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The Role of Drinking Severity on Sex Risk Behavior and HIV Exposure among Illicit Drug Users

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Abstract

Objectives—The current study examined how drinking severity among injection and non-injection drug users is associated with sex risk behaviors and risk of HIV exposure.

Methods—The study is a secondary analysis of an investigation of risk factors among drug users in Baltimore known as the NEURO-HIV Epidemiologic Study. Participants (N = 557) completed an interview, self-reported 30-day alcohol use, lifetime injection and non-injection drug use, and provided blood samples to screen for HIV. Participants were grouped into one of three drinking severity conditions: Abstinents (no reported alcohol use in prior 30-days), Moderate Alcohol Use (30 drinks for females, or 60 drinks for males), or Problematic Alcohol Use (>30 drinks for females, or >60 drinks for males). Drinking severity groups were significantly different on lifetime injection drug use, heroin injection, snorting/sniffing cocaine, and smoking crack.

Results—Logistic regression analyses found problematic alcohol users to be more likely than alcohol abstainers to inject drugs before or during sex (AOR = 5.78; 95% CI = 2.07-16.10), and more likely than moderate alcohol users to use alcohol before/during sex (AOR = 4.96; 95% CI = 2.09-11.81), inject drugs before/during sex (AOR = 2.96; 95% CI = 1.29-6.80) and to be HIV+ among Black participants (AOR = 2.72; 95% CI = 1.14-6.49).

Conclusions—These results outline the necessity for research and clinical intervention among this population to reduce sex risk behaviors and potential HIV exposure, while highlighting the need to examine drinking severity as a predictor of sex risk behaviors.

Sex risk behaviors increase the risk of sexually transmitted diseases (STDs) including the human immunodeficiency virus (HIV).^{1, 2} However, of individuals currently living with HIV, approximately two thirds of them (64.44%) report non-injection drug use (NIDU) in their lifetime,³ indicating that both IDU and NIDU are prevalent substance using categories to consider within this population. IDU is believed to be associated with infectious diseases due to sharing of needles, but multiple pathways have been suggested for how NIDU may

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influence disease status.⁴ This issue is somewhat exacerbated by the prevalence of polysubstance use among individuals who engage in high risk sex behaviors and, subsequently, are at particularly high risk for contracting HIV. In fact, sex with multiple partners, sex while under the influence of alcohol or other drugs, and unprotected sex are the three most prevalent sex-related HIV risk factors.^{1, 5}

Of particular importance is the critical role of alcohol use in engaging in risky behaviors generally, sex risk behaviors specifically, and the subsequent increased risk of contracting HIV. The use of alcohol among IDU and NIDUs may thereby greatly compound the risk of exposure to HIV. Polysubstance use is prevalent among populations of IDUs and NIDUs.^{6, 7} In addition, alcohol use and binge drinking are both associated with increased risk for STDs among women.⁸ This relationship is likely partially due to increased risk of unprotected intercourse under the influence of alcohol.⁹ However, the literature does appear somewhat divided as to the role alcohol use may have on sex risk behaviors. In a study of the substance use and sexual practices of college women, Caldeira et al.¹⁰ found drug use and drinking behaviors to be independently associated with having multiple partners, while sex under the influence of alcohol or drugs was associated with multiple sex partners and inconsistent condom use. In a similar finding, Zablotska et al.¹¹ found HIV incidence increased with a couple's alcohol consumption prior to a sexual encounter. Couples who did not drink prior to sexual contact had the lowest HIV incidence. The incidence of HIV increased in couples where one person drank prior to sex, and was highest in couples where both individuals consumed alcohol prior to engaging in sex.¹¹ Similarly, in a study of women attending a family planning clinic in Tanzania, those who reported drinking during study follow-up had significantly higher risk of HIV acquisition.¹²

