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Sexual Risk Behavior and Sex Under the Influence: An Event Analysis of Men in Substance Abuse Treatment Who Have Sex with Women

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Abstract

The objective of this study was to determine if there is evidence for a causative link between sex under the influence of drugs or alcohol and risky sex for men in substance abuse treatment. Men in treatment participating in a multi-site HIV prevention protocol who reported on baseline, 3 or 6-month computerized assessments the details of their most recent sexual events, and who reported having sexual events under the influence and not under the influence, and who reported most recent events that did and did not include condom use served as participants (n=37). Safe sex was not significantly more likely to happen when participants were under the influence of drugs or alcohol during their most recent sexual event (48.3%) than when they were not under the influence (49%, p=.82). In this high-risk in treatment sample, a causative link between sex under the influence of drugs or alcohol and sexual risk behavior was not supported.

Introduction

Roughly one million individuals in the U.S. are infected with human immunodeficiency virus (HIV) and the rate is rising.[1] Injection practices and risky sexual behaviors, such as anal and vaginal intercourse without a condom, among drug abusing populations have contributed to the growth and spread of HIV and other sexually transmitted diseases.[2,3] In comparison with non-infected individuals, presence of other sexually transmitted Infections (STI) increases the risk of acquiring HIV by 200–500% when exposed to the virus through sexual contact. Additionally, if an HIV-infected individual is also infected with another STI, that person is more likely to transmit HIV through sexual contact than other HIV-infected persons.[4] A number of studies have observed that sex under the influence of drugs or alcohol is associated with increase in sexual risk behavior.[5–11]

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Declaration on Interests

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

Approaches to studying the interplay between risky sexual behavior and substance use vary. There are two meta-analyses that detail the wide body of literature to date in regard to alcohol and condom use and alcohol and HIV infection.[12,13] Much of the findings suggest an association between alcohol and sexual behavior. Although sexual risk behavior is often linked to substance use, the relationship is not clearly understood in regard to whether there is a correlative relationship or a causal relationship. Research on the link between substance use and sexual risk behavior has shown inconsistent findings.[3,13] Some of this is due to the differences in methodological approaches.

Some studies use global association designs where general substance use habits are correlated with general sexual activity and condom use. In a typical global association study, participants provide information about the quantity and frequency of their recent substance use, as well as information about the number of times they engaged in specific sexual HIV-risk behaviors during the same reporting period.[14] Other studies use situational association designs where a participant's frequency of high-risk sexual behaviors is correlated with the participant's frequency of engaging in sex while using substances.[3,15] Situational association studies move beyond global association studies in that whether participants engaged in sexual acts while intoxicated is assessed and related to an index of sexual risk behavior.[14]

In event analysis, respondents are asked a number of questions about a specific sexual incident so as to ensure temporal contiguity of substance use and sexual behavior.[3] Event analysis measures a participant's substance use and safe/unsafe sexual behavior in a specific sexual incident so as to ensure temporal contiguity of substance use and sexual behavior. However, if a person is queried about two different recent events (e.g. under the influence and not under the influence sexual events) during the same assessment episode, the problem of attribution error may occur. Attribution theory is concerned with the ways in which people explain (or attribute) the behavior of others or themselves (self-attribution) with something else.[16] This can refer to a situation where a respondent is asked about general sexual experiences in the recent past (some risky, some not) and asked why at times they behaved in a sexually risky manner. They may attribute the risky sexual behavior to substance use. Social desirability theory posits that a respondent will reply in a manner that will be viewed favorably by others.[17] If it is socially more desirable to have safer sex but the respondent did not have safer sex, then the respondent may use the excuse that a substance is to blame for their behavior, i.e. "I only had unsafe sex because I was high."

