestimation. Second, given that the cost of treating one case of HIV is anywhere from $300,000 to $600,000 (Schackman et al., 2006), preventing even a handful of HIV cases can have vast implications for resource deprived areas such as rural Appalachia. Third, drug treatment and other harm reduction services such as syringe exchange are not likely to be available in rural areas. Yet in a seminal review, Sorenson and colleagues (Sorensen & Copeland, 2000) found that drug treatment, and methadone maintenance in particular, significantly reduces HIV risk among drug users. Therefore, studying HIV risk factors in areas such as Appalachia is of the utmost importance in order to understand how to prevent new infections.

While less prevalent in rural populations, HIV is, in fact, more prevalent among offender populations than in the general public, as the Bureau of Justice Statistics estimates that approximately 1% of federal prisoners and 1.7% of state prisoners are HIV-positive (Maruschak, 2008). While there is some evidence that HIV risk increases for those in correctional settings (Hammett, 2006), data suggest that engagement in risk behaviors, such as drug use (both injection and non-injection) and unprotected sexual activity are more prevalent among those who have had contact with the correctional system (Hudson et al., 2009; Pearson et al., 2008; Tolou-Shams, Brown, Gordon, & Fernandez, 2007).

Injection drug use has rarely been described in rural populations. Further, since HIV and illicit drug use is more prevalent in offender populations, this group may be at higher risk for engaging in HIV risk behaviors such as injection drug use. Therefore, the objectives of this study were two-fold: First, to determine the prevalence of IDU and explore injection risk behaviors; Second, to examine the independent correlates of risky injection practices among a cohort of rural probationers to better inform HIV prevention in resource-deprived areas.

2. Methods

2.1 Sample

Study participants consisted of 800 felony probationers from 30 probation offices in rural Appalachian Kentucky. Between March 2001 and December 2004, 800 probationers were recruited to participate in a HIV-prevention trial. The study methods are described in greater detail elsewhere (Leukefeld et al., 2003; Oser, Leukefeld, Cosentino-Boehm, & Havens, 2006a) and the study was approved by the Institutional Review Board at the University of Kentucky.

2.2 Measures and Variable Definitions

An interviewer-administered questionnaire ascertained data related to lifetime drug use, HIV-risk behaviors, criminality, self-reported infectious diseases, and sociodemographics. Participants were compensated $50 for the baseline interview. OraSure (OraSure Technologics, Bethleham, PA) was utilized to determine HIV serostatus and pre- and post-test counseling was completed in accordance with the Centers for Disease Control and Prevention guidelines for HIV testing.

The dependent variables of interest included self-reported lifetime IDU and “risky” injection behaviors, both dichotomous variables. “Risky” injection behaviors were defined as engaging in receptive syringe sharing or sharing of other injection equipment (such as cottons and cookers). Receptive syringe sharing (RSS) was defined as having self-reported renting or sharing syringes that the participant thought had been used. Distributive syringe sharing (DSS) was defined as giving or lending syringes or works to a running partner, sex partner or friend, or giving/selling syringes without cleaning them. In the questionnaire, the response set for receptive and distributive syringe sharing includes: “Never”, “Rarely” (1 – 10%), “Sometimes” (11 – 50%) and “Very Often” (51%+).

Variables examined for their association with IDU included dichotomous mental indicators (serious depression and serious anxiety defined by the Addiction Severity Index (McLellan et al., 1992)) and self-reported infectious diseases (HIV, hepatitis B and hepatitis C). The lifetime prevalence (ever/never) of using the following drugs was also examined: alcohol, marijuana, cocaine, heroin, prescription opioids, and sedatives.

2.3 Statistical Analysis

Sociodemographics and lifetime drug use was first compared across IDU/Non-IDU (NIDU) groups using contingency table analyses and the Wilcoxan rank-sum test for categorical and continuous variables, respectively. To determine the correlates of risky injection behavior, multiple logistic regression was utilized. Variables significantly associated with risky injection behavior at the bivariate level ($p<0.05$) were entered into the multivariable logistic regression model one at a time until the most parsimonious model was achieved. Odds ratios and 95% confidence intervals are reported. Confidence intervals that do not include one are considered statistically significant. STATA, version 10.0 (College Station, TX) was used for all analyses.

3. Results

3.1 Differences between IDUs and NIDUs

The sample was primarily white (95.1%), male (66.5%), and the median age was 32.3 (interquartile range [IQR]: 25.2, 40.5). Of the 800 rural probationers, 179 (22.4%) reported lifetime injection drug use. As seen in Table 1, compared with NIDUs , IDUs were significantly more likely to have reported serious anxiety, serious depression, and lifetime use of marijuana, cocaine/crack cocaine, heroin, amphetamines (including methamphetamine), and prescription opiates. IDUs were also significantly more likely than NIDUs to self-report hepatitis C and hepatitis B infection. HIV serostatus did not differ between IDUs and NIDUs, however, there was only one self-reported case of HIV, but the participant did not have a seropositive sample.