Illicit drug use appears to promote increased sex risk behaviors by lowering inhibitions and increasing propensity toward risky behaviors,^{13, 14} although there is some discordance in the literature on this issue.⁴ Another possibility is that of the connection between STDs and illicit drug use is actually explained by a third causal variable - the desire for disengagement from risk awareness,¹⁵ impulsivity,¹⁶ personality disorder,¹⁷ and/or cognitive factors.¹⁸ The differences in outcomes of alcohol use on STDs may result from differences in how alcohol consumption is assessed across studies, which has hampered a more thorough understanding of how alcohol use may impact HIV¹⁹ and STDs.²⁰

Though this body of literature has made a strong case for the argument that alcohol use may play a role in increased likelihood of engaging in sex risk behaviors as well as increasing risk for exposing oneself to STDs or HIV, the literature has largely overlooked the distinction of how the severity of alcohol use may alter this relationship. Research has indicated that the level of alcohol use severity is an important predictor of negative outcomes²¹⁻²⁸ including sex risk behaviors^{10, 26} and increased risk of STDs.^{8, 28, 29} Despite this, the drinking severity distinction is largely overlooked within studies of illicit substance users. This gap is of some concern when we note that alcohol is among the most misused substances in the world and is of particular danger of being misused among IDUs,^{30, 31} where studies have indicated rates of alcohol use or misuse as high as 91%.³² As such, a case can be made to investigate problematic alcohol consumption as a contributor to sex risk

behaviors and subsequently to increased exposure risk to STDs or HIV than would moderate alcohol use or abstaining from alcohol use entirely.

Further, those that engage in IDU have higher rates of HIV and other STDs than do NIDU,³³ and moreover, elevated rates of alcohol use and misuse have been linked to higher rates of HIV and other STDs.³⁴ Subsequently, a population which engages in both problematic alcohol use as well as IDU would be both at risk for engaging in sex risk behaviors while simultaneously having higher rates of HIV and STDs. That is, a population of IDUs is both at elevated risk for contracting HIV and other STDs as well as transmitting them to their partners by means of unprotected sex and other sex risk behaviors. Despite this, however, no studies have investigated sex risk behaviors by alcohol use severity among a population of both IDUs and NIDUs. The current study is an attempt to bridge this gap in the literature by exploring rates of sex risk behaviors among injection and non-injection drug users and varying drinking severity conditions. Specifically, we expect to see that those reporting problematic alcohol use in the prior 30-days would be more likely than abstinent or moderate alcohol users to engage in alcohol use, IDU and NIDU before or during sex, as well as be more likely to be HIV+ on blood tests.

Method

Sample

The current study was a secondary analysis of data from an investigation of neuropsychological and social-behavioral risk factors among injection and non-injection drug users in Baltimore known as the NEURO-HIV Epidemiologic Study. The NEURO-HIV study included questions on demographic variables, medical/educational/social histories, patterns of licit and illicit drug use as well as a brief battery of cognitive functioning variables. This study was approved and monitored by the Institutional Review Board at the Johns Hopkins Bloomberg School of Public Health beginning in February 2002 and has been reviewed and reapproved annually every year throughout its duration. Because the NEURO-HIV Epidemiologic Study is discussed in great detail elsewhere^{18, 35} it will be outlined below only as it is directly relevant to the current study.

Participants of the NEURO-HIV Epidemiologic Study were between the ages of 15 and 50 years old and self-reported their use of injection and non-injection drugs in the prior six months. Participants were recruited through advertisements in local papers, street outreach, and referrals from local service agencies. Participants provided written informed consent and completed a face-to-face HIV-Risk Behavior Interview. Participants were remunerated \$45 in gift cards for the baseline assessment. The present study used a subset of participants ($N = 557$) who disclosed their level of alcohol use in the prior 30-days.

The mean age of the sample was 31.5 years ($SD = 7.8$). The majority of the sample was male (56%) and identified as Black (52%). Sixty-three percent of the sample population reported having engaged in IDU at some point in their lives and 8.3% ($n = 46$) tested positive for HIV. See Table 1 for descriptive statistics for the entire study sample.

Measures

General Demographics—Participant self-reported demographic information including age, sex, race, and highest education level attained. HIV status was gathered by means of blood screening.