In order to obtain a causal relationship between substance use and risky sexual behaviors, Cooper et al.[18] argue that the following conditions should be present. First, substance use must precede sexual activity. Second, substance-associated sexual behavior should be distinctively different from usual patterns of behavior. In other words, a causal association between risky sex and substance use can be made only if key risk behaviors are promoted (e.g., having sex with a partner who would normally be rejected) or key protective behaviors inhibited (e.g., failure to use a condom when one is usually used). By examining drinking/drugging and condom use in specific sexual encounters through the use of event analysis, one can target the role of substance use in influencing unprotected sex.

Traditional event analysis has limitations in that it does not eliminate the possibility of confounding factors such as personality characteristics.[18] Someone who is predisposed to risky behavior may use substances and have risky sex more often either on a regular basis or during specific events, which cannot be teased out in event analysis of a single sexual event. However, if a respondent gives information on an event that include substance use and on another event that does not include substance use, it is possible to perform a within-participant analysis of substance using events and non substance using events and their

sexual behavior risk.[3] If the individual also reports on sexual events in which safe sex occurred and events in which risky sex occurred, then the possible link between risky sex and sex under the influence could be further elucidated by examining these double discordant (safe-risky sex/under the influence-not under the influence) events.

Breslow and colleagues proposed a conditional logistic model for estimating relative risk in matched case-control studies.[19,20] Matched design doesn't have separate independent samples of cases and controls. Our data is an example of a perfectly matched design, where three events are collected for each individual. A conditional logistic model is appropriate here since it allows within person analysis by conditioning on individuals, which yields an evaluation of the risk factors and fully controls the individual person characteristics that are difficult to control confounding factors in other designs.

The National Institute on Drug Abuse Clinical Trial Network protocol 0018 (The Real Men Are Safe trial) [21] provided a unique opportunity to examine the possible link between sex under the influence and risky sex. Analysis of baseline data from the trial indicated sex under the influence was associated with risky sexual behavior.[11] Since only baseline data was utilized the approached only qualified as a "situational association" study. In the protocol participants were administer an audio computer assisted structured interview at three time points that included a detailed reporting of their most recent sexual event. This allowed for the possibility that some participants would report sex under the influence events and sex not under the influence across assessment time points. In addition some of these individual could report both sexually safe events and sexually risky events. By selecting cases that report discordant events on both of these two dimensions contributions attributed to individual differences such as personality can be held constant when comparing discordant events. In addition, potential attribution bias[16] is minimized because the discordant events are reported on at separate time points 90 days apart and at no time are participants asked to compare these events on either the sexual risk or under the influence dimensions.

The objective of this paper is to examine whether support for a causative link can be established between sex under the influence and risky sex. Support for a causative link would be established if risky sex happens more frequently for under the influence events compared to not under the influence events for men who meet the criteria of describing multiple most recent sexual which were discordant on sex under the influence and risky sex dimensions across events.

Methods

Parent Study procedures

Participant inclusion criteria for the parent "Real Men Are Safe" protocol were males over the age of 18, in substance abuse treatment at a participating community treatment program, who reported engaging in unprotected vaginal or anal intercourse during the prior 6 months, a willingness to be randomly assigned to one of two interventions, a stated intention to complete assessment batteries at baseline, post-intervention and at 3- and 6 months follow-up, and the ability to speak and understand English.[21] Exclusion criteria included observable, gross mental status impairment, including severe distractibility, incoherence or retardation as measured by clinician assessment or the Mini Mental Status Exam.[22]

The Sexual Behavior Interview (SBI) was administered as part of assessments conducted at baseline, 3 months post intervention and 6 months post intervention. The SBI items were selected or adapted from the SADAR (Sex and Drug Abuse Relationship Interview[10] and the SERBAS (Sexual Risk Behavior Assessment Schedule).[23,24] Behaviors assessed

included: 1) frequency of unprotected vaginal, anal, and oral sex by partner type (main vs. casual) over the past 90 days; 2) number, gender, and risk status of partners (high risk defined as injection drug using, crack cocaine using, exchanges sex for drugs/money, or is thought to be HIV positive); 3) percentage of times sex occurred under the influence of drugs or alcohol over the prior 90 days, and 4) an assessment of the most recent sexual event that included: number of days since the event, was the participant and/or partner under the influence, if yes - which drug(s), what sex acts took place, and were condoms used. SBI items were administered using the audio computer assisted structured interview (ACASI) method, shown to elicit more self reports of high-risk behaviors than face-to-face interviews.[25,26]