The majority of participants reporting IDU had injected prescription opioids (58.7%), cocaine (68.7%), and heroin (21.2%). More than a third of those injecting prescription opioids (37.4%) indicated they had injected OxyContin® in particular. Only 8.4% of IDUs reported lifetime speedball (heroin and cocaine combined) injection and 40.2% had injected amphetamines (including, but not limited to methamphetamine). Of the IDUs, 18% had only ever injected prescription opioids.

3.2 Injection Risk Behaviors among IDUs

Among those with a lifetime history of IDU, a third (34.5%) had engaged in receptive syringe sharing (RSS) and all but five (97.1%) had practiced distributive syringe sharing (DSS) (see Table 2). In fact, 75.3% of the IDUs said they “Very Often” sold or gave away syringes without cleaning them. Only 8% of injectors “Very Often” cleaned their works with bleach. Almost half reported sharing injection-related equipment such as cottons and cookers (44%). Most (83.9%), however, reported that they “Very Often” used a new syringe only once and did not use it again. Thirty-percent of the IDUs indicated they never got their syringes legally, whereas another third said they “Very Often” got their syringes from legal sources.

3.3 Correlates of Risky Injection Practices

Of the 179 IDUs in the sample, almost half (49.7%) reported risky injection practices (i.e., receptive syringe sharing and/or sharing of injection equipment). As displayed in Table 3, participants with serious anxiety or depression, those reporting lifetime injection of cocaine,

heroin, speedballs and/or prescription opioids, and those self-reporting hepatitis B or hepatitis C infection were significantly more likely to have engaged in risky injection behaviors.

In multivariable models, adjusting for age, race, gender, and opioid injection, participants reporting lifetime cocaine injection were almost 15 times more likely than those with no history of cocaine injection to have participated in risky injection practices (Adjusted Odds Ratio: 14.9, 95% Confidence Interval: 8.0, 27.7) (Table 4). Similarly, participants indicating lifetime injection of prescription opioids were 14.7 times more likely to have reported participating in risky injection behaviors, controlling for age, race, gender and lifetime cocaine injection.

4. Discussion

In this study of rural probationers, we found that approximately one quarter had injected drugs in their lifetime. Whereas previous estimates suggested that IDU was rare in rural Appalachian Kentucky (Leukefeld et al., 2002), this and another recent study (Havens et al., 2007a) indicate a much higher prevalence than previously thought. And among the more interesting findings was that prescription opioid injection was highly prevalent – a trend that, to our knowledge, has not been observed in urban populations. Among the injectors, many also participated in high risk injection practices, including receptive and distributive syringe sharing. Finally, in addition to prescription opioid injection, lifetime injection of cocaine was independently associated with risky injection practices.

The lifetime prevalence of IDU was slightly less than another recent study conducted in the area (Havens et al., 2007a); however, it should be noted that over the course of the study period, the prevalence of IDU steadily increased from 17.5% in 2001 to 26.7% in 2004 ($p=0.07$). And the majority of these IDUs also participated in high risk injection practices, as more than a third of IDUs in this cohort of rural probationers engaged in RSS and 97% in DSS. While the prevalence of RSS was considerably less than that reported in urban populations (Pollini et al., 2008; Wagner et al., 2009; Bailey et al., 2007), those samples were made up entirely of IDUs. In contrast, the 97% of the IDUs in this study reporting DSS is far greater than that of other studies of IDUs throughout the United States, where the range is anywhere from 25 – 55% (Bluthenthal et al., 2007; Golub et al., 2007; Kapadia et al., 2007) . The high prevalence of DSS may be due to lack of availability of sterile injection equipment as there are no syringe exchange programs in the area and only a third of participants indicated they acquired syringes from legal sources. Even though the proportion of IDUs reporting RSS was relatively low compared with urban IDUs, given the potentially small network of IDUs in a rural community, transmission of HIV and other BBIs may be particularly efficient in this population.

Much of the increase in IDU across the study period can be attributed to the increase in the proportion of those injecting prescription opioids. In 2001, only 10% of those recruited reported injecting prescription opioids. By 2004, the percentage of those recruited to the study who were injecting opioids was significantly greater at 17.8%. It should be noted that similar increases were not seen in other drugs that were reported as being injected (Havens, Oser, & Leukefeld, 2007b). Further, 18% of those who reported lifetime IDU had never injected drugs prior to injecting prescription opioids not intended for parenteral use (i.e., pills that were dissolved and prepared for injection). The results from this study, indicating prescription opioid injection is prevalent among rural Appalachian drug users, is in accord with a recent study by Havens and colleagues (Havens et al., 2007a) in which they reported that amongst the 44.3% lifetime IDUs, the majority (90.2%) had only ever injected prescription opioids and not cocaine and/or heroin. In a study of methadone patients with

prescription opioid dependence, the prevalence of IDU was significantly lower than those with heroin dependence (Rosenblum et al., 2007). These findings indicate there may be an emerging trend of prescription opioid injection among rural drug users that has obvious implications for transmission of HIV and other blood-borne infections (BBIs). These data, along with another recent report (Havens et al., 2007a) suggest that injection of prescription opioids is driving IDU in this particular area.