Alcohol Use Problem Severity—The formation of alcohol use problem severity categories in the current study are consistent with standards utilized by the National Institute on Alcohol Abuse and Alcoholism.³⁶ NIAAA defines excess or problematic alcohol use as greater than 14 standard drinks for men and greater than 7 standard drinks for women per week. Participants who reported consuming no alcohol in the prior 30-days, they were placed in the “Abstinent” drinking condition ($n = 220$). When female participants reported consuming 30 drinks or fewer in the course of the prior 30-days, or male participants reported consuming 60 or fewer drinks in the course of the prior 30-days, they were classified as “Moderate Drinkers” ($n = 220$). If either group consumed more than their respective limits, they were placed in the “Problem Drinkers” category ($n = 116$).

Substance Use—Participants self-reported life-time injection and sniffing/snorting of heroin, injection and sniffing/snorting of cocaine, injection or smoking of crack, injection or smoking of methamphetamines. Participants also completed single item measures assessing age of first drink, first IDU, and first NIDU.

Sexual Behavior Information—Sex with multiple partners, sex while under the influence of alcohol or other drugs, and unprotected sex are the most prevalent sex-related HIV risk factors.¹ Accordingly, we included series of single item measures from the HIV-Risk Behavior Interview assessing the following items: (a) age of first engaging in sex – participants self-reported the age at which they first had a sexual experience, (b) substance use history before and during sex – participants self-reported the frequency with which they drank alcohol, used injection or non-injection drugs before or during sex, (c) condom use – participants self-reported the percentage of times they used condoms during sex, (d) partner IDU or non-IDU status – participants self-reported whether they knew about the IDU or NIDU history of their sexual partners, (e) partner STD status – participants reported on whether they knew if their sexual partners had any kind of STD before or during their sexual encounter with them, and (f) number of lifetime casual partners – casual partners were defined as sex partners with whom the participant had sex with for less than 3-months including one night stands. With the exception of number of casual partners all items were limited to the prior 30-days.

Statistical Analyses

Chi-square and one-way analyses of variance (ANOVA) statistics were conducted to determine significant differences in substance-related factors among conditions of drinking severity. A series of logistic regression analyses were conducted to determine differences between drinking severity conditions, sex risk behaviors, and HIV status. Age and sex were controlled in all logistic regressions, however, IDU was also controlled for in the logistic regressions predicting HIV+ status among participants as IDU are particularly vulnerable to blood-borne diseases and subsequently this could be considered a potential confound.

Further, participants in the HIV+ analysis were stratified by race to allow for more in-depth comparisons. All statistical analyses used SPSS v. 18.0 (SPSS Inc., Chicago, IL).

Results

The mean age of first alcohol use was 13.9 years ($SD = 4.11$), 14.2 years ($SD = 4.07$), and 13.9 years ($SD = 4.02$) for Abstainers, Moderate Alcohol Users, and Problematic Alcohol Users respectively. Age of first IDU and NIDU was 21.83 ($SD = 6.27$) and 14.63 ($SD = 3.75$), 24.18 ($SD = 6.43$) and 14.63 ($SD = 4.03$), 22.52 ($SD = 6.85$) and 14.42 ($SD = 3.51$) for Abstainers, Moderate Alcohol Users, and Problematic Alcohol Users respectively. See Table 2 for descriptive drug use statistics broken down by 30-day alcohol use severity.

Chi square analyses and one-way ANOVAs were used to identify differences between groups for each of the substance-related variables. A series of one-way ANOVAs were conducted to compare scores on all substance-related variables between the three groups of drinking severity. There was a significant difference between conditions on age of first IDU, $F(2, 347) = 4.84, p = .008$, lifetime alcohol use during or before sex, $F(2, 377) = 15.08, p < .001$, and lifetime IDU during or before sex, $F(2, 377) = 3.53, p = .030$. Further, drinking severity groups were found to be significantly different on measures of lifetime IDU ($\chi^2 = 9.97, p = .007$), lifetime heroin injection ($\chi^2 = 13.82, p = .001$), lifetime snorting/sniffing cocaine ($\chi^2 = 8.19, p = .017$), and lifetime smoking crack ($\chi^2 = 11.07, p = .004$). The means and standard deviations and significance of difference between conditions are presented in Table 2.