Participants were randomized to attend either Real Men Are Safe or HIV Education. Details concerning randomization, intervention content and delivery, interventionist training and fidelity monitoring are provided in Calsyn et al.[21]

All procedures were approved by the Human Subjects Committee of the University of Washington. In addition the procedures were approved by each institutional review board providing human protection oversight for each treatment program in which the trial was conducted. Participants were assured by written consent that all data collected by research staff would not be shared with clinical staff. Thus self disclosure of substance used would not jeopardize their status in the treatment program.

Case selection, current study

In order for cases to be included in the primary data analyses planned (see below) they needed to meet the following criteria: 1) answered questions about their most recent sexual event for at least two of the three assessments (baseline, 3 month follow up, 6 month follow up); 2) only women were identified as sexual partners during these events; 3) sexual partner type (regular or casual) had to be the same for compared events, (condom use is more apt to occur with casual versus regular partners),[27] 4) respondent provided sufficient detail of the event so it could be determined whether the respondent was under the influence of drugs or alcohol for the event and whether the event was sexual risky (vaginal or anal intercourse without a condom); 5) two out of three sexual events had to be discordant on both sexual risk (safe/unsafe event) and sex under the influence (yes/no).

In Table I the application of case selection criteria is presented for the 537 men from the Real Men Are Safe trial who reported only sex with women during the most recent sexual events, Table 1 provides the number who described their most recent sexual event at both of the assessments points being compared. Also listed are the number who: 1) reported having the same partner type for both events; 2) provided sufficient detail to determine event sex risk and under the influence status; 3) reported being under the influence for both events; 4) reported being under the influence for neither event; 5) reported being under the influence at first event, but not the second event and visa versa. For those who reported being under the influence and not under the influence for different sexual events Table I identifies the number who: 1) were sexually safe at both events; 2) were unsafe at both events; 3) sexually safe at first event, but not the second and visa versa. Of the 771 comparisons examined, 50 (6.5%) observations meet criteria for case selection for further analysis. Thirteen observations represented a second double discordant observation for a participant. Thus, there were 37 cases that met full criteria. For each of these cases the respondent reported being both under the influence and not under the influence for two different reports of their most recent sexual events and also reported both being sexually safe and sexually unsafe for two different reports of their most recent sexual events. These 37 men reported on 103 paired observations and 107 discrete sexual events.

Data analysis

The primary data analysis planned can be viewed as an example of matched case-control studies.[19,20] In order to eliminate as many as possible confounding factors, the best solution was to perform a within-person analysis. We denoted x=1 as sex under the influence of drugs or alcohol, Y=1 as safe sex. In order to eliminate person effects, a conditional logistic model on individual conditional probabilities was built. Within this model, of interest is the log odds ratio of safe sex under influence and safe sex under no influence, which can be interpreted as the drug effects on the chance of safe sex. If the log odds ratio is zero, that means there are no drug effects on safety of sex, i.e. no matter whether a patient is under influence, the chance of a safe sex is the same. If the log odds ratio is greater than zero, then a person under influence is more likely to have safe sex. If the log odds ratio is less than zero, then a person under influence is less likely to have safe sex. The maximum likelihood estimator (MLE) and the 90% confidence interval around the log odds ratio are also calculated. Details for conducting the analysis are provided in the appendix.