Lifetime history of cocaine injection was also significantly associated with risky injection practices. This is not surprising given that numerous studies have found injecting cocaine to be associated with increased risk for HIV and HCV among IDUs (Tyndall et al., 2003; Maher et al., 2006; De, Cox, Boivin, Platt, & Jolly, 2007). Unfortunately, previous research demonstrates that cocaine injection may not be influenced by increasing access to opioid substitution therapy (Condelli, Fairbank, Dennis, & Rachal, 1991; Grella, Anglin, & Wugalter, 1997) or syringe exchange. In this cohort, however, in contrast to prescription opioid injection, the prevalence of cocaine injection did not rise significantly over the study period of 2001 to 2004 (Havens et al., 2007b). Therefore the influence of cocaine injection on HIV risk among rural Appalachian drug users appears to be constant.

While the rates of cocaine injection may not be significantly affected by increasing access to opioid substitution therapy or syringe exchange, there is great potential for prevention and intervention among the opioid injectors. Syringe exchange programs (SEP's) in particular are associated with decreased incidence of HIV in addition to linking IDUs with additional services such as HIV testing and treatment as well as substance abuse treatment (Vlahov & Junge, 1998; Heimer, 1998; Strathdee et al., 1999). However, this may not be feasible in rural areas where there are marked health disparities (Appalachian Regional Commission, 2008; Halverson, 2004) and resources to fund such endeavors are likely not available.

Finally, while this study has demonstrated that this particular sample of rural probationers are engaging in risky behaviors such as injection drug use, the fact remains that of the 800 participants tested, there were no cases of HIV. This is in accord with the study by Havens and colleagues (2007a) in which there were no self-reported cases of HIV among opioid injectors. Potential explanations include low baseline seroprevalence in rural Appalachia, lack of mobility and structure of the local injector networks (Oser et al., 2006b). Likely, it is a combination of all three of these factors that is contributing to the lack of HIV in this particular population. Oser and colleagues (2006b) determined that mobility is indeed low; however, these probationers in particular are constantly cycling in and out of the criminal justice system, which may be a key to the eventual introduction of HIV to the area. And while anthropological data suggest tight social networks among Appalachian people (Drake, 2001), if and when HIV is introduced into the area, these networks may actually facilitate the transmission as opposed to insulating rural IDUs from the disease.

4.1 Limitations

Given the cross-sectional nature of this analysis, we were unable to determine the temporal sequence of events. For example, those with self-reported hepatitis C infection were far more likely to have engaged in risky injection practices; however, it could be that participation in these risky behaviors precipitated the transmission of the hepatitis C virus. The study was also conducted in on area in Eastern Appalachian Kentucky among criminal offenders, which may limit the generalizability of the findings. We were also reliant on participant self-report for drug use and other HIV risk behaviors. However, the literature indicates that both self-reported drug use and HIV risk behaviors are indeed reliable and valid measures of actual behaviors (Darke, 1998; Latkin, Vlahov, & Anthony, 1993).

4.2 Conclusions

Despite these limitations, this study sheds light on IDU in an understudied population of rural drug users. Further, these results provide additional evidence that prescription opioid injection is an emerging problem in rural Appalachia. There are many potential avenues for future studies. First, it would be worthwhile to determine potential differences in injection-risk behaviors among prescription versus illicit opioid users as well as incidence and prevalence of HIV and HCV in a cohort of predominantly prescription opioid injectors. In addition, future research could examine the social network structure among rural drug users in order to determine the risk for the transmission of infectious diseases such as HIV and HCV. Although there were no cases of HIV in this particular cohort, it is not a question of if HIV will enter this area, but when. Therefore, understanding the potential for epidemic spread through risky injection or sexual practices is of the utmost importance to inform prevention activities. This may be especially important for criminal justice populations such as the one presented here, where a high proportion of these probationers are cycling in and out of correctional institutions where HIV is far more prevalent (Maruschak, 2008). These data also suggest that education around risky injection and drug use practices is warranted.