A series of logistic regression analyses were performed to assess the ability of drinking severity to predict sex risk behaviors above and beyond other drinking severity conditions after controlling for both age and sex of participants. Table 3 displays the associations between drinking severity conditions and past 30-day sex risk conduct specifically focusing on unprotected sex partners and use of alcohol, IDU, or NIDU before or during sex. No significant associations between drinking severity conditions and unprotected sex with casual partners and NIDU before or during sex in the prior 30 days were found in the current study.

The overall model predicting alcohol use during or before sex in the prior 30 days was significant ($p < .001$) indicating the model was able to distinguish between moderate and problematic drinkers who reported they had used alcohol during or before sex and those who had not. Drinking severity was a significant predictor of alcohol use during or before sex. Specifically, after controlling for the effects of age and sex, problematic drinkers were almost five times more likely than moderate drinkers to use alcohol during or before sex (AOR= 4.96; 95% CI: 2.09-11.81).

Injection drug use during or before sex was significantly more common among problematic drinkers than both abstainers ($p = .031$) as well as moderate drinkers ($p < .001$) indicating the model was able to distinguish between problematic alcohol users and abstainers as well as problematic and moderate alcohol users. Again, those who reported problematic alcohol use were three times more likely than moderate alcohol users and almost six times more

likely than abstainers to engage in IDU before or during sex (AOR= 2.96; 95% CI: 1.29-6.80 and AOR= 5.78; 95% CI: 2.07-16.10 respectively).

Finally, a similar analysis using differences in drinking severity to predict HIV+ status stratified by race and controlling for age, sex, and IDU status was conducted utilizing differences in drinking severity to predict current HIV+ status (see Table 4). A strong link between drinking severity conditions and HIV+ status for White participants was not supported in the current study. The overall model predicting HIV+ status among Black participants was significant ($p = .048$) indicating the model was able to distinguish between moderate and problematic drinkers who tested positive for HIV. In fact, Black participants in the problematic alcohol use category were almost three times more likely than those reporting moderate alcohol use to be HIV+ (AOR= 2.72; 95% CI: 1.14-6.49).

Discussion

The current research provides important contributions to the existing literature that investigates substance misuse and its association to sex risk behaviors. Specifically our research examines differences among drinking severity and what role it may play in increasing sex risk behaviors and subsequent risk of exposure to HIV or other STDs among an illicit drug using population. Interestingly, drinking severity conditions did not differ significantly in terms of the number of unprotected sex partners, supporting studies that found no link between being under the influence of alcohol and engaging in sex risk behaviors.³⁷ This is of particular interest as some previous literature has found that those who engage in excessive alcohol use are more likely to engage in sex risk behaviors including having multiple sex partners and unprotected sex.¹⁰ One factor which may contribute to this finding in the current study is the nature of the population in question. That is, as the participants in the current study did not all utilize injection drugs, but were polysubstance users of some degree, and as such are at elevated risk for engaging in sex risk behaviors compared to non-substance using populations.

In the current study problematic alcohol users were almost five times more likely to use alcohol during or before having sex. Though this finding is somewhat self-explanatory, it is interesting that problematic alcohol users were also almost six times and three times more likely to use injection drugs before or during sex than both abstainers and moderate alcohol users respectively. However, moderate alcohol users were no more likely to use injection drugs prior or during sex than were those who abstained from alcohol use. Problematic alcohol users were also the least likely to be IDUs when compared to the moderate alcohol users and alcohol abstainers. Though these findings appear somewhat incongruent, as previously discussed, this may be a function of impaired judgment due to excessive alcohol exposure or the result of a simple preference for alcohol or drinking as a route of administration than for opioids or injection as a route of administration.