Results

Demographics

The mean age and education for the 37 selected cases was 37.3 (*sd*=10.1) and 12.6 (*sd*=1.3) years respectively. Ethnic distribution for selected cases was: White 21 (56.8%), African American 10 (27.0%), and Hispanic 6 (16.2%). Six (16.2%) of the selected cases were married, 22 (59.5%) were previously married, and 9 (24.3%) never married. Twenty selected cases (54.1%) were employed. Selected cases (*n*=37) were similar to all other participants (*n*=500) and all other participants with complete follow up data (*n*=200) on all demographic characteristics and were not statistically significantly different from them.

Relationship between sex under the influence and risky sex

Following the data analytic plan laid out above and in the appendix the value obtained for the log odds ratio of safe sex under influence and safe sex under no influence) is 0.18. The MLE of the odds ratio is 1.20, with 90% confidence interval (0:63; 1:57). Testing for the log odds ratio = 0 gives a *p*-value of 0.82. Thus there is not significant evidence supporting the hypothesis that sex under the influence of drugs or alcohol affects sexual risk behavior.

Another way to visualize the results is to represent the 107 discrete sexual events for the 37 double discordant men in a 2 (under the influence) × 2 (sex risk) matrix as has been done in Table II. Safe sex happened in 48.3% of the under the influence events and 49% of the not under the influence events, thus providing further support for the null hypothesis that being under the influence for sexual events is not causatively linked to unsafe sex for those events.

To conduct the analysis proposed we purposely focused on participants who were discordant on the dimensions of being under the influence and sexual risk for two or more recent sexual event reports. However, since only 37 (15.6%) participants for whom we had full data for at least two sexual events met these criteria, it speaks to the consistency of behavior by the participants on these two dimensions. By summing rows in Table 1 we find there are 577 (74.8%) concordant paired observations on the sex under the influence dimension. The participant was under the influence both times (18.95%) or not under the influence both times (55.85%). For sex risk, participants were concordant for 584 (75.7%) of paired observations. The participant sex risk was safe both times (11.8%) or unsafe both times (63.9%).

Discussion

It has been widely observed that sex under the influence of drugs or alcohol is associated with increase in sexual risk behavior.[5–11] Two possible explanations for this observation are: 1). risky people do risky things, thus the link is correlative in nature; 2) being under the influence directly contributes to engaging in risky sexual behavior (a causative link).[15,18,28,29] The Real Men Are Safe study provided a unique opportunity to provide empirical support for the latter hypothesis if it could be shown that men who engaged in double discordant sexual events (under the influence and not under the influence/unsafe sex and safe sex) engaged in unsafe sex more often under the influence than not under the influence events. A causative link was not supported as these men were just as likely to engage in unsafe sex as safe sex when under the influence. These findings are consistent with previous findings in which within person event analysis methodology was applied.[3,7,13–15,30–32] One exception had been with men who have sex with men using methamphetamines in which results were consistent with a causative link.[33–35] Unlike the current study these studies did not control for "attributional bias" in that people are asked about an under the influence and a not under the influence event at the same assessment time point. There may be some demand characteristics for respondents to "attribute" their risky behavior to being under the influence.

It was difficult to identify cases for the primary analysis since most study participants were fairly consistent in their behavior. Only 37 participants (15.6%) were actually discordant in their under the influence behavior and sexual risk behavior, i.e. they performed risky or non-risky sexual behavior at one encounter while using substance and performed the opposite way in the comparison encounter while not using substance. These results allude to a consistency in behavior across substance use and sexual risk for this population rather than an ability to predict sexual risk as a function of substance use. On the sex under the influence dimension, behavior was concordant for 74.8% of paired observations. For sex risk dimension, participants were concordant for 75.7% of paired observations.