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Table 1

Demographic and substance use characteristics among rural IDUs and NIDUs (N=800)

	IDU (n=179)		NIDU (n=621)		
	n	**%**	**n**	**%**	**p-value**
Gender					
Male	122	68.2	410	66.0	0.331
Female	57	31.8	211	34.0	
Race/Ethnicity					
African American	1	0.6	20	3.2	0.037
White	171	95.5	590	95.0	
Other Race/Ethnicity	7	3.9	11	1.8	
Age in years, median (interquartile range [IQR])	32.0 (26.0, 40.1)		32.4 (24.9, 40.6)		0.890
Marital Status					
Married	53	29.8	205	33.1	0.655
Single	49	27.5	170	27.5	
Divorced/Widowed/Separated	75	42.7	244	39.4	
Education in years, median (IQR)	11 (9, 12)		11 (9, 12)		0.758
Serious Anxiety	125	69.8	347	55.9	<0.001
Serious Depression	133	74.7	347	55.9	<0.001
Self-Reported Infectious Diseases					
Hepatitis B	7	3.9	5	0.8	0.007
Hepatitis C	23	12.8	5	0.8	<0.001
HIV	0	0	1	0.2	1.000
Lifetime Substance Use					
Prescription opiates	166	92.7	344	55.4	<0.001
Alcohol	178	99.4	604	97.3	0.063
Cocaine	176	98.3	350	56.4	<0.001
Marijuana	176	98.3	539	86.8	<0.001
Heroin	66	36.9	25	4.0	<0.001
Sedatives	156	87.2	334	53.8	<0.001

Table 2

Prevalence of Engaging in Risky Injection Practices among Rural IDUs (n=175*)

	IDUs	
	n	%
Any Receptive Syringe Sharing	60	34.5
Any Distributive Syringe Sharing	169	97.1
Any Sharing Injection Equipment	77	44.0
Sharing Syringes “Very Often”	13	7.5
Sharing Cookers/Cottons “Very Often”	33	18.9
Syringe Acquisition		
Rent Syringes “Very Often”	3	1.7
Acquire Used Syringes “Very Often”	13	7.4
Syringe from Sterile Wrapper “Very Often”	31	17.7
Legally acquire Syringes “Very Often”	64	36.6
Syringe Disposal		
Give/lend Works to Running Partner “Very Often”	71	40.8
Give/lend Works to Sex Partner “Very Often”	34	19.4
Give/lend Works to Friend/Other “Very Often”	25	14.3
Throw Syringes/Works Away “Very Often”	28	16.0
Sell/Give Syringes w/o Cleaning “Very Often”	131	75.3
Sell/Give Syringes after Cleaning	6	3.4
Reuse w/o Cleaning “Very Often”	6	3.4
Reuse after Cleaning “Very Often”	19	10.9
Syringe Cleaning Practices		
Clean with Water Only “Very Often”	50	28.6
Clean with Boiling Water “Very Often”	46	26.3
Clean with Bleach “Very Often”	14	8.0
Clean with Alcohol “Very Often”	32	18.3
Clean with Heated Match “Very Often”	5	2.9

*Syringe practices data missing for 4 IDUs

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Table 3

Demographic and Substance Use Characteristics among Risky and Non-Risky Rural Drug Users

	Risky Injection Drug Use (n=89)		No Risky Injection Drug Use (n=621)		
	n	**%**	**n**	**%**	**p-value**
Gender					
Male	53	59.6	476	67.3	0.154
Female	36	40.4	232	32.7	
Race/Ethnicity					
African American	0	0	21	3.0	0.022
White	84	94.4	676	96.2	
Other Race/Ethnicity	5	5.6	13	1.8	
Age in years, median (interquartile range [IQR])	32 (26.5, 39.7)		32.3 (24.9, 40.5)		0.959
Marital Status					
Married	30	34.1	228	32.2	0.933
Single	24	27.3	195	27.5	
Divorced/Widowed/Separated	34	38.6	285	40.3	
Education in years, median (IQR)	11 (9, 12)		11 (9, 12)		0.794
Serious Anxiety	68	76.4	404	56.9	<0.001
Serious Depression	69	78.4	410	57.7	<0.001
Self-Reported Infectious Diseases					
Hepatitis B	4	4.5	8	1.1	0.035
Hepatitis C	16	18.0	12	1.7	<0.001
HIV	0	0	1	0.1	1.000
Lifetime Injection Drug Use					
Cocaine Injection	66	74.2	57	8.0	<0.001
Heroin Injection	18	20.2	20	2.8	<0.001
Speedball Injection	10	11.2	5	0.7	<0.001
Prescription Opiate Injection	61	68.5	43	6.1	<0.001

Table 4

Independent correlates of risky injection practices among rural felony probationers

	Adjusted Odds Ratio	95% Confidence Interval
Lifetime Cocaine Injection	14.9	8.0 – 27.7*
Lifetime Opioid Injection	14.7	7.7 – 28.1*
Age	0.99	0.96 – 1.03
African American	0.48	0.13 – 1.70
Male	1.67	0.88 – 3.18

* $p<0.001$