Interestingly, among Black participants in the current study, problematic alcohol users were almost three times more likely than moderate alcohol users to be HIV+, however were no more likely than those who abstained from alcohol to be HIV+. Additionally, though not significant, fewer moderate alcohol users were HIV+ than abstainers. This curious finding

may be due to sociocultural differences or allude to a potential protective factor associated with responsible alcohol use. One possible explanation could be that those who use alcohol responsibly are more likely to develop self control as they are exposed to alcohol. This may translate into other life skills such as decision-making abilities in potentially risky sexual situations or venturing into other drug use. Though this was clearly beyond the scope of the current study, it is an idea that warrants further investigation in larger sample sizes. Similarly, comparable results were not obtained when looking at White populations. This lack of significance may likely be less due to racial differences and more on sample size. The current study had only six White HIV+ participants, which was likely insufficient to detect significant differences in drinking severity. However, as HIV is clearly as much of a concern for White populations as it is for Black populations, additional research with racially diverse populations is warranted to determine the impact of varying levels of alcohol use on HIV status. Future research should investigate this phenomenon in greater detail.

The current study supports previous research indicating the necessity of addressing safe-sex practices within standard addiction treatment in an effort to reduce HIV infections through sex risk behaviors while under the influence of a substance. One avenue in which this may be feasible is in substance abuse treatment facilities. Understandably, in standard substance abuse treatment protocols the primary focus is frequently on reducing or eliminating substance misuse. However, the current research suggests that in addition to targeting substance use in treatment, discussing the need for safe sexual practices while under the influence is also necessary or abstaining from substance use during or before engaging in sex. In terms of IDUs this may be achieved in counseling services associated with methadone maintenance. That is, providing education that specifically targets engaging in sex risk behaviors while under the influence and how this may potentially contribute to the spread of HIV and other STDs may promote safer sex among this population of substance users.

The current study has several limitations that should be noted to allow for the proper interpretation of the findings. First, the current study utilizes a cross-sectional design which, though common in research, cannot be used for making causal inferences. However, it may be useful to stimulate future research and further scientific understanding. The current research also utilizes self-report measures to assess alcohol and drug use behaviors and history. That is, participants may over or under report the amount of substances they use deliberately or unintentionally which may influence the findings of this study. Though self-report measures of substance-related variables provide information over a greater time interval than could be achieved by physiological or other methods the current study could have been strengthened by physiological measurement such as blood or urinalysis to cross-validate self-reported substance use histories, thereby reducing the likelihood of misreporting recent substance use. Additionally, the use of self-report could have been further supported by validating alcohol drinking severity by means of concordance between participant self-report and family/peer reports on alcohol use behaviors. Despite this, a review of self-report among IDUs concluded using self-report is a reliable and valid method of describing drug use behaviors and history³⁸. Given the nature of this type of research, the use of self-report measures appeared both necessary and appropriate. Finally, as the current study deals specifically with IDU and NIDU, the applicability of the findings to populations

beyond the populations utilized in this study are questionable and limited. Similarly, the current study looked at STDs generally and HIV specifically, but one may expect to see different results when examining infectious diseases not also transmittable by means of needle use.

Conclusion

Participants that reported problematic alcohol use were almost five times more likely than moderate users to drink before or during sex and almost three times more likely to use injection drugs. They were also almost six times more likely than those who abstained from drinking in the prior thirty days to use injection drugs during or before sex. Furthermore, problematic drinkers were almost three times more likely than moderate alcohol users to be HIV positive among Black participants. However, no relationship was found between drinking severity and number of unprotected sex partners or NIDU before or during sex. Clearly, the problematic use of alcohol results in increases in sex risk behaviors which may put an already at risk group of IDUs at further risk of contracting HIV and other STDs. If not already included in existing treatment protocols, adding or expanding standard substance abuse treatment interventions to include discussions of safe sex practices – particularly when dealing with IDUs – may help to begin to address this concern.