There are several important implications based on the findings for clinicians treating substance abusing men. Although unsafe sex happens more often when men are under the influence, the link does not appear to be causative. Thus if a man in treatment who has been engaging in risky sex discontinues his substance use one should not assume safe sex practices are likely to ensue. In fact the data suggest unsafe sex is likely to continue. The treatment provider needs to continue to address sexual risk behavior during counseling sessions even when sobriety and recovery have taken hold. Moreover, in order to decrease HIV risk, men who come into substance abuse treatment and report risky sexual behavior, whether they continue to use or not, should be targeted for safe-sex practices and risk reduction strategies right from the start of treatment. Men in substance abuse treatment who attribute unsafe sexual behavior to being under the influenced should be challenged to accept responsibility for their unsafe behavior as there is little support for "I was unsafe because I was high." Finally, in prior reports we have advocated that sex under the influence needs to be treated primarily as a relapse prevention issue, rather than a HIV/STI prevention issue.[36] These findings reinforce that stance as there is little support for an argument that reducing sex under the influence among men in substance abuse treatment would lead to a reduction in risky sexual behavior.

Several limitations of the current study should be considered to place the results in context. Due to the restrictive case selection criteria the sample size for conducting the analysis was small. The necessity for the statistical analyses of identifying cases that were discordant for safe sex and sex under the influence for 2 of the 3 sexual events led to a small proportion of the overall original sample being represented in the analysis, and therefore the

generalizability of the findings to all patients in the study is limited. However, the percent of men with double discordant events engaging in safe sex under the influence and not under the influence events is very similar (48.3% vs. 49%), and does not suggest a trend that might have been significant with a larger sample. Although the study was conducted in a variety of settings and had few exclusion criteria, the limits on generalizability of the findings in terms of patient factors such as self referral to the study, age, type of substance of abuse, psychiatric and substance abuse diagnosis, and sexual history, have not been explored. Findings are limited to adult men in substance abuse treatment. The association between sex under the influence and sexual risk may be different for women, adolescents, or those who misuse substances infrequently. Another limitation is associated with event analyses. The self report of the most recent sexual events may not be representative of the individuals overall sexual behavior.

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Appendix: Detailed description of data analytic procedures

The primary data analysis planned can be viewed as an example of matched case-control studies.[19,20] In order to eliminate as many as possible confounding factors, the best solution was to perform a within-person analysis. We denoted x=1 as sex under the influence of drugs or alcohol, Y=1 as safe sex. In order to eliminate person effects, a conditional logistic model on individual conditional probabilities was built. Let $P(Y_{ij}=1|x_{ij})=p_{ij}$, where $i = 1,\ldots, I$ and $j = 1,\ldots, t$.

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right)=a_i+bx_{ij}$$

If we assume that events are conditionally independent from time to time, given exposure, then the likelihood can be written as:

$$L(\alpha,\beta)\propto\exp\left(\sum_{ij}a_iY_{ij}+b\sum_{ij}x_{ij}Y_{ij}\right)$$

The quantity we are interested in is *beta* (*b)*, which is the log odds ratio of safe sex under influence and safe sex under no influence, or we can interpret it as the drug effects on the chance of safe sex. If b=0, that means there are no drug effects on safety of sex, i.e. no matter whether a patient is under influence, the chance of a safe sex is the same. If b>0, then a person under influence is more likely to have safe sex. If b<0, then a person under influence is less likely to have safe sex. By conditioning on each person's sum of response, $Y_{i+}=\sum_{j=1}^{t}Y_{ij}$, the person effects a_i could be eliminated. Through some calculation, persons with either Y_{i+} = 3 or 0 or x_{i+} = 3 or 0 don't contribute in estimating b. Therefore, we restrict

our analysis to participants with at least one change of behavior on both sex under the influence and sexual risk in two out of the three sexual events, i.e. persons with $Y_{i+} = 1,2$ and $x_{i+} = 1,2$.