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Table 1

Sample Population Demographics

Total Sample (<i>N</i> = 557)		
	<i>M</i>	<i>SD</i>
Age	31.50	7.83
Age first drink	13.93	4.01
Age first IDU	22.69	6.36
Age first non-IDU	14.79	3.96
Age first had sex	14.62	2.73

	<i>n</i>	%
Sex		
Male	315	56.6
Female	242	43.4
Race		
White	267	47.9
Black	290	52.1
Education		
Less than high school	249	44.7
Finished high school	308	55.3
Drinking Severity		
Abstinence	220	39.5
Moderate	220	39.5
Problematic	116	20.8
Injection Drug User	352	63.2
HIV+ Status	46	8.3

Table 2

Multivariate Analyses of Substance Use and Sex Risk Behavior History

	Abstinent (<i>n</i> = 220)		Moderate Alcohol Users (<i>n</i> = 220)		Problematic Alcohol Users (<i>n</i> = 116)		<i>F</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Age first drink	13.99	4.11	14.23	4.07	13.93	4.02	2.25
Age first IDU	21.83	6.27	24.18	6.43	22.52	6.85	4.84**
Age first NIDU	14.63	3.75	14.63	4.03	14.42	3.51	0.07
Number of lifetime partners	28.26	80.54	48.30	271.22	26.83	33.38	0.57
Frequency of condom use	46.57	49.32	46.89	51.17	48.62	28.45	0.05
Alcohol use during or before sex	--	--	28.15	24.73	47.53	26.69	15.08***
IDU during or before sex	21.71	46.89	11.55	20.20	13.77	22.66	3.55*
Non-IDU during or before sex	28.21	43.65	29.32	27.03	35.18	34.00	1.20

	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	χ^2
Illicit Substance Use ^a									
Injection Drug Users	158	71.8	142	64.5	64	55.2	9.97	**	
Heroin Injection	157	71.4	136	61.8	60	51.7	13.82	**	
Heroin Snort/Sniff	181	82.3	188	85.4	93	80.2	0.23		
Cocaine Injection	113	51.4	109	49.5	45	38.8	4.78		
Cocaine Snort/Sniff	139	63.2	159	72.3	91	78.5	8.19	*	
Crack Injection	9	4.1	11	5.0	5	4.3	0.14		
Crack Smoke	134	60.9	166	75.5	89	76.7	11.07	**	
Meth Injection	10	4.5	9	4.1	9	7.8	2.53		
Meth Smoke	7	3.2	4	1.8	4	3.5	1.25		
Sex Risk Behaviors ^b									
Sex with IDU partner	90	40.9	66	30.0	26	22.4	2.61		
Sex with possible AIDS/HIV+ partner	189	85.9	209	95.0	100	86.2	3.64		
Sex with possible HBV/STD partner	170	77.3	178	80.9	80	68.9	4.74		

^aIndicates lifetime

100>d

10>d
**
50>d
*

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Table 3
Summary of Logistic Regression Odds Ratios with Severity of Drinking Condition as a Predictor of Past 30-day Sex Risk Behaviors

Predictors	Unprotected sex with casual partners		NIDU ^a before or during sex		Alcohol use during or before sex		IDU ^b before or during sex	
	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
Abstainer vs. Moderate User	0.85	0.49-1.19	1.44	0.30-2.36	--	--	1.88	0.68-5.21
Abstainer vs. Problematic User	1.24	0.90-8.45	2.75	0.40-3.87	--	--	5.78***	2.07-16.10
Moderate vs. Problematic User	1.45	0.71-5.36	1.95	0.52-4.06	4.96***	2.09-11.81	2.96**	1.29-6.80

Note. AOR are adjusted for participant age and sex

* = $p < .05$

** = $p < .01$

*** = $p < .001$

^a indicates Non-Injection Drug Use

^b indicates Injection Drug Use

Table 4

Summary of Adjusted Odds Ratios for Logistic Regression Analyses Using Alcohol Use Category as a Predictor of HIV+ status Stratified by Race, Sex and Injection Drug Use Status

	White <i>n</i> = 267, 6 HIV+		Black <i>n</i> = 290, 40 HIV+	
	<i>AOR</i>	95% CI	<i>AOR</i>	95% CI
Predictors				
Abstainer vs. Moderate User	1.44	0.28-7.42	0.57	0.24-1.34
Abstainer vs. Problematic User	1.17	0.12-11.82	1.49	0.64-3.46
Moderate vs. Problematic User	0.76	0.07-7.99	2.72*	1.14-6.49

AOR are adjusted for age, sex and injection drug use status

*
 $p < .05$.