For each person, we have a measure of consistency between under the influence and risk, whose distribution only depends on b. We denote $Z_i = \sum_{j=1}^{3} x_{ij} Y_{ij}$ as the consistency measurement. Participants can be grouped into 8 categories (2 [under the influence, yes/no] by 2 (safe/unsafe sex) by 2 [sex event 1/sex event 2]) and the number of participants in each category, $n_1, \ldots, n_8$, are counted. The corresponding probabilities derived from the conditional logistic model are:

$$p_1 \equiv \Pr(Z_i=0|Y_{i+}=1, x_{i+}=1)=\Pr(Z_i=1|Y_{i+}=2, x_{i+}=2)=\frac{2}{2+e^b}$$
$$1-p_1 \equiv \Pr(Z_i=1|Y_{i+}=1, x_{i+}=1)=\Pr(Z_i=2|Y_{i+}=2, x_{i+}=2)=\frac{e^b}{2+e^b}$$
$$p_2 \equiv \Pr(Z_i=0|Y_{i+}=1, x_{i+}=2)=\Pr(Z_i=0|Y_{i+}=2, x_{i+}=1)=\frac{1}{1+2e^b}$$
$$1-p_2 \equiv \Pr(Z_i=1|Y_{i+}=1, x_{i+}=2)=\Pr(Z_i=1|Y_{i+}=2, x_{i+}=1)=\frac{2e^b}{1+2e^b}$$

Based on these counts, we form our conditional likelihood of b as:

$$L(\beta) \propto p_1^{n_1+n_2}(1-p_1)^{n_3+n_4} p_2^{n_5+n_6}(1-p_2)^{n_7+n_8}$$

The maximum likelihood estimator (MLE) and the 90% confidence interval around b are then calculated.

Table I

Case selection process. Baseline assessments were available for 537 men reporting only sex with women

	Assessment time point pair		
Step in case selection criteria	**Baseline-3 Months**	**Baseline-6 Months**	**3 Months–6 months**
	n (%)	**n (%)**	**n (%)**
Recent sexual event reported at both assessments*	354 (65.9)	346 (64.4)	312 (58.1%)
Respondent had same partner type (regular/casual) at both sexual events†	297	274	257
Sufficient event detail to determine under the Influence & sexual risk†	280 (94.3)	253 (92.3)	238 (92.6)
Respondent under the influence for both events‡	59 (21.1)	42 (16.2)	46 (19.3)
Respondent under the influence for neither event‡	147 (52.5)	137 (54.2)	146 (61.3)
Discordant under the influence events			
Under the influence for first event, but not second event‡	44 (15.7)	48 (19.0)	22 (9.2)
Safe sex at both events‡	4 (1.4)	4 (1.6)	3 (1.3)
Unsafe sex at both events‡	26 (9.3)	29 (11.5)	11 (4.6)
Safe sex at first event, unsafe sex at second event‡	**9 (3.2)**	**6 (2.4)**	**4 (1.7)**
Safe sex at second event, unsafe sex at first event‡	**5 (1.8)**	**9 (3.6)**	**4 (1.7)**
Under the influence for second event, but not first event‡	30 (10.7)	27 (10.7)	24 (10.1)
Safe sex at both events‡	6 (2.1)	1 (0.4)	2 (0.8)
Unsafe sex at both events‡	18 (6.4)	22 (8.7	19 (8.0)
Safe sex at first event, unsafe sex at second event‡	**5 (1.8)**	**4 (1.6)**	**0 (0)**
Safe sex at second event, unsafe sex at first event‡	**1 (0.4)**	**0 (0)**	**3 (1.3)**
Cases selected (sum of bolded cells) ‡	20 (7.1)	19 (7.5)	11 (4.6)

*Denominator to determine the percent is based on total number of cases

†Denominator to determine the percent is from row above

‡Denominator to determine the percent is based on the number with sufficient event detail to determine under the Influence & sexual risk

Table II

Relationship between sex under the influence and sexual risk for cases who report discordant under the influence and discordant sexual risk events

	Under the influence events	
	Yes	No
Sexual risk of events	**n (%)**	**n (%)**
Safe	24 (48.3)	28 (49.0)
Unsafe	25 (51.7)	30 (51.0)